Minnesota Department of Transportation Agreement Number: 73807P

Minnesota Intelligent Transportation Systems

Statewide Intelligent Transportation Systems As-Is Agency Reports for Minnesota

Volume 5
City of Minneapolis

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August 1996

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Appendices

1. INTRODUCTION

The purpose of the Polaris Project is to define an Intelligent Transportation Systems (ITS) architecture for the state of Minnesota. An architecture is a framework that defines a complex system, in terms of a set of smaller, more manageable systems which are fully defined in terms of their individual boundaries, functions, physical components, and interfaces. They illustrate how each of the systems interrelate and contribute to the overall ITS objectives and requirements.

A well defined architecture provides many benefits for a complex system. It defines and optimizes the location of system functions. It identifies critical interfaces, and illustrates how associated systems can be integrated to share resources and information. It establishes standards for communications and physical components so that inter-operability can be maintained as the system evolves to incorporate new capabilities and technologies.

The Minnesota Statewide ITS Architecture is a tailored version of the National ITS Architecture. Tailoring incorporates the prioritized wants and needs of the state's transportation users and stakeholders, as well as its existing ITS infrastructure. The functional architecture, physical architecture, system requirements and implementation plan are fully documented in the following project deliverables:

ITS Traveler Wants/ Needs - Information obtained from Minnesota residents in ten end user sessions held across the state. Used to establish and prioritize end-user requirements.

ITS Transportation Wants/ Needs - Information obtained from ITS stakeholder institutions. Used to establish and prioritize ITS service provider requirements.

ITS Wants/ Needs Analysis - Final results and recommendations of the wants and needs research.

Statewide ITS As-Is Agency Reports for Minnesota - Information about existing transportation systems that establish the starting point for the Architecture Implementation Plan.

ITS System Specification - Incorporates the results of the functional and physical architectures into specification format. The specification will clearly identify ITS system level requirements for the identified Minnesota ITS services.

ITS Component Specification - Incorporates the results of the functional to physical allocation in specification format. The specification will clearly identify the Minnesota ITS component systems requirements.

ITS Architecture Implementation Plan - A recommended ITS deployment strategy for future state initiatives.

2. SCOPE

This document, *Statewide ITS As-Is Agency Reports for Minnesota*, consists of a collection of individual system survey reports related to transportation systems. The Polaris Project will use the survey information collected to derive the existing architectural framework. After the existing architectural framework is derived, this information will be used as the baseline for developing the Minnesota Statewide ITS Architecture.

Agencies identified and contributed to this document were:

- Minnesota Department of Transportation Office of Advanced Transportation Systems
- Minnesota Department of Transportation Traffic Management Center
- Minnesota Department of Transportation Metropolitan Division
- Minnesota Department of Transportation Electrical Services Section
- St. Paul Department of Public Works
- Minneapolis Department of Public Works
- Hennepin County Department of Public Works
- Ramsey County Department of Public Works
- Minnesota State Patrol
- Hennepin County Medical Center
- Metropolitan Council Transit Operations
- Metropolitan Airports Commission
- Gopher State One Call
- Minnesota Office of Tourism

2.1 Document Overview

This document presents the methods, assumptions and procedures used to collect the baseline information. The documentation of systems that were inventoried is presented in Section 3.

2.2 Methods, Assumptions, and Procedures

2.2.1 System Identification

Agency and system candidates were based upon several factors prior to survey. Through market research, the highest wants and needs priorities for traveler and transportation related agencies identified the functional areas to be improved (i.e. Travel Conditions). The Polaris Project took the functional wants and needs and associated the wants and needs functions to current Minnesota Agencies. Another factor that contributed to identifying the candidate agencies was the presence of existing Intelligent Transportation Systems infrastructure that has been deployed to support integrating open systems for travelers, inter-agency and intra-agency needs.

One hundred twenty one pre-survey candidate systems identified by the process described previously, are listed in Appendix A. The pre-survey candidate list represents systems that were known by members of the Polaris Architecture working team, Mn/DOT Guidestar, and SRF Consulting Group, Inc. Of the 121 candidate systems, 38 system surveys were performed and

included in this document. The 38 systems were selected as Abest representatives@ of the 121 pre-survey candidates and provided a diverse base of information to use for developing the Minnesota Statewide ITS Architecture.

2.2.2 Data Collection Guide

The survey of systems required that a standard data collection approach be applied for the *Statewide ITS As-Is Agency Reports for Minnesota*. A data collection guide was prepared to help this effort.

The data collection guide was developed to provide interviewers with an overview of relevant information that needed to be collected during the survey for each system. The data collection effort focused on the following:

- A block diagram of the system and interfaces to external users and systems.
- All hardware elements that are interconnected to form the bounds of the system.
- All software components used by the hardware elements.
- All system interfaces that connect hardware components together and external systems to the system.
- All personnel using the system.

The Data Collection Guide is presented in Appendix B.

2.2.3 Field Data Collection

The survey collection activities were completed by two teams of interviewers. Prior to an on-site interview, an agency or system contact person was briefed as to the nature of the survey. In some cases, generally where agencies knew little of the Polaris project, a follow-up letter was sent to further outline the desired level of information.

The on-site interview was generally a free format discussion of the specific system elements. The data collection guide was only used to ensure all components where discussed. The interviewers recorded the audio portion of the interview in order to help with the documentation of the system. Where possible, the actual system components were also recorded on videotape, again, to help with the system documentation. In some cases, written documentation from the agency was reviewed to help describe the system.

A report of the surveyed system followed a standard format and consisted of two basic parts: 1) a system block diagram and 2) a data collection template. The block diagram is intended to depict the system components and interfaces while the template thoroughly describes the system configuration. The template is organized to step through the system related personnel, hardware, software and interfaces. All systems documented for the project used this standardized approach. The system documentation was separated by agencies into eight volumes.

The system reports contained in this volume follow in Section 3.

3. AS-IS BASELINE SYSTEM DOCUMENTATION

3.5 CITY OF MINNEAPOLIS

3.5.1 CITY OF MINNEAPOLIS FORTRAN TRAFFIC SIGNAL CONTROL SYSTEM

ine Data Collection
Fortran Traffic
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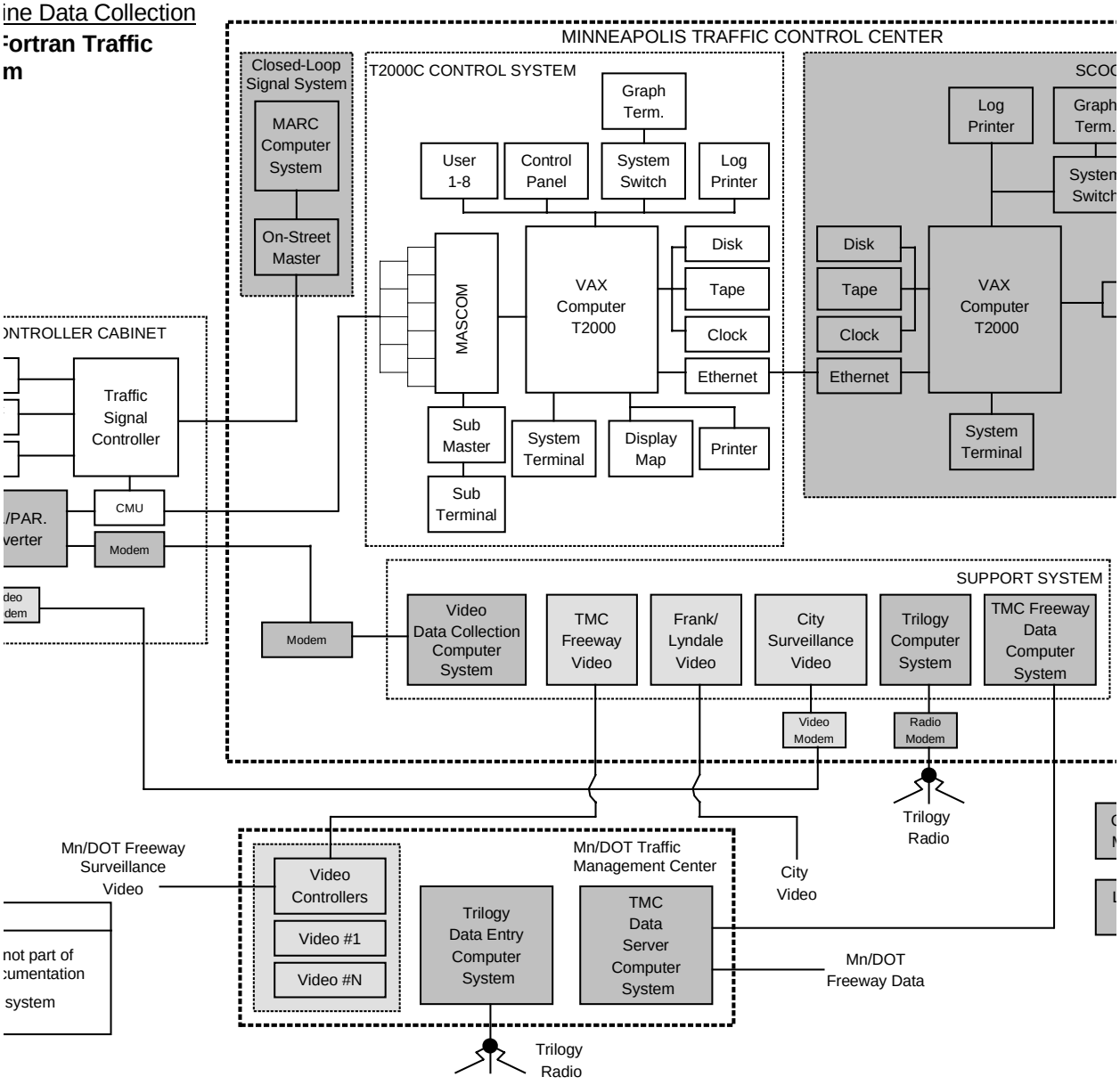


AS-IS DATA COLLECTION TEMPLATE

1.0 AGENCY ACITY OF MINNEAPOLIS@

- Agency Type	Department of Public Works/Transportation Division
- Agency Functions	Manage Traffic Operations and Data
- Agency Location(s)	Border Avenue Facility 300 Border Avenue North Minneapolis, MN 55405-1528
- Contacts	Michael J. Monahan Director of Transportation and Special Projects City of Minneapolis 233 City Hall Minneapolis, MN 55415-1318 (612) 673-5750 (voice) - (612) 348-7383 (fax)

2.0 SYSTEM AFORTRAN TRAFFIC SIGNAL CONTROL SYSTEM@

- Date of As-Is Data Collection	2/28/96
- Purpose	Provide central management of traffic signal control systems in the City of Minneapolis.
- Hours of Operation	7 days a week, 24 hours per day
- Geographic Coverage	City of Minneapolis Approximately 725 of the 780 of the city traffic signal control systems are controlled by the Fortran system. There are 170 signal systems located in the Minneapolis Central Business District (CBD). The rest of the signal systems are located within the city limits. There are approximately 55 signal systems that are not connected to the Fortran system. These signal systems are generally located on the periphery of the city. The city is bounded by approximately: NORTH - 37th Avenue N.E. east of Mississippi River and 53rd Avenue North west of the river WEST - Xerxes Ave North to the north of I-394 and France Avenue South to the south of I-394 SOUTH - TH 62 EAST - Mississippi River and TH 280
- Contacts	Dallas W. Hildebrand, P.E. Planning, Programming & Design Engineer City of Minneapolis Department of Public Works-Traffic Division 300 Border Avenue North Minneapolis, MN 55405-1528
- Status	Existing
- Constraints	Some software functions were not purchased due to financial constraints.

- Issues	The City of Minneapolis does not have the budget or manpower to keep up with maintenance of the traffic signal control systems.
- Recommended Improvements	The city upgraded the original 1970 version of the Fortran computer system in 1995. There is a plan to upgrade the existing electro-mechanical local traffic signal controllers to NEMA controllers. The city is also re-establishing a maintenance plan for system detectors.
- Block Diagram	See attached
- Typical Operational Scenario	(1) System communicates with the traffic signal controllers to indicate when to hold or force-off signal timing on a particular phase. (2) System monitors intersections for communication failures, controller failures and system coordination errors. Operator can update/monitor intersection status from traffic control center. (3) System operator monitors Mn/DOT Traffic Management Center video and city video cameras. (4) System stores a library of timing plans used for operation of the system. (5) System allows the traffic signal systems engineer to create and store timing plans in the system.
- Other	1) System can operate in time of day, traffic responsive mode or without timing plan (free). Most of the system is running time of day operation. Approximately five (5) percent of the system is currently running traffic responsive mode. In the past, approximately one third of the system was running traffic responsive, but as system detectors failed and were not replaced due to budget constraints, these systems were operated by time of day. 2) The system also includes approximately 400 system vehicle detectors mostly located on arterial streets. Some of the system vehicle detectors are currently not operating. The system also monitors over 1,000 vehicle detectors at the intersections used for actuated control of the signal systems. 3) The city also operates a closed-loop signal system on an arterial street with the master controller located in the traffic control center. The city would like to control more arterial streets as closed-loop systems.

2.1 PERSONNEL APLANNING, PROGRAMMING AND DESIGN ENGINEER@

- Personnel Function	Oversee traffic operations, planning, design and operational tests.
- Quantity	1
- Location	City of Minneapolis, Department of Public Works -

	Transportation Division
- Workload	40 hours/week - Does not work directly with day to day operation of the Fortran system.
- Working hours	Normal business hours
- Status	Existing
- Contact	Dallas W. Hildebrand, P.E.

2.2 PERSONNEL ATRAFFIC SIGNAL SYSTEMS ENGINEER@

- Personnel Function	Oversee day to day Fortran system operation, develop timing plans and oversee staff.
- Quantity	1
- Location	City of Minneapolis, Department of Public Works - Transportation Division
- Workload	40 hours/week
- Working hours	Normal business hours
- Status	Existing
- Contact	Roger Plum

2.3 PERSONNEL ATRAFFIC SYSTEM OPERATORS@

- Personnel Function	Monitor system operation and implement timing plans in addition to other administrative duties.
- Quantity	2
- Location	City of Minneapolis, Department of Public Works - Transportation Division
- Workload	75 percent of time on Fortran system
- Working hours	6:00 am - 7:00 pm, Monday - Friday The operator shifts overlap from 10:00 am to 2:00 pm. The city does staff the control center during some special events that do occur during their normal working hours.
- Status	Existing

2.4 PERSONNEL ATRAFFIC SYSTEM ANALYST@

- Personnel Function	Works on Fortran system database.
- Quantity	1
- Location	City of Minneapolis, Department of Public Works - Transportation Division
- Workload	25 to 50 percent of time on Fortran system
- Working hours	Normal business hours
- Status	Existing

2.5 PERSONNEL AELECTRICIAN@

- Personnel Function	Maintain traffic signal control systems and lighting systems.
- Quantity	23 Total 5 Foreman 2 Signal service personnel 1 Technician 15 Electricians
- Location	City of Minneapolis, Department of Public Works - Transportation Division
- Workload	Normal work week
- Working hours	Normal business hours
- Status	Existing

3.1 HARDWARE ADEC VAX COMPUTER@

- Hardware Type	Computer
- Functions	Runs Fortran traffic signal control software application.
- Location	Minneapolis traffic control center
- Data Name/Contents	1) Process data 2) Signal timing data
- Data Type	Data
- Status	Existing
- Other	Digital Equipment Corporation VAX computer

3.1.1 SOFTWARE AFORTRAN T2000C@

- Software Type	Transportation software application
- Software Standards	Similar to Urban Traffic Control System (UTCS). It was modified to be able to control more intersections
- Functions	(1) Commands intersection controllers to operate timing plans by time of day, traffic responsive or operate as isolated intersections. (2) Collects and stores traffic count data from the system vehicle detectors. (3) Monitors traffic controller status for failures, green time on the coordinated phase and communications. (4) Prints and displays reports. (5) Allows traffic engineer to create and store library of timing plans.
- Application Language	Mostly C, approximately 10 to 15 percent still in assembly language.
- Status	Existing
- Issues	Proprietary software.
- Contacts	Fortran Traffic Systems Limited 470 Midwest Road Scarborough, Ont. M1P 4Y5, Canada (416) 288-1320 (voice) (416) 288-9914 (fax) 1-800-265-1197 (toll free USA) Possible contacts: Peter Lengyel, Peter Ragsdale or Mike Bowie
- Other	Existing system allows central computer to monitor both coordinated phase green time as well as cross street green. In the previous version of the software this was not available, therefore, most of the intersection controller cabinets are not wired for this operation. The city is in the process of upgrading the cabinets for this new feature.

3.1.2 SOFTWARE AVMS OPERATING SYSTEM@

- Software Type	Operating system
- Software Standards	Other
- Functions	Control VAX CPU 1) Run software application, manages disk space and memory. 2) Perform data backups. 3) Control hardware resources, printers, displays and controllers.
- Status	Existing
- Policies	None

3.2 HARDWARE AMASTER COMMUNICATIONS UNIT (MASCOM)@

- Hardware Type	Line drivers - specialized modem (bipolar DC communications)
- Functions	Sends and receives data from intersection communication management units (CMU).
- Location	Minneapolis traffic control center
- Data Name/Contents	Timing coordination phase hold and force offs, traffic counts and controller status.
- Data Type	Data
- Status	Existing
- Constraints	Each line driver can communicate with 14 intersections (1792 intersection capacity for entire communication system)
- Other	There are 128 line drivers.

3.3 HARDWARE ACLOCK@

- Hardware Type	Clock
- Functions	Send time data to CPU.
- Location	Minneapolis traffic control center
- Data Name/Contents	Time
- Data Type	Data
- Status	Existing

3.4 HARDWARE AGRAPHICAL TERMINAL@

- Hardware Type	Terminal/Workstation
- Functions	1) Displays system information. 2) Reports system events
- Location	Minneapolis traffic control center
- Data Name/Contents	System information
- Data Type	Data

- Status	Existing

3.5 HARDWARE ASYSTEM SWITCH@

- Hardware Type	Switch
- Functions	Enable system
- Location	Minneapolis traffic control center
- Data Name/Contents	None
- Data Type	Data
- Status	Existing

3.6 HARDWARE ACONTROL PANELA

- Hardware Type	System control device
- Functions	Allows system operators manual control of timing functions.
- Location	Minneapolis traffic control center
- Status	Existing

3.7 HARDWARE AUSER TERMINAL@

- Hardware Type	Terminal/Workstation
- Functions	1) Displays collected count and event information. 2) Displays current timing plans. 3) Receives input for creating timing plans.
- Location	Minneapolis traffic control center
- Data Name/Contents	System information (existing timing plans, event logs, traffic counts)
- Data Type	Data
- Status	Existing
- Other	System allows up to eight user terminals. The city has the ability to dial up the system remotely using a modem.

3.8 HARDWARE ASYSTEM TERMINAL@

- Hardware Type	Terminal/Workstation
- Functions	1) Displays collected count and event information. 2) Displays current timing plans. 3) Receives input for creating timing plans. 4) Used to control Fortran and VAX operating system.
- Location	Minneapolis traffic control center
- Data Name/Contents	System and computer information
- Data Type	Data
- Status	Existing

3.9 HARDWARE ADISPLAY MAP@

- Hardware Type	Wall map - approximately 6 feet high and 18 feet wide.
- Functions	Shows all intersections on the system. Graphically displays real time intersection green status, communication status and type of control at intersection (time of day, traffic responsive or free)
- Location	Minneapolis traffic control center
- Data Name/Contents	Real time intersection status: 1) Green status 2) Communication status 3) Coordination status
- Data Type	Data
- Status	Existing

3.10 HARDWARE APRINTER@

- Hardware Type	Printer
- Functions	Prints operator requested data
- Location	Minneapolis traffic control center
- Data Name/Contents	Timing plan and traffic count data
- Data Type	Data
- Status	Existing

3.11 HARDWARE ALOG PRINTER@

- Hardware Type	Printer
- Functions	Prints data
- Location	Minneapolis traffic control center
- Data Name/Contents	System event/error data which include: 1) Communication errors 2) Controller errors 3) Coordination errors
- Data Type	Data
- Status	Existing

3.12 HARDWARE ASUB MASTER@

- Hardware Type	Controller
- Functions	Fortran system backup computer
- Location	Minneapolis traffic control center
- Data Type	Data
- Status	Existing

3.13 HARDWARE ASUB TERMINAL@

- Hardware Type	Terminal
- Functions	Allows system operator access to sub master controls.
- Location	Minneapolis traffic control center
- Data Type	Data
- Status	Existing

3.14 HARDWARE APC COMPUTER@

- Hardware Type	PC computer
- Functions	Allows display of wall map information graphically on a personal computer.
- Location	Minneapolis traffic control center
- Data Name/Contents	System operation/status data
- Data Type	Data
- Status	Existing
- Other	This system uses one of the user interfaces to the Fortran system. The software that communicates with the VAX computer is DOS based and is custom written by Fortran Traffic Systems Limited. Fortran is currently working on a Windows based version of the software.

3.15 HARDWARE ACOMMUNICATION MODIFICATION UNIT (CMU)@

- Hardware Type	Communication unit
- Functions	Special device used with the electro-mechanical and NEMA controllers that holds local controller dwell time on a specific interval and waits for a signal from the Fortran system to start timing again.
- Location	Field controller cabinet
- Data Type	Data
- Status	Existing
- Other	Approximately 50 percent of the traffic controllers in the city are electro-mechanical controllers.

3.16 HARDWARE ATRAFFIC SIGNAL CONTROLLER@

- Hardware Type	Traffic signal controller - City has a variety of intersection controllers: including NEMA and electro-mechanical.
- Functions	Operate traffic signal control system
- Location	Field controller cabinet
- Data Name/Contents	Timing information, traffic counts and controller status.
- Data Type	Data
- Status	Existing
- Other	Approximately 50 percent of the traffic controllers in the city are electro-mechanical controllers.

4.1 INTERFACE	VAX computer
- Connects to ...	Master Communication Unit (MASCOM)
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Specialized modem - DMA connection to line driver
- Information Type/Content	Timing coordination phase hold and force offs, traffic counts and controller status.
- Information Direction	Both
- Information Frequency	Once per second
- Information Standards	Proprietary
- Other	128 line driver, with capability of communication with 14 intersections. Frequency with build in CRC and address.

4.2 INTERFACE	VAX computer
- Connects to ...	Clock
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	Time
- Information Direction	Input

4.3 INTERFACE	VAX computer
- Connects to ...	Graph terminal
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	Timing coordination status, traffic counts and controller status.
- Information Direction	Output
- Information Frequency	Continuous
- Information Standards	Proprietary

4.4 INTERFACE	VAX computer
- Connects to ...	System switch
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	Database of timing plans and traffic counts
- Information Direction	Input
- Information Frequency	As needed
- Information Standards	Proprietary

4.5 INTERFACE	VAX computer
- Connects to ...	Control panel
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Direction	Output

4.6 INTERFACE	VAX computer
- Connects to ...	User terminal - Up to 8 terminals
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	1) Displays collected count and event information. 2) Displays current timing plans. 3) Receives input for creating timing plans.
- Information Direction	Both
- Information Frequency	As needed

4.7 INTERFACE	VAX computer
- Connects to ...	Log printer
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	System errors
- Information Direction	Output
- Information Frequency	Continuous

4.8 INTERFACE	VAX computer
- Connects to ...	System terminal
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	1) Displays collected count and event information. 2) Displays current timing plans. 3) Receives input for creating timing plans. 4) Used to control Fortran and VAX operating system.
- Information Direction	Both
- Information Frequency	As needed
- Information Standards	Proprietary

4.9 INTERFACE	VAX computer
- Connects to ...	Display map
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Protocol/Standard	Proprietary
- Information Type/Content	Signal status, coordination status and communication status
- Information Direction	Output
- Information Frequency	Once per second
- Information Standards	Proprietary

4.10 INTERFACE	VAX computer
- Connects to ...	Printer
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	System information, count reports and timing information
- Information Direction	Output
- Information Frequency	As requested

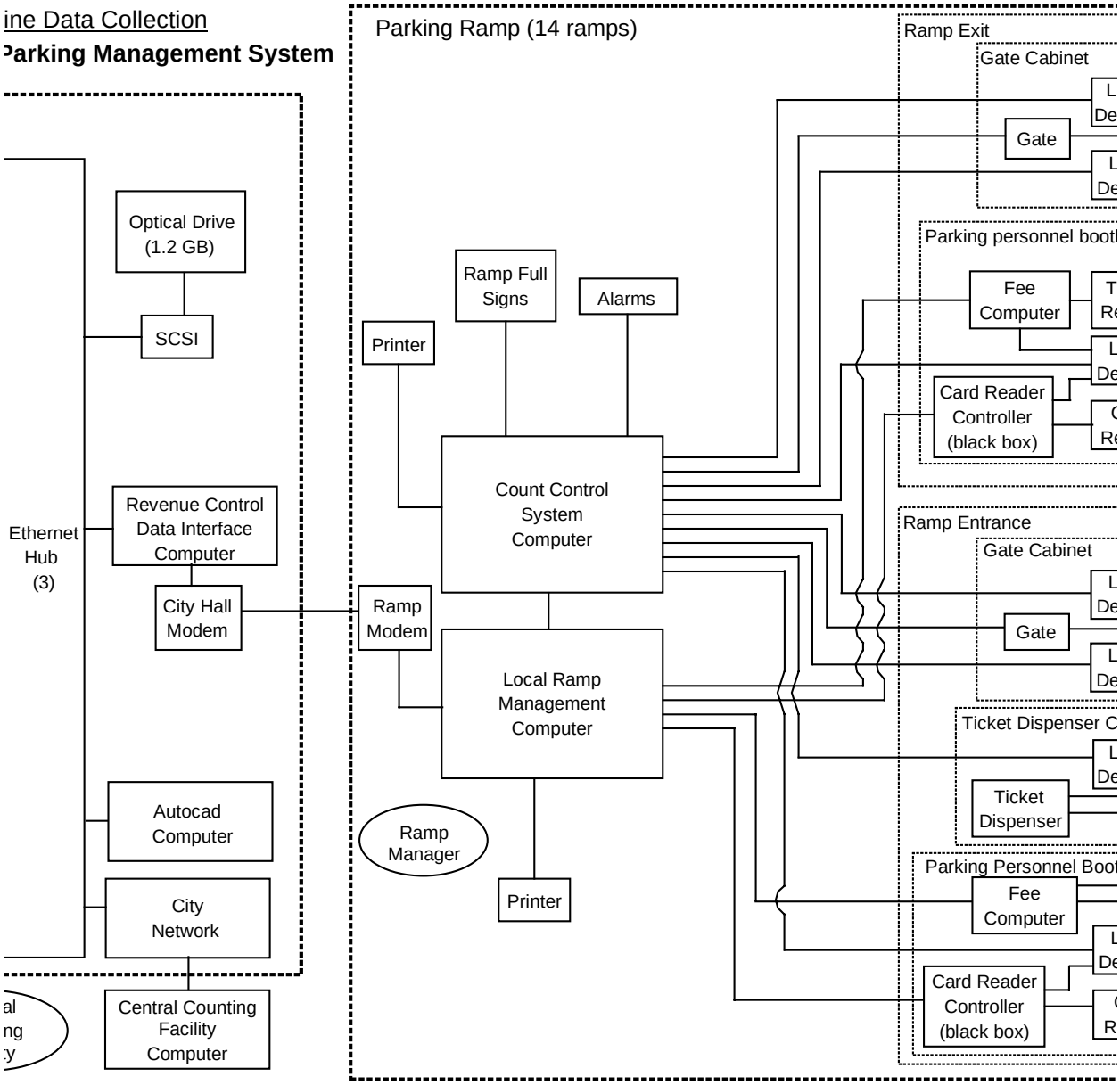
4.11 INTERFACE	Master communication unit (MASCOM)
- Connects to ...	Sub master
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	Provides backup system coordination information.
- Information Direction	Both
- Information Frequency	As needed

4.12 INTERFACE	Sub master
- Connects to ...	Sub master terminal
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232 Serial
- Information Type/Content	Allows access to back up system parameters.
- Information Direction	Both
- Information Frequency	As needed

4.13 INTERFACE	Master communication unit (MASCOM)
- Connects to ...	Communication management unit (CMU)
- Interface location	Minneapolis traffic control center and field controller cabinet
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Twisted pair cable
- Protocol/Standard	Proprietary
- Information Type/Content	Signal coordination parameters, traffic count data and system status information.
- Information Direction	Both
- Information Frequency	Once per second
- Other	The city has six 50 pair trunk lines (300 pair total) running into the traffic control center. The city is currently using 70 pair for the system.

4.14 INTERFACE	Communication management unit (CMU)
- Connects to ...	Traffic signal controller
- Interface location	Field controller cabinet
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Wire
- Information Type/Content	Signal coordination parameters, traffic count data and system status information.
- Information Direction	Both
- Information Frequency	Once per second

3.5.2 CITY OF MINNEAPOLIS PARKING MANAGEMENT SYSTEM


ine Data Collection
Parking Management System
Optical Drive
(1.2 GB)
SCSI
Ethernet
Hub
(3)
Revenue Control
Data Interface
Computer
City Hall
Modem
Autocad
Computer
City
Network
Central Counting
Facility
Computer
Parking Ramp (14 ramps)
Ramp Full
Signs
Alarms
Printer
Count Control
System
Computer
Ramp
Modem
Local Ramp
Management
Computer
Ramp
Manager
Printer
Ramp Exit
Gate Cabinet
Gate
Parking personnel booth
Fee
Computer
Card Reader
Controller
(black box)
Ramp Entrance
Gate Cabinet
Gate
Ticket Dispenser
Ticket
Dispenser
Parking Personnel Booth
Fee
Computer
Card Reader
Controller
(black box)

AS-IS DATA COLLECTION TEMPLATE

1.0 AGENCY ACITY OF MINNEAPOLIS@

- Agency Type	Department of Public Works - Traffic Division
- Agency Functions	Manage and administer city parking facilities, traffic signals and signing
- Agency Location(s)	350 South 5th Street Room 233 City Hall Minneapolis, MN 55415-1314
- Contacts	Gregory A. Finstad, Transit & Parking Skyway Systems Engineer; City of Minneapolis (612) 637-2411 (voice)

2.0 SYSTEM APARKING MANAGEMENT SYSTEM@

- Date of As-Is Data Collection	1/31/96
- Purpose	Gather occupancy, usage and fee collection data for overall management and financial planning purposes. Data is also used for monitoring both monthly contract and transient parking. Information gathered is used to analyze parking needs and for overall planning purposes.
- Hours of Operation	24 hours per day
- Geographic Coverage	City of Minneapolis Central Business District (CBD) The area of the CBD is bounded by 3rd Avenue North, Mississippi River, I-35W and I-94. The city also maintains and operates a ramp in the St. Anthony/Riverplace area located at University Avenue and 3rd Avenue S.E. About 20,000 parking spaces are controlled and managed by the City of Minneapolis (14 ramp structures and some surface lots). There are approximately 60,000 total parking spaces in Minneapolis CBD.
- Contacts	Timothy A. Blazina, Manager Lots and Ramps, City of Minneapolis (612) 673-2411 (voice) (612) 673-2149 (fax) (612) 622-2185 (pager)
- Status	Existing - System is fourth generation of parking management system for the city.
- Policies	1) The city of Minneapolis is trying to develop a Apublic@ open standard for system inter-operation. Desired outcome is compatibility of all parking systems in the metropolitan area. Twin Cities Metropolitan Airport Parking System has similar hardware and software components to the City of Minneapolis system.

	2) Security is a high priority. The current policy is to have security personnel observe each parking stall every 30 minutes. Closed circuit TV (CCTV) is used to monitor stairwell and entry/exit locations. 3) The City is experimenting with CCTV to satisfy the above stated safety policy. 4) Revenues are sent directly to Central Counting Facility. Ramp managers do not know actual amount of revenues collected.
- Issues	1) The City of Minneapolis is considering the integration of on-street parking and the impound lot with the parking management system because they are all revenue generating facilities and have similar systems with regard to revenue control. 2) Working with Mn/DOT for better freeway signage to parking facilities (Variable Message Signs & Changeable Message Signs) and connection to Mn/DOT Traffic Management Center.
- Recommended Improvements	1) Proximity card readers with longer (8-10 feet) detection range are desired for freeway parking facility access points. This would allow higher speed entries to the parking facility directly from the freeway. 2) Currently approximately 20 % of monthly parkers do not use the ramp on any given day. The city and software company are developing software that will look at historical data of monthly patrons use, and determine on any given day and time, how many of these parking spaces that could be resold to transient vehicles. 3) The city would also like to explore integration of parking facility entrances and exits with traffic control signal systems. This would allow control of traffic signal timing to provide better egress from parking structures and the CBD.
- Block Diagram	See attached
- Other	1) The city of Minneapolis would like to publish information/data from the system but they have so much data that it is hard to determine what would be important/useful. They don=t want put out data just because they have it. It should be something that is important/useful to people. All data that is collected is public after revenue control is completed. 2)City-owned parking structures are also used as major transit hubs in Minneapolis CBD. They also house the fleet of City Traffic Control Agents (meter maid vehicles) 3) Fiber optic cable is installed in two of the 14 parking ramps but it has not yet been connected to City Hall. The

	city would like fiber connection to all ramps in the system but money is not currently available. Staff is trying to combine this activity with other construction projects to keep cost lower. Direct connection to all ramps would enable the city to: a) Obtain real-time parking data for quicker revenue control analysis b) Communicate with changeable message signs that will allow notification of motorists (real-time) of parking space availability at a particular ramp. 4) All entrance and exits lanes are equipped to handle both monthly and transient parking vehicles. Each ticket dispenser/card reader is equipped with an intercom so that a parking vehicle can communicate with the ramp office if a problem occurs. The intercom system is also used for security purposes throughout the ramp structure.
- Typical Operational Scenario	Scenario A - Monthly parker 1) As a monthly parker pulls into/out of ramp, a single loop senses the vehicle and the loop detector activates the card reader to look for card. 2) As the driver passes an access card within 10-12@ of the proximity card reader, the reader controller records the card number, time, and date and then opens the gate. 3) A pavement loop senses when the car is passed the loop detector sends a signal to gate to close. 4) Two additional loops count the car directionally. 5) Vehicle count and card infmation is sent to the local ramp computer and the count control system computer. NOTE: A car must be present for activation of the ticket dispensers, card readers and fee computers. This ensures that cards can not be reused if the vehicle is still in the ramp. Scenario B - Transient In 1) When a transient parker pulls into the ramp, loop senses the vehicle and the loop detector activates the ticket dispenser. 2) Driver takes a hole punch ticket with time, date, and location information. 3) The ticket dispenser opens the gate and the a pavement loop senses when the car has passed the gate and sends a signal to the gate to close. 4) Two additional loops count car directionally. 5) Vehicle count information and ticket information is sent to the local ramp computer and the count control system computer. Scenario C - Transient Out 1) As a transient parker leaves the ramp a single loop activates fee computer and ticket reader.

	2) The operator inputs the hole punch ticket into the ticket reader. 3) The fee computer logs ticket and calculates fee. The cashier handles revenue transaction and this information is sent to the local ramp computer. 4) The fee computer opens the gate and a single loop senses when the car has passed the gate and the loop detector closes the gate. 5) Two additional loops count the vehicle directionally exiting the ramp. 6) Fee and vehicle count information is sent to the local ramp computer and the count control system computer.
- Operational Scenario Cont.	Scenario D - System Management 1) The count control system monitors gates, loops and ramp occupancy. It reports through a printer all gate/loop failures and displays Afull sign@ if applicable. 2) Information from the count control system is sent to local ramp management computer. 3) The local ramp management computer controls which entry/exit lanes are open as well as the open/closed signs. 4) The local ramp management computer also maintains monthly parker card data base and logs all transactions from the fee computers. 5) The ramp manager reviews all summary reports and responds to any failures.. 6) The City Hall revenue control data interface computer uses a dial-up polling procedure to gather data from each ramp on a daily basis. 7) The revenue control system produces summary information that is reviewed by the parking system analyst and forwarded to the ramp manager. 8) The ramp manager compares data from the local ramp management system to financial data received from the central counting facility (Bank). 9) The revenue and parking data is archived on optical disk for audit use. 10) The parking ramp management system is also used for special event parking.

2.1 PERSONNEL ATRANSIT AND PARKING SKYWAY ENGINEER@

- Personnel Function	System Coordinator - Oversees system operation and approves financial data for distribution
- Quantity	1
- Location	Minneapolis City Hall
- Status	Existing
- Contact	Gregory A. Finstad, P.E.

	Transit & Parking Skyway Systems Engineer - Traffic Engineering Division 233 City Hall Voice (612)-673-2411
- Other	Although there are only 9 people working within City Hall on the parking management system, there are approximately 400 people required to operate the entire parking system. Other workers include : ramp mangers, cashiers, security officers, and maintenance personnel.

2.2 PERSONNEL AMANAGER-LOTS AND RAMPS@

- Personnel Function	Has direct responsibility for operation and administration of the parking management and revenue control system.
- Quantity	1
- Location	Minneapolis City Hall
- Status	Existing
- Contact	Timothy A. Blazina Manager - Lots and Ramps

2.3 PERSONNEL AENGINEER@

- Personnel Function	Parking systems engineer - Responsible for construction and maintenance of parking lots and ramps.
- Quantity	2
- Location	Minneapolis City Hall
- Workload	40 hours/week
- Working hours	Regular working day
- Status	Existing
- Contact	Timothy A. Blazina

2.4 PERSONNEL APARKING SYSTEMS ANALYST@

- Personnel Function	Review parking management reports and investigate discrepancies
- Quantity	2
- Location	Minneapolis City Hall
- Workload	40 hours/week
- Working hours	Regular working day
- Status	Existing
- Contact	Timothy A. Blazina

2.5 PERSONNEL AACCOUNTANT I@

- Personnel Function	Review revenue control reports prior to forwarding to management
- Quantity	1
- Location	Minneapolis City Hall
- Workload	40 hours/week
- Working hours	Regular working day
- Status	Existing
- Contact	Timothy A. Blazina

2.6 PERSONNEL AACCOUNTANT II@

- Personnel Function: Review revenue control reports prior to forwarding to management
- Quantity: 1
- Location: Minneapolis City Hall
- Workload: 40 hours/week
- Working hours: Regular working day
- Status: Existing
- Contact: Timothy A. Blazina

2.7 PERSONNEL AACCOUNTANT ASSISTANT@

- Personnel Function: Assist in review of revenue control reports
- Quantity: 1
- Location: Minneapolis City Hall
- Workload: 40 hours/week
- Working hours: Regular working day
- Status: Existing
- Contact: Timothy A. Blazina

2.8 PERSONNEL ACLERICAL ASSISTANT@

- Personnel Function: Clerical duties for parking system management personnel
- Quantity: 1
- Location: Minneapolis City Hall
- Workload: 40 hours/week
- Working hours: Regular working day
- Status: Existing
- Contact: Timothy A. Blazina

2.9 PERSONNEL APARKING SYSTEMS CONSULTANT@

- Personnel Function	Assist city in system development and implementation - supplier of some hardware and software components. Company also provides maintenance service to city
- Quantity	Not applicable
- Location	Don Harstad Co. 7103 NE Highway 65 Fridley, MN 55432
- Workload	As needed
- Working hours	Not applicable
- Status	Existing
- Contact	Curt Sorenson Voice (612)-571-5660
- Other	Don Harstad Company also has a maintenance contract for equipment in city of Minneapolis parking garages.

3.1 HARDWARE ALOCAL RAMP MANAGEMENT COMPUTER@

- Hardware Type	Computer PC
- Functions	1) Runs Dyna-Park Software (Applied Management Corporation) 2) Collects and stores data from peripheral devices 3) Gathers data for transferring to City Hall=s revenue control data interface.
- Location	14 parking ramp offices throughout Minneapolis CBD.
- Data Name/Contents	Parking system information and status of components including card readers, fee computers, ticket dispensers and count control system (1)Log file - monthly parking, transient parking (2)Event log file - gates, tickets, loops, full (3)Lot file - 15 min. traffic count data (4) Monthly parking database - backup of hard core data
- Data Type	Data
- Status	Existing
- Other	Intel Pentium 100 (4MB mem, 1GB HD) -Concurrent Dos w/ RNET Smart Card Bus

3.1.1 SOFTWARE ADYNA-PARK@

- Software Type	Parking management software application
- Software Standards	Proprietary - written by Applied Management Corporation, Helena, MT
- Functions	Collects information from system components(gates, ticket dispensers, Dyna-Count computer, expected revenue information) and produces reports for ramp manager review
- Status	Existing
- Recommended Improvements	The city and software company are developing software that will look at historical data of monthly patrons use and determine on any given day and time how many of these parking spaces could be resold to transient vehicles.
- Contact	Applied Management Corporation

3.1.2 SOFTWARE ACONCURRENT DOS@

- Software Type	Operating System
- Software Standards	Other
- Functions	Control PC hardware resources and peripherals
- Status	Existing
- Issues	Concurrent Dos used because of multi-tasking capabilities. Several different data sources are connected - count control system, card reader controller, ticket dispensers, etc.

3.1.3 SOFTWARE APROCOMM@

- Software Type	Communications software
- Functions	Used to download data from Local Ramp Management computer to Revenue Control Data Interface computer.
- Status	Existing

3.1.4 SOFTWARE APKZIP@

- Software Type	File compression utility software
- Functions	Compress data to be sent to Revenue Control Data Interface
- Status	Existing

3.2 HARDWARE ACARD READER CONTROLLER@

- Hardware Type	Controller by Westinghouse - (Westinghouse bought AShlage@)
- Functions	1) Stores identification numbers for driver held monthly pass card. 2) Does not store any real time information.
- Location	Parking ramp office
- Data Name/Contents	Card number, ENTRANCE/EXIT date/time, ENTRANCE/EXIT location
- Data Type	Data
- Status	Existing
- Other	Multi-switch monitor allows multiplexing on coaxial cable to monitor loop/gate status

3.3 HARDWARE ACARD READER@

- Hardware Type	Proximity Radio Frequency card reader
- Functions	Reads monthly parking user card number and sends information to card reader controller
- Location	Park ramp access points
- Data Name/Contents	Card number is a 10 digit unique number to Westinghouse system
- Data Type	Data
- Status	Existing
- Recommended Improvements	Plan to upgrade freeway access entrances to a longer range card reader (8= to 12=) as system become cost effective.
- Other	System utilizes individual ID cards and card readers at city-owned ramps and surface lots to facilitate monthly contract parking.

3.4 HARDWARE AFEE COMPUTERS AND TICKET READER@

- Hardware Type	Computer
- Functions	Reads transient parker hole punch ticket, computes fee, logs transactions, validates tickets, allows for multiple rates and sends information back to local ramp computer.
- Location	Parking ramp egress points
- Data Name/Contents	Transaction number, fee collected, time
- Data Type	Data
- Status	Existing
- Issues	No standards for ticket reader and fee computer therefore must be from same manufacturer to be compatible.
- Recommended Improvements	Processor interrupts while making transaction - needs larger buffer to hold information.
- Other	Amano -Amano/Cincinnati Incorporated - special design for use in parking applications- uses an 8 bit processor with interrupts, proprietary protocol

3.5 HARDWARE ATICKET DISPENSER@

- Hardware Type	Peripherals - parking management system
- Functions	Records time/date/ticket number and puts information on hole punch ticket for incoming transient parkers
- Location	Parking entrance locations
- Data Name/Contents	Hole punch card
- Data Type	Data
- Status	Existing
- Other	Can also use magnetic read tickets, some compatibility problems exist with ticket readers and fee computers, must be from the same manufacturer. Two ramps currently have magnetic stripe read cards. These cards can contain more information.

3.6 HARDWARE ACOUNT CONTROL SYSTEM COMPUTER@

- Hardware Type	Computer
- Functions	Runs Dyna-Count Software (Applied Management Corporation)
- Location	Parking ramp offices (14 ramps)
- Data Name/Contents	Monitors parking system count information and system components status : gates, loops, full signs, alarms(low tickets, ticket in chute, gate open too long, loop detector on too long, back outs)
- Data Type	Data
- Status	Existing
- Other	Intel 386/486 computer-Latest Dos version w/Windows

3.6.1 SOFTWARE ADYNA-COUNT@

- Software Type: Count management software application
- Software Standards: Proprietary - Windows-based by Applied Management Corporation, Helena, MT
- Functions: Collects, controls, monitors and processes information from system components(gates, loops), activates full sign when appropriate, logs system events and produces reports for ramp manager review.
- Status: Existing
- Contact: Applied Management Corporation

3.6.2 SOFTWARE ADOS-LATEST VERSION@

- Software Type: Operating System
- Software Standards: Dos
- Functions: 1) Control, PC hardware resources
  2) Executes software applications
- Status: Existing

3.6.3 SOFTWARE AWINDOWS-LATEST VERSION@

- Software Type: Operating System
- Software Standards: Windows
- Functions: 1) Run applications
  2) Provides graphical interface.
  3) Controls operating system.
- Status: Existing

3.7 HARDWARE ACOUNT CONTROL SYSTEM PRINTER@

- Hardware Type: Printer
- Functions: Print reports
- Location: Parking ramp office
- Data Name/Contents: Parking count information, event log (loop status, gate status, low tickets)
- Data Type: Data
- Status: Existing
- Other: Microline 320

3.8 HARDWARE AGATES@

- Hardware Type	Traffic control gate
- Functions	Physical barrier to ingress and egress locations. Controlled by card reader controller, ticket dispensers, fee computers and count control system. Can be manually operated.
- Location	Parking garage ingress and egress locations
- Data Name/Contents	On/off relay
- Data Type	N/A
- Status	Existing
- Other	Approximately six (6) different brands(manufactures) that do same basic function

3.9 HARDWARE AVEHICLE COUNT LOOPS AND DETECTORS@

- Hardware Type	Vehicle detectors
- Functions	Count vehicles entering and exiting parking structures, activate ticket dispensers, card readers and close gates. Very similar to loops found at signalized intersections. Currently using a four loop system, (1) loop activates card reader, (2) activates ticket dispenser, (3) & (4) used to count traffic directionally and to close gate when detector senses that car is passed gate.
- Location	Parking garage ingress and egress locations
- Data Name/Contents	On/off
- Data Type	Data
- Status	Existing

3.10 HARDWARE ARAMP FULL SIGNS@

- Hardware Type	Message sign
- Functions	Displays AFULL@ when ramp does not contain any more spaces.
- Location	Parking ramp entrance locations
- Data Name/Contents	On/off message
- Data Type	Data
- Status	Existing

3.11 HARDWARE ALOCAL RAMP CONTROL PRINTER@

- Hardware Type	Printer
- Functions	Print reports
- Location	Parking ramp office
- Data Name/Contents	Parking count information, event log (loop status, gate status, low tickets)
- Data Type	Data
- Status	Existing
- Other	Microline 320

3.12 HARDWARE ARAMP MODEM@

- Hardware Type	Modem - v.34-28,800 BPS
- Functions	Enables data communication over telephone lines to Revenue Control Data Interface computer in City Hall
- Location	Parking ramp office (14 ramps)
- Data Type	Data
- Status	Existing

3.13 HARDWARE ACITY HALL MODEM@

- Hardware Type	Modem - v.34-28,800 BPS
- Functions	Enables communication from Revenue Control Data Interface in City Hall to local ramp computer for batch polling of each local ramp computer.
- Location	City Hall
- Data Type	Data
- Status	Existing
- Recommended Improvements	Direct connection to all ramps and surface lots, fiber installed to two ramps but not yet connected to City Hall
- Other	Batch polling is started daily at 4:00am, data is received from all ramps by 6:40am

3.14 HARDWARE AREVENUE CONTROL SYSTEM DATA INTERFACE@

- Hardware Type	Computer
- Functions	1) Runs PRRS - Parking Revenue Report System 2) Runs communications software 3) Other office functions.
- Location	City Hall
- Data Name/Contents	1) Expected parking revenue information 2) Ramp usage and capacity This computer uploads hourly summary information from all local ramp computers.
- Data Type	Data
- Status	Existing
- Other	PC computer-Dos based.

3.14.1 SOFTWARE APARKING REVENUE REPORTING SYSTEM (PRRS)@

- Software Type	Parking revenue software application
- Software Standards	Proprietary
- Functions	1) Processes information from local ramps 2) Produces management reports
- Status	Existing
- Policy	Access to raw financial information from local ramp computers is limited to two (2) people. (Transit and Parking Skyway Engineer and Manager - Lots and Ramps)
- Contact	Applied Management Corporation

3.14.2 SOFTWARE AMS DOS@

- Software Type	Operating System
- Software Standards	Dos
- Functions	1) Control PC resources 2) Execute software applications
- Status	Existing

3.14.3 SOFTWARE APROCOMM@

- Software Type	Communications software
- Functions	Used to download data from local ramp computer to revenue control data interface computer.
- Status	Existing

3.14.4 SOFTWARE AAUTO-MAX@

- Software Type: Communication scheduling software
- Functions: 1) Selects which telephone number or communication profile to dial.
  2) Invokes communications software
  3) Executes file transfer
- Status: Existing

3.14.5 SOFTWARE APKZIP@

- Software Type: File compression utility software
- Functions: Used to decompress incoming data from local ramp computers
- Status: Existing

3.14.6 SOFTWARE AWINDOWS-LATEST VERSION@

- Software Type: Operating System
- Software Standards: Windows
- Functions: Run applications
- Status: Existing

3.14.7 SOFTWARE ANOVELL NETWARE@

- Software Type: Communications protocol
- Software Standards: IPX/SPX
- Functions: Network interface
- Status: Existing

3.15 HARDWARE ASCSI CONTROLLER@

- Hardware Type: Peripheral controller
- Functions: Controls device that read/writes data and communicates with central processing unit.
- Location: City Hall
- Data Name/Contents: See HW 2.16
- Status: Existing

3.16 HARDWARE AOPTICAL DRIVE@

- Hardware Type	1.2 GB optical drive
- Functions	Stores monthly parking/revenue data for audit purposes and future analysis.
- Location	City Hall
- Data Name/Contents	All pertinent data concerning parking ramp operations: counts, monthly and transient parking, revenue information
- Data Type	Data
- Status	Existing

4.1 INTERFACE	Card Reader Controller
- Connects to ...	Card reader
- Interface location	14 Parking ramps
- Interface Type	Data
- Interface Direction	Both
- Interface Component	75 Ohm coaxial cable
- Protocol/Standard	AWEGIN@ interface-defacto standard (most popular)
- Information Type/Content	Card number, time/date, reader malfunction
- Information Direction	Both
- Information Frequency	Continuous

4.2 INTERFACE	Card Reader Controller
- Connects to ...	Local ramp management computer
- Interface location	Parking ramp
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	Card number, time/date, reader malfunction
- Information Direction	Both
- Information Frequency	Continuous

4.3 INTERFACE	Fee Computer
- Connects to ...	Ticket Dispenser
- Interface location	Parking ramp
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	Serial number of ticket, time/date, lane number
- Information Direction	Output
- Information Frequency	As needed

4.4 INTERFACE	Local Ramp Management Computer
- Connects to ...	Fee computers
- Interface location	Parking ramp
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232/RS-422
- Protocol/Standard	Proprietary
- Information Type/Content	Logs transactions, validates ticket, calculates multiple rates and sends data to local ramp computer.
- Information Direction	Both
- Information Frequency	Continuous
- Information Standards	Special design for parking

4.5INTERFACE	Local Ramp Management Computer
- Connects to ...	Count Control System Computer
- Interface location	Parking ramp
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Protocol/Standard	Proprietary
- Information Type/Content	Loop status, gate status, low tickets, event messages
- Information Direction	Both
- Information Frequency	Continuous
- Information Standards	Special design for parking

4.6INTERFACE	Count Control System Computer
- Connects to ...	Printer
- Interface location	Parking ramp
- Interface Type	Data
- Interface Direction	Output
- Interface Component	RS-232
- Information Type/Content	Traffic count information, event reports, system errors
- Information Direction	Output
- Information Frequency	User request
- Other	Microline 320

4.7INTERFACE	Local Ramp Management Computer
- Connects to ...	Printer
- Interface location	Parking ramp
- Interface Type	Data
- Interface Direction	Output
- Interface Component	RS-232
- Information Type/Content	Financial reports, traffic count information, event reports, system errors
- Information Direction	Output
- Information Frequency	User request
- Other	Microline 320

4.8INTERFACE	Controllers/Computers
- Connects to ...	Gates, loop controllers, full signs, lane open/closed signs.
- Interface location	Parking ramp
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Wire relay
- Information Type/Content	On/off message
- Information Direction	Both
- Information Frequency	Continuous

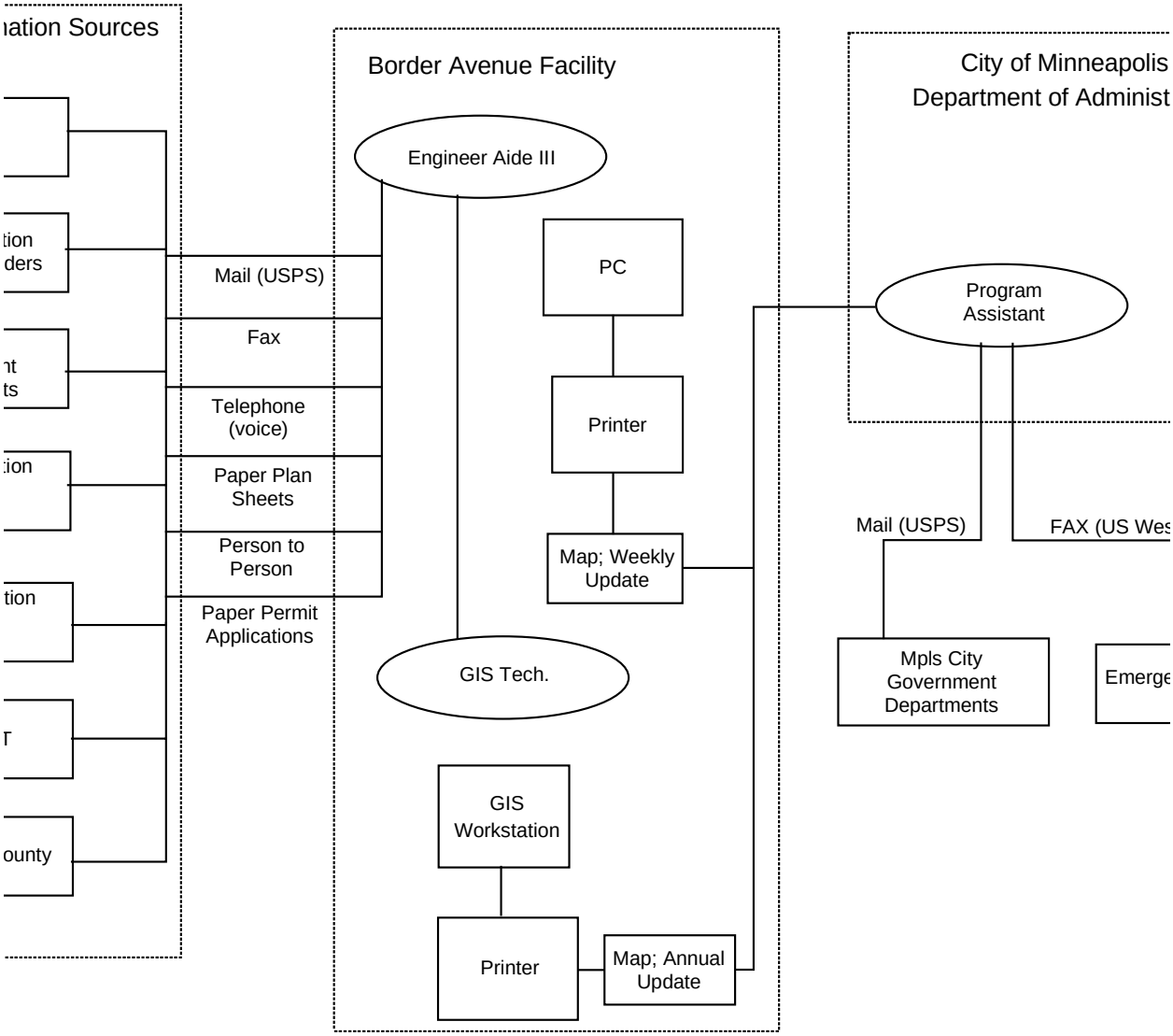
4.9INTERFACE	Revenue Control Data Interface Computer
- Connects to ...	Local Ramp Management Computer
- Interface location	City Hall/parking ramp
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Service provider (US West)
- Protocol/Standard	Public
- Information Type/Content	Parking system data to City Hall
- Information Direction	Both
- Information Frequency	1 time per day
- Constraints	No direct connections to Local ramp intersection i.e. no real time data

4.10INTERFACE	Loop controller
- Connects to ...	Count Control System Computer, Gates
- Interface location	Parking ramp
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Wire relay
- Information Type/Content	On/off message
- Information Direction	Both
- Information Frequency	Continuous

3.5.3 CITY OF MINNEAPOLIS CONSTRUCTION INFORMATION SYSTEM

Baseline Data Collection

ɔolis Construction Information System



AS-IS DATA COLLECTION TEMPLATE

1.0 AGENCY ACITY OF MINNEAPOLIS@

- Agency Type	City Government Department of Public Works, Traffic Engineering
- Agency Functions	Manage traffic operations and data, including: $ Signal system installation/ programming/ maintenance $ Road maintenance/ repair.
- Agency Location(s)	300 Border Av. S, Minneapolis.

2.0 SYSTEM ACONSTRUCTION INFORMATION SYSTEM@

- Date of As-Is Data Collection	1/29/96
- Purpose	Collect and distribute timely construction information. This system is basically manually operated. Mapping is done by system personnel from hard copy data provided to them in a variety of formats. Generally, two types of maps are produced, an annual map and weekly update. These maps are also distributed manually. Preconstruction meetings for each project prior to commencing work - attendees include contractors, utilities in area, County, and Mn/DOT . An annual preconstruction meeting is held in spring where utility companies and other government agencies doing work in Minneapolis share the upcoming season=s construction plans.
- Hours of Operation	System updated/used during working hours (7:00 - 4:00).
- Geographic Coverage	Weekly updates: Minneapolis Central Business District (CBD) Annual updates: City of Minneapolis, city limits
- Contacts	Harvey W. Fleitman, Engineering Aide III, City of Minneapolis
- Status	Existing
- Policies	No policy on format of construction information coming into system from external information sources (see block diagram).
- Constraints	Construction information for area outside of downtown Minneapolis is collected throughout the year. This information is put on a map in the spring of the year and disseminated at that time. It is not disseminated after this point. No real time collection of data.
- Issues	System has developed and become more formalized over last few years since Harvey Fleitman has been collecting/disseminating information.
- Recommended Improvements	Would like more uniform reporting of construction

	information so that it will be in a standard format coming from each of the external information sources. External information sources include utility companies such as Northern States Power, Minnegasco, Minneapolis Energy Center, Paragon Cable, communication service providers such as U.S. West and MCI, and City Government Departments (12).
- Block Diagram	See attached
- Typical Operational Scenario	Data will be collected through meetings and inter-departmental communications. Construction information is then distributed to various city departments.

2.1 PERSONNEL AENGINEERING AIDE@

- Personnel Function	Accumulate construction information, generate maps to be forwarded.
- Quantity	1
- Location	Border Av.
- Working hours	Normal work day approx. 7:00 - 4:00
- Contact	Harvey W. Fleitman

2.2 PERSONNEL ADIRECTOR OF TRANSPORTATION AND SPECIAL PROJECTS@

- Personnel Function	Oversee traffic operations
- Quantity	1
- Location	City Hall
- Contact	Michael J. Monahan

2.3 PERSONNEL ATRAFFIC SIGNAL SYSTEMS ENGINEER@

- Personnel Function	Accumulate construction information, generate maps to be forwarded.
- Quantity	1
- Location	Border Av.

2.4 PERSONNEL APROGRAM ASSISTANT@

- Personnel Function	Accumulate construction information and maps and then forward to appropriate entities.
- Quantity	1
- Location	Minneapolis City Hall.

3.1 HARDWARE APC@

- Hardware Type	IBM Compatible PC
- Functions	Used to create weekly update maps
- Location	Border Av.
- Data Name/Contents	The map has the following information if provided by an external information source - Project type: pavement, sewer, street, utility(includes streamline projects) ,signal and any other projects affecting traffic operations in the CBD. Project construction limits and location. No information concerning exact date or duration of any given construction project is available. Incoming information from external sources is variable and contains differing levels of detail.
- Data Type	Map showing location and type of construction project.
- Status	Existing
- Contact	Harvey Fleitman

3.1.1 SOFTWARE AMS-DOS@

- Software Type	Operating System

3.1.2 SOFTWARE AAUTOCAD LITE@

- Software Type	CAD
- Software Standards	Vector graphics (AutoCad .DXF format)
- Functions	Record and display location construction project information.
- Status	Existing

3.2 HARDWARE AULTIMAP GIS WORKSTATION@

- Issues	Parent company of Ultimap has ceased creating updates to software for last 3 years.
- Other	Additional information about this hardware was requested subsequent to the interview, however, none was provided.

3.2.1 SOFTWARE

- Software Type	Operating System
- Other	Additional information about this software was requested subsequent to the interview, however, none was provided.

3.2.2 SOFTWARE AULTIMAP@

- Software Type	GIS
- Other	Additional information about this hardware was requested subsequent to the interview, however, none was provided.

4.1 INTERFACE	ENGINEER AIDE III
- Connects to ...	External information sources
- Interface location	Border Av.
- Interface Type	Paper
- Interface Direction	Both
- Interface Component	U.S. Postal System
- Protocol/Standard	N/A
- Information Type/Content	Locations, times, and dates of construction projects
- Information Direction	Both
- Information Frequency	Daily

4.2 INTERFACE	ENGINEER AIDE III
- Connects to ...	External information sources
- Interface location	Border Av.
- Interface Type	Data/Paper
- Interface Direction	Both
- Interface Component	Facsimile Machine with a dedicated US West voice grade telephone line
- Protocol/Standard	FAX Protocol (group unknown)
- Information Type/Content	Locations, times, and dates of construction projects
- Information Direction	Both
- Information Frequency	Sporadic
- Information Standards	None

4.3 INTERFACE	ENGINEER AIDE III
- Connects to ...	External information sources
- Interface location	Border Av.
- Interface Type	Voice
- Interface Direction	Both
- Interface Component	US West voice grade line
- Information Type/Content	Locations, times, and dates of construction projects
- Information Direction	Both
- Information Frequency	Sporadic, generally immediately prior to beginning a construction project

- Information Standards	None

4.4 INTERFACE	ENGINEER AIDE III
- Connects to ...	External information sources
- Interface location	Border Av.
- Interface Type	Paper
- Interface Direction	Both
- Interface Component	U.S. Postal System
- Information Type/Content	Permit applications
- Information Direction	Both
- Information Frequency	Daily
- Information Standards	None

4.5 INTERFACE	ENGINEER AIDE III
- Connects to ...	External information sources
- Interface location	Border Av.
- Interface Type	Paper
- Interface Direction	Both
- Interface Component	U.S. Postal System
- Information Type/Content	Construction plan sheets for review of traffic control issues (signal revisions, lane closures, detours). Plan sheets include all information required to build project : (location map, project limits, general layout, construction plans, typical sections)
- Information Direction	Both
- Information Frequency	Daily
- Information Standards	None

4.6 INTERFACE	ENGINEER AIDE III
- Connects to ...	External information sources
- Interface location	Border Av.
- Interface Type	Voice
- Interface Direction	Both
- Interface Component	Person to person communications
- Information Type/Content	Locations, times, and dates of construction projects
- Information Direction	Both
- Information Frequency	Daily
- Information Standards	None

4.7 INTERFACE	ENGINEER AIDE III
- Connects to ...	GIS Technician
- Interface location	Border Av.
- Interface Type	Voice
- Interface Direction	Both
- Interface Component	Person to person communications
- Information Type/Content	Locations, times, and dates of construction projects for annual map
- Information Direction	Both
- Information Frequency	Daily
- Information Standards	None

4.8 INTERFACE	AutoCad PC
- Connects to ...	Printer
- Interface location	Border Av.
- Interface Type	Data
- Interface Direction	Output
- Interface Component	Parallel Cable
- Information Type/Content	Weekly map to be printed
- Information Direction	Output
- Information Frequency	As needed
- Information Standards	None

4.9 INTERFACE	GIS Workstation
- Connects to ...	Printer
- Interface location	Border Av.
- Interface Type	Data
- Interface Direction	Output
- Information Type/Content	Annual map to be printed
- Information Direction	Output
- Information Frequency	As needed
- Information Standards	None

4.10 INTERFACE	Border Avenue Facility
- Connects to ...	Minneapolis City Hall
- Interface location	N/A
- Interface Type	Paper
- Interface Direction	Both
- Interface Component	Interoffice mail
- Information Type/Content	Annual and weekly maps for distribution
- Information Direction	Both
- Information Frequency	Daily
- Information Standards	None

4.11 INTERFACE	Minneapolis City Hall; Program Assistant
- Connects to ...	Minneapolis City Government Departments
- Interface location	Minneapolis City Hall
- Interface Type	Paper
- Interface Direction	Both
- Interface Component	Interoffice mail
- Information Type/Content	Annual and weekly maps
- Information Direction	Both
- Information Frequency	Daily
- Information Standards	None

4.12 INTERFACE	Minneapolis City Hall; Program Assistant
- Connects to ...	Emergency Service Providers
- Interface location	Minneapolis City Hall
- Interface Type	Paper/Data
- Interface Direction	Both
- Interface Component	Facsimile Machine with a dedicated US West voice grade telephone line
- Information Type/Content	Weekly maps
- Information Direction	Both
- Information Frequency	As needed
- Information Standards	None

APPENDIX A

As-Is Agency Reports
Pre-Survey Candidate Systems List

PRE-SURVEY CANDIDATE SYSTEMS

Traffic Signal Control Systems
- City of St. Paul Computran traffic signal control system
- City of St. Paul traffic signal intersection hardware (field equipment)
- City of Minneapolis Fortran traffic signal control system
- Mn/DOT Metro Division/District traffic office closed loop traffic signal system(s)
- County closed loop traffic signal systems (Hennepin, Ramsey, etc.)
- City closed loop traffic signal systems
- Video detection/control of signal system (T.H. 65 & 53rd, Lyndale and Franklin Ave)
- Pre-emption of traffic signals for emergency vehicles (EVP)
- Pre-emption of traffic signal at fire stations
- Pre-emption of traffic signals at railroad crossings (20 locations in Metro area)
- Minneapolis AUSCI operational test

Freeway Management System
- Mn/DOT TMC ramp meter system
- Mn/DOT TMC video surveillance system
- Mn/DOT TMC CMS control system
- KBEM radio broadcast system
- Mn/DOT TMC cable TV information system - (Triple Vision system)
- Mn/DOT Metro Division/District portable changeable message signs
- TMC traffic history database (volume and occupancy data)
- TMC incident log database
- U of M Autoscope incident detection system
- Genesis operational test
- Trilogy operational test
- Mn/DOT workzone traffic management system operational test

Transit Management Systems
- MCTO "Trapeze" scheduling/planning system (creates bus/driver schedules)
- MCTO "radio" system (computer assisted radio system, 7 channels)
- MCTO automatic passenger counters (on some buses)
- MCTO electronic fare collection boxes (on all buses)
- MCTO TIC BusLine system (voice responses system, customer service system)
- MCTO customer service system for route/schedule planning (live telephone operators)
- MCTO transportation section (provides construction information to MCTO)
- MCTO bus stop database (contains the attributes of each bus stop)
- MCTO Police crime/incident tracking system
- MCTO Opticom emitters (EVP on 80 buses)
- MCTO speed light system (ramp meter pre-emption on selected ramps)
- MCTO Route-O-Matic system - vectors around incidents and congestion
- Metropolitan Council Rideshare system (Mn dial-a-ride)
- MCTO funded paratransit systems
- Metropolitan Council Metro Mobility passenger registration system
- Metropolitan Council Metro Mobility passenger reservation system
- U of M transit management
- Southwest Transit
- Minnesota Valley Transit
- Plymouth Metrolink
- School bus dispatch systems

Incident Management Program
- Mn/DOT TMC Highway Helper program (including AVL system)
- Private tow contracts
- U of M police incident management
- St. Paul DIVERT operational test

Electronic Fare Payment Systems
- City of Minneapolis Parking fare collection (smart card)
- City of Minneapolis electronic parking meter maid system
- Smart Darts operational test

PRE-SURVEY CANDIDATE SYSTEMS (CONTINUED)

Electronic Toll Collection Systems
- Toll road proposals (5 proposals in MN)
- Congestion Pricing Study
- Mileage based tax study

Multi modal Traveler Information Systems
- Travlink operational test

Administrative Systems
- Mn/DOT Electrical Services maintenance management system
- Mn/DOT Electrical Service gopher state one-call access system
- Mn/DOT TIS
- Mn/DOT automatic traffic recorder system
- Mn/DOT ISTEA management systems
- Mn/DOT CVO administrative systems
- DPS CVO administrative systems
- City of Minneapolis sign database

Other Information Systems
- Airline flight arrival/departure information - NW
- Airport rental car kiosk - Hertz
- MN Office of Tourism travel information center kiosks
- Mn/DOT TMC road weather information system access
- Mn/DOT Metro Division weather information access
- Mn/DOT Aeronautics weather information system
- Mn/DOT statewide road weather information telephone information
- Mn/DOT Pavement Condition and Weather Reporting System - future
- Internal distribution system Distribution of TMC loop data via the Internet
- RWIS - Mn/DOT future Road/Weather Information System

Emergency Response Systems
- Motorist call box system
- Mobile Data Terminals (MDT) in all State Patrol cars
- Laptop PC's in State Patrol cars to replace MDT's - pilot project in 1996
- Emergency 911 log system at State Patrol
- State Patrol information desk
- State Patrol South St. Paul information desk
- State Patrol access to drivers license information. via 911 center
- Mn/DOT Mayday operational test
- Demand response dispatch systems - numerous standalone systems

Parking Management Systems
- Metropolitan airports commission parking management
- City of Minneapolis parking management systems
- U of M parking management
- St. Paul Advanced Parking Information System operational test

Miscellaneous
- Mn/DOT portable traffic management system
- City of Minneapolis police special event management
- City of St. Paul special event management
- U of M special event management
- Mn/DOT pilot differential GPS broadcast base station
- Mn/DOT maintenance vehicle AVL
- Mn/DOT Metro Division/District maintenance dispatch
- Hennepin County Medical Center emergency vehicle dispatch
- MN Pollution Control Agency air quality monitoring sites
- Met. Council Forecasting models - uses data from Mn/DOT TIS database
- U of M traffic management system proposal

Interagency Systems
- ICTM - Integrated Corridor Traffic Management System operational test (includes Autoscope)
- ARCTIC - operational test in Virginia, MN

PRE-SURVEY CANDIDATE SYSTEMS (CONTINUED)

CVO Systems
- List of systems from MN Guidestar
- CVO call-in number
- State Patrol toll free Information number

Construction Information/Notification Systems
- Gopher State One Call system for utility locations
- Mn/DOT construction information dissemination
- Counties' systems (Hennepin County)
- Counties' systems (Ramsey County)
- City system (Minneapolis)
- City system (St. Paul)
- Utilities' systems

Communications Systems
- Mn/DOT TMC Fiber optic data communications system
- Mn/DOT Microwave Communication System
- Mn/DOT T1 system
- Mn/DOT Wide Area Network
- MNET (STARS)
- Voice radio - State Patrol, Mn/DOT Maintenance, DNR
- 800 MHZ Trunked Radio system (Metro area)
- Internet Communications
- Traffic Signal Interconnect systems
- RBDS - Radio Broadcast Data Systems
- Mn/DOT Video Conferencing

APPENDIX B

As-Is Agency Reports
Data Collection Guide