BROWARD COUNTY
ADVANCED TRANSPORTATION MANAGEMENT SYSTEM (ATMS) SOFTWARE

FUNCTIONAL REQUIREMENTS

FPID No. 228087-1-32-01/228089-1-32-01

Prepared For

FLORIDA DEPARTMENT OF TRANSPORTATION
District Four
3400 West Commercial Boulevard
Ft. Lauderdale, Florida 33309

Prepared By

GRAY-CALHOUN & ASSOCIATES, INC.
7850 NW 146th Street
Suite 408
Miami Lakes, Florida 33016

March 2004

TABLE OF CONTENTS

Description **Page**

DEFINITIONS....1
INDUSTRY STANDARDS....1
FUNCTIONAL REQUIREMENTS....2
Required Traffic Management Features....2
Required System Architecture Features....4
Required Communications and Control Features....6
Required System Reporting Features....6
Required Maintenance Features....8
INSTALLATION REQUIREMENTS....9
TESTING REQUIREMENTS....9
DOCUMENTATION....10

APPENDICES

Appendix

A COMMERCIAL BOULEVARD ALPHA TEST SITE SYSTEM DIAGRAM
B TESTING PLAN
C EVALUATION MATRIX

DEFINITIONS

Term	Definition
ATMS	Advanced Transportation Management System
BMP	Bitmap Format
CATV	Cable Television
CCTV	Closed Circuit Television
CD-ROM	Compact Disc Read Only Memory
CORBA	Common Object Request Broker Architecture
DATEX	Data Exchange
DMS	Dynamic Message Sign
DXF	AutoCAD File Format
GIS	Geographic Information Services
GUI	Graphical User Interface
HAR	Highway Advisory Radio
HTML	Hypertext Markup Language
JPEG	Joint Photographic Experts Group
MPEG	Motion Pictures Experts Group
NTCIP	National Transportation Communications for ITS Protocol
PDA	Personal Digital Assistant
SQL	Structured Query Language
TCP/IP	Transmission Control Protocol/Internet Protocol
VPN	Virtual Private Network

INDUSTRY STANDARDS

The software shall support the following industry standards:

- NTCIP
- MPEG-2
- TCP/IP

FUNCTIONAL REQUIREMENTS

The ATMS software features are divided into Traffic Management, System Architecture, Communications and Control, System Reporting and Maintenance. For some sections, there are required elements and optional elements. Capability to perform optional elements will enhance the evaluation of the system software package.

Required Traffic Management Features

The ATMS software shall allow for user-defined monitoring of intersection operation, including once-per-second polling, allowing for the real-time status of intersections in reports and graphics. Polling shall occur without interruption during data uploads and downloads.

Preemption shall be recognized as a valid operation and the controller is not considered to be in a failure mode due to limited cycling.

The system shall support radar, video and loop detection devices and be able to add various manufacturers' protocols.

Traffic responsive algorithms shall be provided to process data from the field and select a timing pattern from a library of different plans, based upon historical signatures. Traffic responsive algorithm capabilities shall include:

- Vehicle actuated – modified phase splits based on vehicle actuation and gaps
- Future traffic prediction – uses the volume data from detectors and projects future conditions
- Pattern matching – the volume and occupancy data are compared with profiles in memory. Once a similar stored profile is identified, the associated parameters are activated.

The system shall provide DMS control and monitoring for implementing a motorist information system. The sign messages shall be user-selectable from an existing library or customized for

the event. The system shall be able to communicate with various DMS models and be able to add various manufacturers' protocols (NTCIP and non-NTCIP) via a driver library.

CCTV control and monitoring shall be provided to allow for integrated pan/tilt/zoom control and assignment of MPEG-2 video to various output devices. The pan/tilt/zoom control shall be via joystick or mouse. The CCTV control shall have stored presets for each camera.

The system shall be able to communicate with various CCTV models and shall be able to add various manufacturers' protocols. NTCIP shall be supported.

The system shall be capable of viewing a minimum of four concurrent MPEG-2 video streams on every workstation at a time. The MPEG-2 decoding shall be performed via a software video player. The player must be integrated into the ATMS. The use of a separate product for displaying and controlling the video streams shall not be permissible. It is permissible to use a third party product viewer if the viewer is integrated into the ATMS software, and appears and functions as an integral part of the ATMS.

The MPEG-2 control system must allow for seamless joining to and dropping from multicast groups. The system must also allow for a camera tour of an operator-selected group of cameras. Dwell time shall be operator selectable.

The system shall support pan/tilt/zoom control via virtual RS-232 ports. The system shall have the capacity for 500 virtual ports, and each port must be able to be assigned to a specific IP address and Ethernet port number corresponding to a physical RS-232 port on a field Ethernet encoder. The software must select the appropriate virtual communications port when a camera is selected, so that the pan/tilt/zoom control for that particular camera is routed to the correct encoder RS-232 port in the field.

The ATMS software shall support incident management to allow operators to implement traffic diversion patterns to alleviate problems that may occur during non-recurring congestion scenarios. The system shall include incident tracking to allow for information to be entered,

including lanes affected, duration of incident, incident clearance time and work zone information.

Traffic adaptive algorithms shall be provided to perform constant optimizations for signal timing plans instead of matching current conditions to an existing timing plan, thus allowing for signals to adapt to non-recurring congestion, events, incidents or traffic demand increase, without needing to be reset.

The ATMS software shall support transit priority to allow operators to implement active and/or passive priority for transit vehicles thereby potentially increasing the person throughput of an intersection.

Optional Traffic Management Features

- Support for HAR to inform the public of incidents, current traffic conditions, travel restrictions, notice of events, construction progress or general safety information.
- Capable of communicating with various HAR models and be capable of adding various manufacturers' protocols.
- Support built-in weather alerts to allow an operator to anticipate some type of events and adjust the system accordingly, and capable of responding to weather sensor activity.
- Support parking guidance to allow an operator to adjust traffic/timing patterns for special events and major destination venues. Should parking guidance be supported, it may be integrated with DMS control for automated or semi-automated response to venue parking information.

Required System Architecture Features

The ATMS software shall consist of a client-server architecture with open network and database standards to allow a shared database with workstation access across a network. The system shall allow for a maximum of 50 simultaneous users without affecting the system performance.

A GUI shall be used for ease and consistency in operations to allow real-time access to system features, preferably using multiple layers. The background graphic formats supported shall

include JPEG, BMP, DXF, Microstation and AutoCAD files. The system features to be accessible via the GUI shall include:

- System elements: CCTV, HAR (optional), DMS, Detectors, Intersections
- Dynamic graphics displaying the real-time signal timing parameters
- Corridor-wide dynamic graphics showing real-time coordination information
- Area-wide dynamic display to allow "point and click" access to individual intersections

The system shall utilize personal computer based local area networks with central databases to allow responsible personnel to share a common system database and allow for expansion of the system. The system shall operate over an Ethernet network.

It shall be possible to synchronize the system with a universal time reference to maintain the integrity of system progression. Synchronization shall be traceable to the National Bureau of Standards. The system time shall be capable of being broadcast to all field equipment at the same time and by groups.

The system shall use a standard SQL database engine to facilitate usage and platform compatibility.

The system shall support multiple security levels to allow users with different responsibilities access to various areas of the system. The system shall allow for multiple levels of security on a menu-by-menu basis.

Optional System Architecture Features

- Support automatic web page generation to provide the internal agency real-time report and status information, including communications status, intersection status (i.e., preemption, flash, etc.), error reports and alarm reports and to provide the public with real-time traffic information to use in trip planning, including real-time reports and graphics images.

Required Communications and Control Features

The ATMS shall utilize distributed control with central monitoring (polling) to take full advantage of the intelligence of the modern controller, along with minimizing the effect of communications failures. The system shall not require periodic polling to operate, only for monitoring and upload/download of plans and controller parameters.

Multiple types of communication media shall be supported, including, but not limited to, fiber-optics, leased analog lines, agency owned twisted pair, spread spectrum radio, microwave, leased CATV and agency-owned broadband coaxial cable. Dial-up support for isolated intersections shall also be supported.

The system shall include database transfer between the central control and field devices to facilitate deploying new traffic/timing patterns and the utilization of the field intelligence. This shall be done with minimal or no effect on the monitoring of the system. The system shall be able to transfer databases to and from the controllers seamlessly. The software shall support industry standard NTCIP protocols and TCP/IP to communicate with field devices. Industry standard type 2070 controllers shall be supported.

<u>Optional Communications and Control Features</u>

- Capable of center-to-center communication via NTCIP, CORBA or DATEX to facilitate interagency communications.

Required System Reporting Features

The system shall support the importing and exporting of data to and from traffic modeling packages such as Synchro for assistance in the optimization of traffic signals. Data to be exchanged may include detector data, time-space diagrams and measures-of-effectiveness reports.

The system shall support alarm events. These events shall be able to be prioritized by the operator as to thresholds and type of alerts. Alert types shall include:

- Email – Both individual and groups
- Pop Up – Pop up messages on-screen with audio alert
- Paging – Standard dial-up paging protocol must be supported

Each alarm event must be logged to facilitate documentation of problems. Error logs shall include as much information as possible about the events and the status of the system leading up to the event.

Predefined and custom reports such as system measures-of-effectiveness, real-time communications failures, device failures and adherence to signal timing pattern failures shall be included. Predefined reports shall include alarms, pattern changes, group status, intersection status and system reports.

The ATMS software shall support data archiving capability to allow for retrieval and sharing of data that may be used for planning, design, developing control strategies, congestion tracking, analyzing performance measures, determining the optimum crisis management and developing other means of operating the system efficiently. The data to be collected and archived shall include:

- Vehicle traffic volumes
- Vehicle speeds
- Vehicle classification
- Traffic incident information, including time sequence of events, location, cause and number of lanes blocked
- Current and scheduled work zone information, including location, number of lanes closed and scheduled duration

The system shall have the capability of processing weekly detector counts to allow for 24-hour data and analysis. The data to be processed include volume, speed and occupancy. The system shall possess the capability to use the data collected and saved as an input to traffic model

interfaces for timing development. Other information such as real-time time-space and platoon progression diagrams shall be available to aid in parameter implementation and testing. The detector volumes shall be used for signal detection presence and data collecting. The data collected will be used planning and processed into approach count or turning movement count formats.

Optional System Reporting Features

- Support for additional data to be collected and archived, such as travel time and delay distribution, and vehicle emissions

Required Maintenance Features

The system shall support field initiated download of controller databases to allow maintenance personnel to replace defective units and bring another unit quickly online without the involvement of a central party. This shall be performed without interruption to the system monitoring.

The system shall support central database and field database comparisons and editing to allow differences between controller timings and information to be resolved.

The system shall support an equipment inventory database to facilitate maintenance documentation of critical equipment, mean time between failure and mean time to repair. The inventory database component may be via third-party software.

The system shall support the copying of controller databases from one controller to another for ease of adding new intersections or new parameters without interruption to the system.

The system shall support remote operator access via dial-up or VPN over Internet to allow an operator to make changes from a remote location after being alerted by automatic paging without interfering with central.

The system shall support PDA devices to upload and download information from and to the controller.

The system shall support a GIS interface to allow the importing and exporting of map features. The system shall be compatible with, as a minimum, ArcView and ArcInfo.

Access to the source code shall be provided to the agency to allow possible future features to be developed competitively or by the agency. The source code may be placed in escrow.

INSTALLATION REQUIREMENTS

The Vendor shall be required to install, configure, and test all software for purposes of the software evaluation process. The software will be installed on a test server and a minimum of two workstations and one maintenance laptop. The software shall be configured to support the Broward County Commercial Boulevard Alpha Test Site controller network as it exists at time of installation. A system diagram of the Commercial Boulevard Alpha Test Site is attached as Appendix A. Timing plans and other parameters shall be entered into the system for all controllers in the Alpha Test Site, even if those controllers are not currently connected to the field fiber network.

TESTING REQUIREMENTS

A test plan for the system is attached as Appendix B. The software shall be tested by the Vendor according to the plan at a time and date approved by the Engineer. Each step of the software test plan shall be followed, and any failure will be noted. If a failure occurs, it will up to the discretion of the Engineer whether to continue the testing or stop until a correction is made. If testing is stopped, it shall resume with the failed feature/requirement after corrections are complete. If testing is not stopped, the failed feature/requirement(s) shall be separately retested after corrections are made.

The Evaluation Matrix is included as Appendix C for informational purposes only.

DOCUMENTATION

The Vendor shall supply full documentation on the software. The documentation shall include information on:

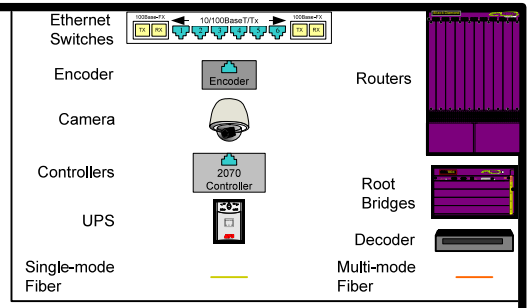
- Installation
- Configuration
- Operations
- Troubleshooting
- Support contact information

The documentation shall be provided in the form of three-ring binders, CD-ROM and HTML help files which can be accessed from within the software system.

APPENDIX A

COMMERCIAL BOULEVARD ALPHA TEST SITE SYSTEM DIAGRAM

	Equipment	Manufacturer	Model
TMC	Routers	Extreme Networks	Black Diamond 6808
	Root Bridges	Extreme Networks	Alpine 3804
	Decoder	VBrick	VBrick-5000
	Workstations		
Intersections	Controllers	Naztec	2070 with Nema functions
	Ethernet Switches	Etherwan	Xpresso 9808
	Camera	Cohu	i-dome 3920
	Encoder	VBrick	VBrick-4000
	UPS	APS	Smart-UPS 700VA



Alpha System Diagram.vsd

Drawn by	CMF
Project No.	2010501
Date	01/13/04

Prepared By:
GRAY CALHOUN
4350 WEST CYPRESS STREET
SUITE 340
TAMPA, FLORIDA 33607
PHONE (813) 831- 8870
FAX (813) 831-9375
www.graycalhoun.com

Project Title	**Broward County ATMS Software**
Drawing Title	**Commercial Boulevard Alpha Test Site System Diagram**

Page

APPENDIX B
TESTING PLAN

BROWARD COUNTY
ADVANCED TRANSPORTATION MANAGEMENT SYSTEM (ATMS) SOFTWARE

TESTING PLAN

FPID No. 228087-1-32-01/228089-1-32-01

Prepared For

FLORIDA DEPARTMENT OF TRANSPORTATION
District Four
3400 West Commercial Boulevard
Ft. Lauderdale, Florida 33309

Prepared By

GRAY-CALHOUN & ASSOCIATES, INC.
7850 NW 146th Street
Suite 408
Miami Lakes, Florida 33016

March 2004

TABLE OF CONTENTS

Description **Page**

OPERATIONAL TEST 1
FUNCTIONAL REQUIREMENTS TEST 1
Traffic Management Features 1
System Architecture Features 3
Communications and Control Features 4
System Reporting Features 5
Maintenance Features 6

The ATMS software testing will be divided into sections dealing with an Operational Test and a Functional Requirements Test. The Vendor shall be responsible for demonstrating software capabilities as it relates to satisfying the operational and functional requirements tests. Should any functionality problems or discrepancies occur, they shall be noted as a failure or as an inability to satisfy a specific requirement. Operational anomalies, such as the inability to install the software or communicate with the field components, shall also be noted as a failure should they occur.

OPERATIONAL TEST

1. Install software package into the designated workstation and establish connectivity to the field components.
2. Validate communications between workstation and field components.

FUNCTIONAL REQUIREMENTS TEST

This section tests the software's ability to satisfy the Functional Requirements. Should the test bed not contain the specific hardware to be tested (i.e., detection), the Vendor shall demonstrate the functionality of the feature to the greatest extent possible without the hardware. Hardware simulators may be provided by the Vendor, if desired, to assist in the demonstration.

The test bed is an IP-based Ethernet network. The Gigabit Ethernet backbone is comprised of three routers. The backbone is connected to the field components via two root bridges, which are then connected to the daisy-chained Ethernet field switches. The final link to the field components is via the Ethernet field switches.

Traffic Management Features

Required

1. Polling
    a. Show real-time status of intersection in reports and graphics.
    b. Change polling rates (user-defined).
2. Preemption
    a. Demonstrate that preemption is a valid operation and the controller is not considered to be in failure mode due to limited cycling.
    b. Demonstrate preemption scenarios.
3. Vehicle Detection
    a. Demonstrate ability to operate with and process data (volume, speed and occupancy) from the following:
        i. Radar Detectors
        ii. Video Image Detectors
        iii. Loop Detectors
4. Traffic Responsive Algorithms
    a. Demonstrate the ability to process data from the field and to select a timing pattern from a library of different plans, based upon historical signatures using traffic responsive algorithms.

b. Demonstrate the following traffic responsive algorithm capabilities:
    i. Vehicle actuated
    ii. Future traffic prediction
    iii. Pattern matching

5. DMS
    a. Demonstrate the ability to control and monitor a DMS.
    b. Demonstrate the ability to have user-selectable sign messages. The messages shall be from an existing library or customized for an event.
    c. Demonstrate ability to communicate with various DMS models and protocols (NTCIP and non-NTCIP) via a driver library.
6. CCTV
    a. Control the CCTV camera using an integrated pan/tilt/zoom control and monitoring system. The pan/tilt/zoom control shall be via joystick or mouse and shall have stored presets for each camera.
    b. The control shall be via virtual RS-232 ports with a minimum of 500 virtual ports. Assign each port to a specific IP address and Ethernet port number corresponding to a physical RS-232 port in a field Ethernet encoder. The software must select the appropriate virtual communications port when a camera is selected so that the pan/tilt/zoom control for that particular camera is routed to the correct encoder RS-232 port in the field.
    c. Demonstrate the ability to communicate with various CCTV models and protocols (NTCIP).
    d. Demonstrate the ability to seamlessly join and drop from multicast groups.
    e. Demonstrate the ability to perform camera tours for a group of cameras as selected by the operator. The dwell time shall be operator selectable.
7. Incident Management
    a. Demonstrate the ability to implement traffic diversion patterns.
8. Traffic Adaptive Algorithms
    a. Demonstrate the ability to add traffic adaptive algorithms to perform constant optimizations for signal timing plans instead of matching current conditions to an existing timing plan, thus allowing for signals to adapt to non-recurring congestion, events, incidents or traffic demand increase without needing to be reset.
9. Transit Priority
    a. Demonstrate the ability to allow operators to implement transit priority.

<u>Optional</u>

1. HAR
    a. Demonstrate the ability to inform the public of incidents, current traffic conditions, travel restrictions, notice of events, construction progress or general safety information via HAR.
    b. Demonstrate the ability to communicate with various HAR models and protocols.
2. Built-in Weather Alerts
    a. Demonstrate the ability to allow an operator to anticipate some type of event and adjust the system accordingly using built-in weather alerts. The system should respond to weather sensor activity.

3. Parking Guidance
    a. Demonstrate the ability to use parking guidance to allow an operator to adjust traffic/timing patterns for special events and major destination venues. The parking guidance can be integrated with the DMS control for automated or semi-automated response.

System Architecture Features

Required

1. Client-server Architecture
    a. Allow a shared database with workstation access across a network using a client-server architecture with open network and database standards.
    b. Demonstrate the ability to allow a maximum of 50 simultaneous users without affecting the performance of the system.
2. GUI
    a. Show real-time access to system features using multiple layers via the GUI.
    b. Demonstrate that the background formats supported include the following file types:
        i. JPEG
        ii. BMP
        iii. DXF
        iv. Microstation
        v. AutoCad
    c. Access the following system features via the GUI:
        i. System elements: CCTV, DMS, Detectors, Intersections, HAR (optional)
        ii. Dynamic graphics displaying the real-time signal timing parameters
        iii. Corridor-wide dynamic graphics showing real-time coordination information
        iv. Area-wide dynamic display to allow "point and click" access to individual intersections
3. Personal Computer-based LAN
    a. Allow personnel to share a common system database and allow for system expansion using personal computer-based LANs with central databases.
    b. Operate over an Ethernet network.
4. Universal Time Reference Synchronization
    a. Synchronize the system with a universal time reference to maintain the integrity of system progression.
    b. Show that the synchronization is traceable to the National Bureau of Standards.
    c. Broadcast the time to all field equipment at the same time and by groups.
5. Standard SQL Database Engine
    a. Use a standard SQL database engine to facilitate usage and platform compatibility.
6. Multiple Security Levels
    a. Restrict the access of various areas of the system depending on the responsibilities of the user using multiple levels of security.
    b. Show the security levels on a menu-by-menu basis.

Optional

1. Automatic Webpage Generation
    a. Generate automatic web pages to provide the internal agency real-time report and status information, including communications status, intersection status (i.e., preemption, flash, etc.), error reports and alarm reports.
    b. Generate automatic web pages to provide the public with real-time traffic information, including reports and graphics images.

Communications and Control Features

Required

1. Distributed Control
    a. Control the system using distributed control with central monitoring that takes advantage of the intelligence of the modern controller along with minimizing the effect of communications failures.
    b. Show that the system does not require periodic polling to operate, only for monitoring and uploading and downloading of plans and controller parameters.
2. Multiple Communication Media
    a. Demonstrate the ability to communicate via the following communications media types, as a minimum:
        i. Fiber optics
        ii. Leased analog lines
        iii. Agency-owned twisted pair
        iv. Spread spectrum radio
        v. Microwave
        vi. Leased CATV
        vii. Agency-owned broadband coaxial cable
        viii. Dial-up
3. Database Transfer
    a. Perform database transfers between the central control and the field devices in order to facilitate deploying new traffic/timing patterns and utilize field intelligence. This shall be done with minimal or no effect on the monitoring system.
    b. Transfer databases to and from the controllers seamlessly.
4. NTCIP Protocols
    a. Show compatibility with industry standard NTCIP protocols:
        i. FDOT approved Management Information Bases (Standard Global MIB (1201) (subset), Standard DMS MIB (1203) (subset) and FDOT specific MIB for DMS)
        ii. Official NTCIP Management Information Bases (CCTV camera control (1205) and Actuated Signal Controller (1202))
5. TCP/IP Communications
    a. Communicate with the field devices via TCP/IP.
6. 2070 Controllers
    a. Demonstrate that the system supports industry standard type 2070 controllers.

Optional

1. Center-to-center Communications
    a. Demonstrate center-to-center communications ability via NTCIP, CORBA or DATEX.

System Reporting Features

Required

1. Data Import and Export
    a. Demonstrate the ability to import and export data to and from traffic system packages such as Synchro. Data to be exchanged includes:
        i. Detector data
        ii. Time-space diagrams
        iii. Measures-of-effectiveness reports
    b. Use other information such as real-time time-space and platoon progression diagrams to aid in parameter implementation and testing.
2. Alarm Events
    a. Prioritize alarm events by the operator with respect to thresholds and type of alerts.
    b. Show the following alert types, as a minimum:
        i. Email – Both individual and groups
        ii. Pop-up – Pop-up messages on-screen with audio alert
        iii. Paging – Standard dial-up paging protocol
    c. Show alarm event logging to facilitate documentation of problems. Error logs shall include as much information as possible about the events and of the status of the system leading up to the event.
3. Predefined and Custom Reports
    a. Show the various predefined and custom reports.
    b. Generate the following reports, as a minimum:
        i. System measures-of-effectiveness
        ii. Real-time communications failures
        iii. Device failures
        iv. Adherence to signal timing pattern failures
    c. Show that the predefined reports include the following, as a minimum:
        i. Alarms Reports
        ii. Pattern Changes Reports
        iii. Group Status Reports
        iv. Intersection Status Reports
        v. System Reports
4. Data Archiving
    a. Demonstrate the ability to archive data that allows for retrieval and data sharing that may be used for planning, design, developing control strategies, congestion tracking, analyzing performance measures, determining the optimum crisis management and developing other means of operating the system efficiently.
    b. Demonstrate that the data collected and archived includes as a minimum:
        i. Vehicle traffic volumes
        ii. Vehicle speeds

iii. Vehicle classification
iv. Traffic incident information, including time sequence of events, location, cause and number of lanes blocked
v. Current and scheduled work zone information including location, number of lanes closed and scheduled duration
vi. Travel time and delay distribution (optional)
vii. Vehicle emissions (optional)

5. Process Weekly Detector Counts
    a. Demonstrate the ability to process weekly detector counts to allow for 24-hour data and analysis. The data to be processed includes volume, speed and occupancy and may be from various detection technologies including radar, video image and loops.
    b. Demonstrate the ability to use the data collected and saved as an input to traffic model interfaces for timing development.
    c. Demonstrate the ability to have other information such as real-time time-space and platoon progression diagrams available to aid in parameter implementation and testing.
    d. Demonstrate the ability to process detector volumes into approach count and turning movement count formats.

Maintenance Features

Required

1. Field Initiated Download of Controller Databases
    a. Demonstrate ability of field personnel to download controller databases in order to replace defective units and bring another controller online quickly without the involvement of a central party. This shall be performed without interruption to the system monitoring.
2. Database Comparisons
    a. Perform central database and field database comparisons and editing to allow differences between controller timings and information to be resolved.
3. Equipment Inventory Database
    a. Use an equipment inventory database to facilitate maintenance documentation of critical equipment, mean time between failure and mean time to repair. The inventory database component may be via third-party software but must be integrated.
4. Controller Database Copying
    a. Show ability to copy controller databases from one controller to another for ease of adding new intersections or new parameters without interruption to the system.
5. Remote Operator Access
    a. Demonstrate the ability to have a remote operator access the system via dial-up or VPN over Internet.
    b. Demonstrate the ability to allow an operator to make changes from a remote location after being alerted by automatic paging without interfering with central.
6. PDA Support
    a. Use a PDA device to upload and download information from and to a field controller.

7. GIS Interface
    a. Import and export map features via the GIS interface.
    b. Show that the GIS interface is compatible with, as a minimum, ArcView and ArcInfo.

APPENDIX C
EVALUATION MATRIX

ATMS SOFTWARE EVALUATION MATRIX

ATMS Software:
ATMS Software Vendor: Date:

Category	Feature	Weighted %	% Conformance	Max Score	Score	Total	Max Pts	Test Location (Lab/Field)
Traffic Management Features	*User defined monitoring of intersection operation			0.00		0.00		
	*Preemption/Priority			0.00		0.00		
	*Detection devices			0.00		0.00		
	*Traffic responsive algorithms			0.00		0.00		
	*Dynamic message sign control and monitoring			0.00		0.00		
	*CCTV control and monitoring			0.00		0.00		
	*Incident Management			0.00		0.00		
	Total	0.00%		0.00		0.00		
System Architecture Features	*Client-Server architecture with open network and database standards			0.00		0.00		
	*Graphical User Interface (GUI)			0.00		0.00		
	*Personal computer based local area networks with central database			0.00		0.00		
	*Synchronization with a universal time reference			0.00		0.00		
	*Standard SQL database engine			0.00		0.00		
	*Multiple security levels			0.00		0.00		
	Total	0.00%		0.00		0.00		
Communications and Control Features	*Distributed control with central monitoring (polling)			0.00		0.00		
	*Support for multiple communication media			0.00		0.00		
	*Database transfer between the central TMC and field devices			0.00		0.00		
	*Standard protocol support capability			0.00		0.00		
	*Support for standard controller types			0.00		0.00		
	Total	0.00%		0.00		0.00		
System Reporting Features	*Traffic model interfaces			0.00		0.00		
	*Event-based alarms, paging and e-mail capability			0.00		0.00		
	*Event-based error logging			0.00		0.00		
	*Predefined and custom reports			0.00		0.00		
	*Data archiving capability			0.00		0.00		
	*Capability of processing weekly detector counts			0.00		0.00		
	Total	0.00%		0.00		0.00		
Maintenance Features	*Field initiated download of controller databases			0.00		0.00		
	*Master (central database and field database comparison and editing)			0.00		0.00		
	*Equipment inventory database			0.00		0.00		
	*Database copy			0.00		0.00		
	*Remote operator access (Dial-up or remote Intranet)			0.00		0.00		
	*PDA device support			0.00		0.00		
	*GIS interface capability			0.00		0.00		
	*Access to source code/Ability to make software modifications			0.00		0.00		
	*Availability of updates			0.00		0.00		
	Total	0.00%		0.00		0.00		
Other Criteria	*Ease of implementation			0.00		0.00		
	*Ability to provide support			0.00		0.00		
	*User friendly/intelligible manuals			0.00		0.00		
	*Application history			0.00		0.00		
	*Traffic adaptive algorithms			0.00		0.00		
	*Transit priority			0.00		0.00		
	*Availability of optional features			0.00		0.00		
	Total	0.00%		0.00		0.00		
			Total	**0.00**		**0.00**		

The following requirements will not be scored:
1) Support for Naztec's 2070 Traffic Controller
2) MPEG-2 capability