August 12, 2013

Mr Graham Heitz
Wisconsin Department of Transportation - SouthWest Region
2101 Wright Street
Madison, WI 53704

Re: Verona Road Adaptive Signal Control System Requirements

Dear Graham,

Enclosed is the final draft of the Verona Road Adaptive Signal Control System Requirements document. Please distribute to the appropriate parties for review.

Please call with questions.

Sincerely,

STRAND ASSOCIATES, INC.®

Luke Holman, P.E. Joe Urban, P.E.

Enclosure: Report

Report for

Wisconsin Department of Transportation SW Region

Verona Road Adaptive Signal Control DRAFT System Requirements

Prepared by:

STRAND ASSOCIATES, INC.®
910 West Wingra Drive
Madison, WI 53715
www.strand.com

August 2013

STRAND ASSOCIATES®

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This System Requirements document is the second step in the Federal Highway Administration's (FHWA) Systems Engineering process for Adaptive Signal Control Technology (ASCT). A draft Concept of Operations (ConOps) document was completed in April 2013 as the first step of the Systems Engineering process to evaluate the need for an ASCT. The conclusions made from the ConOps indicated that ASCT should be pursued for several routes during US 18/151/Verona Road (Verona Road) construction.

Section 1: Scope of System

Section 1.1: Project Purpose

Verona Road is a 4-lane facility that carried up to 61,100 vehicles per day in 2012 at it's highest point near the Beltline Highway (Beltline) interchange. The Beltline is a 6-lane facility that carried 112,000 vehicles per day in 2012 to the near the Verona Road interchange and up to 144,000 vehicles per day east of the Verona Road interchange. Similar facilities in Wisconsin to the Beltline include I-43/94 south of Milwaukee and US 45/I-894 on the west side of Milwaukee. Major construction along Verona Road from Raymond Road through the Beltline is scheduled to begin in 2014 and last through 2019. During construction, there is expected to be diversion of Verona Road traffic to other routes, referenced as the mitigation routes in this document. The mitigation routes include County D/Fish Hatchery Road and Seminole Highway parallel to Verona Road and County PD/McKee road connecting the roadways. The official alternate route is defined as County M and US 14.

A map of the alternate routes, mitigation routes, Verona Road construction zone and area that was considered for adaptive signal control in the ConOps is located in Figure 1.1.

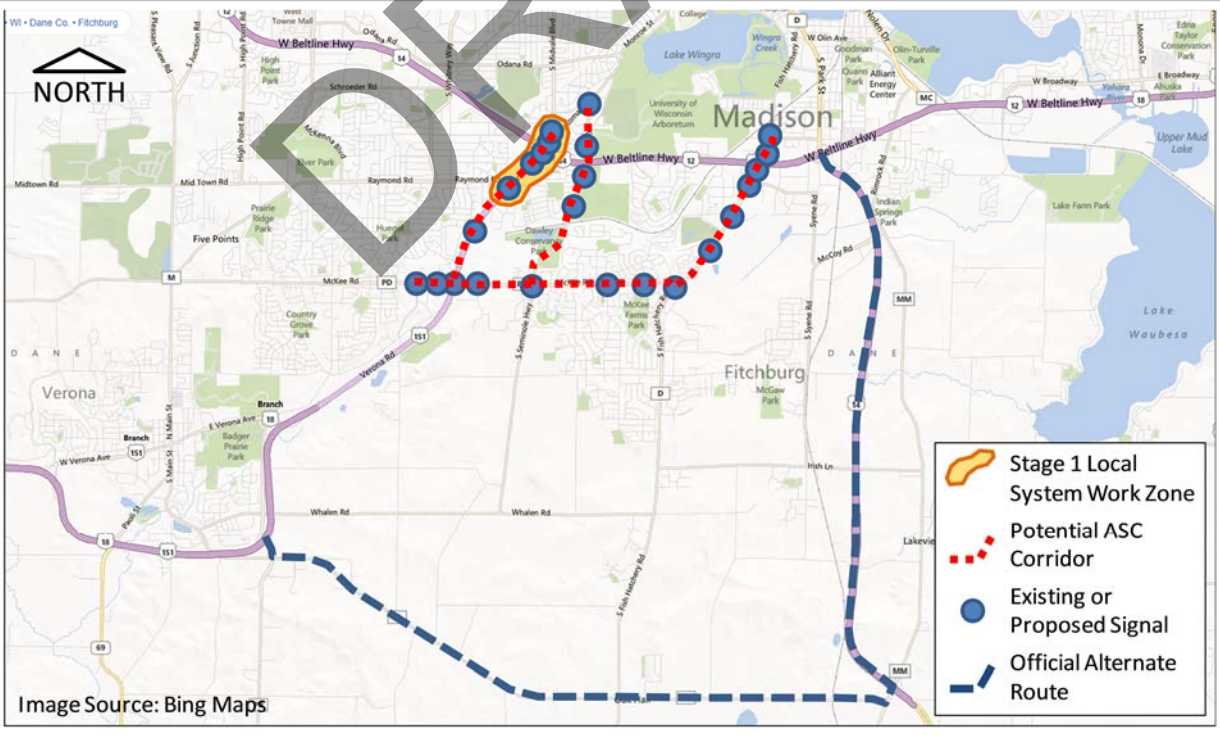

Figure 1.1 Project Location Map

Section 1.2: Stakeholders

Agencies involved in varying degrees for the adaptive control effort will include the following:

- Wisconsin Department of Transportation (WisDOT) Southwest Region
- WisDOT Bureau of Traffic Operations (BTO)
- City of Madison
- City of Fitchburg
- Dane County
- Madison Metro Transit
- WisDOT State Traffic Operations Center (STOC)

The Town of Madison owns a portion of maintenance at the County D/Fish Hatchery Road/Greenway Crossing intersection. Due to their low involvement in the overall study area, the Town of Madison was not included as one of the stakeholders for the adaptive control effort.

Section 1.3: Operations and Maintenance

WisDOT owns and maintains signals along Verona Road and at the Seminole Highway/Beltline ramp terminal intersections. The City of Madison currently maintains all of the other signals within the study corridor regardless of ownership and will continue to do so for the foreseeable future.

Section 1.4: Adaptive Signal Control Implementation

The anticipated routes where adaptive signal control will be used during Verona Road construction are as follows:

- County PD/McKee Road - Verona Road to County D/Fish Hatchery Road
- County D/Fish Hatchery Road - Beltline to County PD/McKee Road

Along Seminole Highway, two intersections that are unsignalized today will be signalized as part of the traffic mitigation for Verona Road construction. These intersections will not be included in the adaptive signal control system because communications between intersections are anticipated to be difficult. The Seminole Highway intersections are discussed in ConOps Section 3.1.

If the Seminole Highway (north of County PD/McKee Road) or Todd Drive intersections are to be adaptively controlled in the future, investigation into infrastructure and communications improvements at each intersection would be needed.

Along Verona Road, ASCT will not be used within the workzone, however, the technology selection should not preclude installation of the ASC in the future as part of a permanent solution.

The number of signals anticipated to be adaptively controlled during construction and potentially after construction are shown in Table 1.4. A map of the signals anticipated to be adaptively controlled during construction is shown in Figure 1.4.

Scenario	Study Area # of Signals	Potential # of ASC Signals	Notes
Before Construction	24	0	Construction starts in 2014
During Construction	26	14	New Signal: Seminole/Sentinel (+1 overall)
			New Signal: Seminole/Nakoma/Yuma (+1 overall)
After Construction	25	19	Includes Verona SPUI (-1 all)
			Potential Verona Road permanent ASC from Williamsburg through Nakoma (+5 ASC)
Future Construction	27	21	Construction planned to start in 2017
			Planned interchange: Verona/County PD (+1 all)
			Planned interchange: Verona/Williamsburg (+1 all)

Table 1.4 Plan for Signals in Study Area

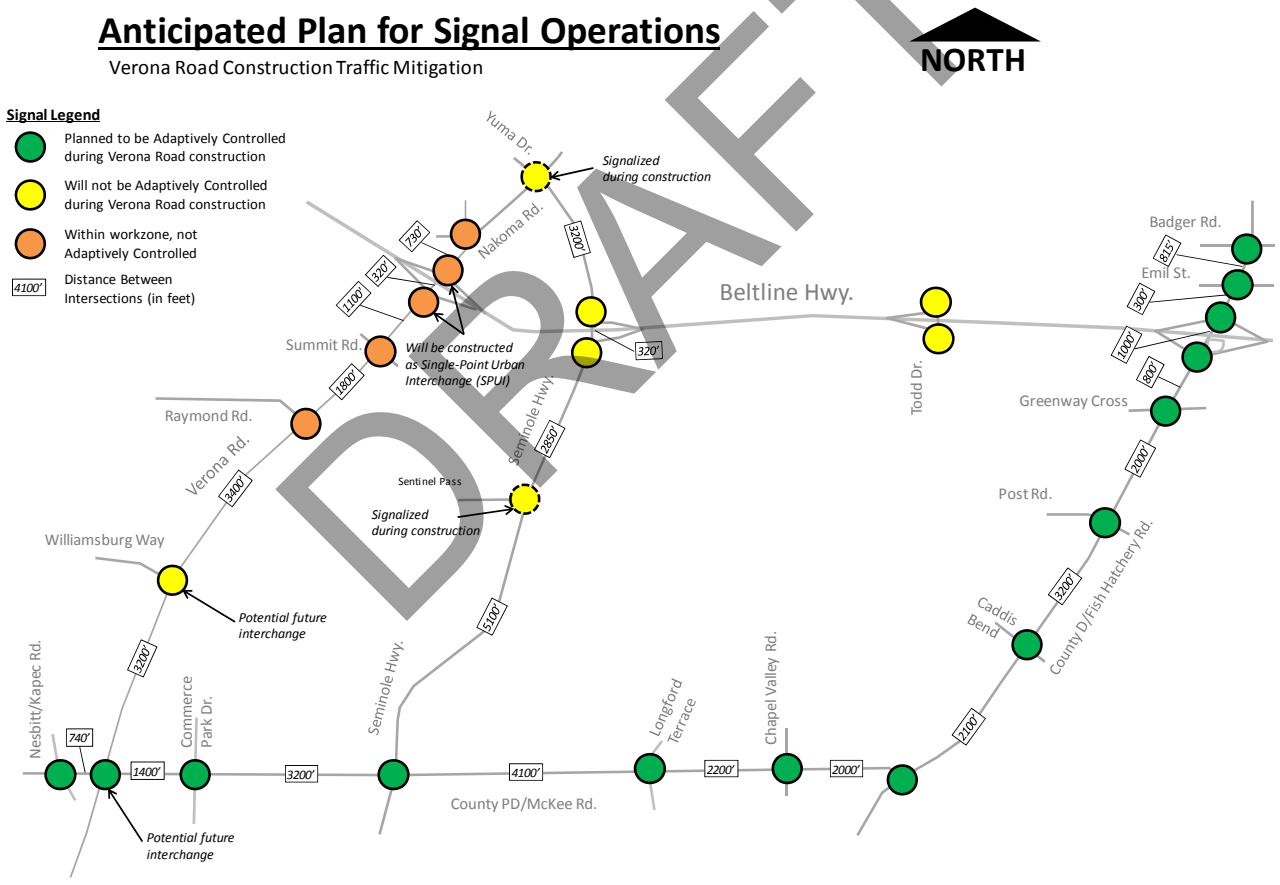

Figure 1.4 Anticipated Plan for Traffic Signals during Verona Road Construction

Section 2: References

References used to develop this document are as follows:

- Verona Road Adaptive Signal Control Concept of Operations (DRAFT 8-12-13)
- Model Systems Engineering Documents for Adaptive Signal Control Technology (ASCT) Systems (August 2012)
- NCHRP Synthesis 403 - Adaptive Traffic Control Systems: Domestic and Foreign State of Practice (2010)
- Madison Transit Corridor Study: Investigating Bus Rapid Transit in the Madison Area. The Capitol Region Sustainable Communities Initiative and The Madison Area Transportation Planning Board (May 2013).

Section 3: System Requirements

The following subsections 3.1 to 3.18 detail the system requirements for the project. Many of the requirements listed may be met by a central system, or Advanced Traffic Management System (ATMS), that is compatible with the ASCT. The ATMS and ASCT are not listed exclusively in the following requirements, rather just referred to as the ASCT.

Section 3.1: Network Characteristics

1. The ASCT shall be able to control a minimum of 14 signals concurrently during Verona Road construction and at a minimum 21 signals after Verona Road construction. (ConOps 4.2)
2. The ASCT shall support groups of signals. (ConOps 4.2)
    a. The boundaries surrounding signal controllers that operate in a coordinated fashion shall be defined by the user.
    b. The size of a group shall range from 1 to at least 14 signals.
    c. Each group shall operate independently.
    d. The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the system according to a time-of-day schedule, traffic conditions, or when commanded by the user.

Section 3.2: Type of Operation

1. <u>Mode of Operation</u>

1. The ASCT shall operate non-adaptively when adaptive control equipment fails. (ConOps 4.14)
    a. The ASCT shall operate non-adaptively when a user-specified detector fails.
    b. The ASCT shall operate non-adaptively when the number of failed detectors connected to a signal controller exceeds a user-defined value.
    c. The ASCT shall operate non-adaptively when the number of failed detectors in a group exceeds a user-defined value.
    d. The ASCT shall operate non-adaptively when a user-defined communications link fails.
    e. The ASCT shall be able to notify the operator via an external system for failures of items a-d above.
    f. The ASCT shall notify the operator via an email for failures associated with items c and d above.
2. The ASCT shall operate non-adaptively when a user manually commands the ASCT to cease adaptively controlling a group of signals. (ConOps 4.7)

3. The ASCT shall operate non-adaptively when a user manually commands the ASCT to cease adaptive operation. (ConOps 4.7)
4. When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of the signal controllers, maximizing the throughput of the coordinated route. (ConOps 4.1.1)
5. When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers, preventing queues from exceeding the storage capacity at user-specified locations. (ConOps 4.1.4)
6. When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers providing equitable distribution of green times. (ConOps 4.1.3)
7. When current measured traffic conditions meet user-defined criteria, the ASCT shall alter the state of signal controllers providing two-way progression on a coordinated route. (ConOps 4.1.2)
8. The ASCT shall detect repeated phases that do not serve all waiting vehicles. These phase failures may be inferred, such as by detecting repeated max-out. (ConOps 4.1.4)
9. The ASCT shall alter operations, to minimize repeated phase failures. (ConOps 4.1.5)

2. Allowable Phases

1. The ASCT shall not prevent protected/permissive left turn phase operation. (ConOps 4.9)
2. The ASCT shall not prevent the protected left turn phase to lead or lag the opposing through phase based upon user-specified conditions. (ConOps 4.9)
3. The ASCT shall prevent skipping a user-specified phase when the user-specified phase sequence is operating. (ConOps 4.9)
4. The ASCT shall prevent skipping a user-specified phase based on the state of a user-specified external input. (ConOps 4.9)
5. The ASCT shall prevent skipping a user-specified phase according to a time-of-day schedule. (ConOps 4.9)
6. The ASCT shall omit a user-specified phase when the cycle length is below a user-specified value. (ConOps 4.9)
7. The ASCT shall omit a user-specified phase based on measured traffic conditions. (ConOps 4.9)
8. The ASCT shall omit a user-specified phase based on the state of a user-specified external input. (ConOps 4.9)
9. The ASCT shall omit a user-specified phase according to a time-of-day schedule. (ConOps 4.9)
10. The ASCT shall assign unused time from a preceding phase that terminates early to a user-specified phase as follows: (ConOps 4.9)
    a. User-specified phase.
11. The ASCT shall assign unused time from a preceding phase that is skipped to a user-specified phase as follows: (ConOps 4.9)
    a. User-specified phase.
12. The ASCT shall not alter the order of phases at a user-specified intersection. (ConOps 4.1.8)

3. Oversaturation

1. The ASCT shall detect the presence of queues at pre-configured locations. (ConOps 4.1.4)

2. When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy. (ConOps 4.1.4)
3. The ASCT shall prioritize preventing queues at interchange ramp terminal intersections from spilling back to the Beltline highway. (ConOps 4.5)

4. Sequence-based Adaptive Coordination

Each of the requirements for sequence-based adaptive coordination in this subsection relate to ConOps statements 4.1.1 through 4.1.5. Sequence-based adaptive coordination allows for limits on cycle lengths and optimizes the signals cycle lengths and/or phases within the user defined parameters.

1. The ASCT shall select cycle length based on a time-of-day schedule or traffic responsive means based on user-specified thresholds.
2. The ASCT shall calculate a cycle length for each cycle based on its optimization objectives (as required elsewhere, e.g., progression, queue management, equitable distribution of green).
    a. The ASCT shall limit cycle lengths to user-specified values.

5. Responsiveness

Each of the requirements for responsiveness relate to ConOps section 4.8.

1. The ASCT shall limit the change in consecutive cycle lengths to be less than a user-specified value.
2. The ASCT shall limit the change in phase times between consecutive cycles to be less than a user-specified value. (This does not apply to early gap-out or actuated phase skipping.)
3. The ASCT shall limit the changes in the direction of primary coordination to a user-specified frequency.
4. When a large change in traffic demand is detected, the ASCT shall respond in fewer transitions than normal user-specified adaptive operation, subject to user-specified limits.
5. The ASCT shall select cycle length from a list of user-defined cycle lengths.

Section 3.3: External/Internal Interfaces

The ASCT shall support external interfaces according to the following detailed requirements. The following requirements relate to sections 4.3 and 4.11 of the ConOps:

1. The ASCT shall send the following to a central ATMS to be determined.
    a. Operational data
    b. Control data
    c. Monitoring data
    d. Coordination data
    e. Performance data

2. Monitoring of the data listed in requirement 3.3.1 shall be allowed for the following networks:
    a. City of Madison internal network
    b. WisDOT internal network

3. For the data listed in requirement 3.3.1, the ASCT system shall be able to:
    a. Share data
    b. Export data
    c. Utilize an open data source that can be queried by other data sources.
4. The ASCT shall receive commands from the central ATMS.
5. The ASCT shall implement the following commands from the central ATMS when commanded:
    a. Specified cycle length
    b. Specified direction of progression
    c. Specified adaptive strategy
    d. Manual override of ASCT
    e. Disabling of ASCT
    f. Modification of controller databases

Section 3.4: Crossing Arterials and Boundaries

1. The ASCT shall support adaptive coordination on crossing routes (ConOps 4.3).

Section 3.5: Access and Security

1. The ASCT shall provide monitoring and control access at the following locations: (ConOps 4.10)
    a. Remote locations via internet utilizing virtual private network (VPN)
    b. City of Madison Operations/Maintenance Office
2. Policies (IT, security, and others as needed) will be negotiated between the City of Madison and WisDOT. (ConOps 4.4)
3. The ASCT shall not prevent access to the local signal controller database, monitoring or reporting functions by any installed signal management system. (ConOps 4.10)

Section 3.6: Data Log

The data log requirements all relate to the statements in Section 4.11 of the ConOps.

1. The ASCT shall log the following events with time-stamps:
    a. Vehicle phase calls
    b. Pedestrian phase calls
    c. Emergency vehicle preemption calls
    d. Transit priority calls (capability does not exist now, but may in future)
    e. Start and end of each phase
    f. Controller interval changes
    g. Start and end of each transition to a new timing plan
    h. System failures
    i. Loop failures
    j. Communications failures

2. The ASCT shall be able to export its systems log in one or more of the following formats:
    a. Microsoft Excel
    b. Text or CSV

    c. Microsoft Access
3. The ASCT shall store the event log for a user-specified duration.
4. The ASCT shall store results of all signal timing parameter calculations for a user-specified duration
5. The ASCT shall store the following measured data in the form used as input to the adaptive algorithm for a user-specified duration:
    a. Volume
    b. Occupancy
    c. Queue length
    d. Phase utilization
    e. Arrivals on green
    f. Green band efficiency
6. The ASCT system shall archive all data automatically after a user-specified period.
7. The ASCT shall provide data storage for a system size of at least 21 signal controllers. The data to be stored shall include the following:
    a. Controller state data
    b. Reports
    c. Log data
    d. Security data
    e. ASCT parameters
    f. Detector status data.
    g. Volume data
    h. Loop data
8. The ASCT shall calculate and report relative data quality including:
    a. The extent data is affected by detector faults
    b. Any other applicable items
9. The ASCT shall report comparisons of logged data when requested by the user:
    a. Day to day
    b. Hour to hour
    c. Hour of day to hour of day
    d. Hour of week to hour of week
    e. Day of week to day of week
    f. Day of year to day of year
10. The ASCT shall store data logs in a standard database.
11. The ASCT shall report stored data in a form suitable to provide explanations of system behavior to public and politicians and to troubleshoot the system.
12. The ASCT shall store the following data in customizable increments that range from at least 5 minute to 60 minutes:
    a. Volume
    b. Occupancy

Section 3.7: Advanced Controller Operation

The advanced controller operations requirements all relate to the statements in Section 4.9 of the ConOps.

1. When specified by the user, the ASCT shall serve a vehicle phase more than once for each time the coordinated phase is served.
2. The ASCT shall support NEMA phasing
3. The ASCT shall not prevent a phase/overlap output by time-of-day.
4. The ASCT shall not prevent a phase/overlap output based on an external input.
5. The ASCT shall not prevent user-specified phases to be designated as coordinated phases.
6. The ASCT shall have the option for a coordinated phase to be released early based on a user-definable point in the phase or cycle.
7. The ASCT shall not prevent the controller from displaying flashing yellow arrow left turn or right turn.
8. The ASCT shall not prevent the local signal controller from performing actuated phase control using extension/passage timers as assigned to user-specified vehicle detector input channels in the local controller.
    a. The ASCT shall operate adaptively using user-specified detector channels.
9. When adaptive operation is used in conjunction with normal coordination, the ASCT shall not prevent a controller serving a cycle length different from the cycles used at adjacent intersections.

Section 3.8: Pedestrians

The pedestrian requirements all relate to the statements in Section 4.6 of the ConOps unless otherwise noted.

1. When a pedestrian phase is called, the ASCT shall execute pedestrian phases up to a user-specified time before the vehicle green of the related vehicle phase.
2. When a pedestrian phase is called, the ASCT shall accommodate pedestrian crossing times during adaptive operations.
3. When a pedestrian phase is called, the ASCT shall accommodate pedestrian crossing times then resume adaptive operation.
4. The ASCT shall execute user-specified exclusive pedestrian phases during adaptive operation.
5. The ASCT shall execute pedestrian recall on user-defined phases in accordance with a time-of-day schedule.
6. The ASCT shall begin a non-coordinated phase later than its normal starting point within the cycle when all of the following conditions exist: (ConOps 4.9)
    a. The user enables this feature
    b. Sufficient time in the cycle remains to serve the minimum green times for the phase and the subsequent non-coordinated phases before the beginning of the coordinated phase
    c. The phase is called after its normal start time
    d. The associated pedestrian phase is not called
7. When specified by the user, the ASCT shall execute pedestrian recall on pedestrian phase adjacent to coordinated phases.
8. When the pedestrian phases are on recall, the ASCT shall accommodate pedestrian timing during adaptive operation.
9. The ASCT shall not inhibit negative vehicle and pedestrian phase timing during overlap phases. (ConOps 4.9)

Section 3.9: Special Functions

The special functions requirements relate to the statements in Section 4.9 of the ConOps unless otherwise noted.

1. The ASCT shall set a specific state for each special function output based on the occupancy on a user-specified detector.
2. The ASCT shall set a specific state for each special function output based on the current cycle length.
3. The ASCT shall set a specific state for each special function output based on a time-of-day schedule.
4. The ASCT shall be compatible with Origin-Destination travel time technology. (ConOps 4.3)

Section 3.10: Detection

1. The ASCT shall be compatible with the following types of controllers: (ConOps 4.15.5)
    a. TS-1
    b. TS-2
2. The ASCT shall be compatible with detection technologies that are compatible with the controllers listed in requirement 3.10.1. (ConOps 4.15.5).
3. The ASCT shall be able to operate within the existing cabinet environments (ConOps 4.15.5)

Section 3.11: Railroad and Emergency Vehicle Preemption

The railroad and emergency vehicle preemption (EVP) requirements all relate to the statements in Section 4.13.2 of the ConOps.

1. The ASCT shall maintain adaptive operation at non-preempted intersections during railroad preemption.
2. The ASCT shall maintain adaptive operation at non-preempted intersections during EVP.
3. The ASCT shall resume adaptive control of signal controllers when preemptions are released.
4. The ASCT shall execute user-specified actions at non-preempted signal controllers during preemption. (E.g., inhibit a phase, activate a sign, display a message on a DMS)
5. The ASCT shall operate normally at non-preempted signal controllers when special functions are engaged by a preemption event. (Examples of such special functions are a phase omit, a phase maximum recall or a fire route.)
6. The ASCT shall release user-specified signal controllers to local control when one signal in a group is preempted.
7. The ASCT shall not prevent the local signal controller from operating in normally detected limited-service actuated mode during preemption.

Section 3.12: Transit Priority

1. The ASCT shall have the ability to accommodate transit priority in the future. (ConOps 4.13.1)

Section 3.13: Failure Events and Fallback

The failure and fallback mode requirements all relate to the statements in Section 4.14 of the ConOps.

1. Detector Failure

    1. The ASCT shall take user-specified action in the absence of valid detector data from a user-specified number of vehicle detectors within a group.
        a. The ASCT shall release control to central system control.
        b. The ASCT shall release control to local operations to operate under its own time-of-day schedule.
    2. The ASCT shall use the following alternate data sources for operations in the absence of the real-time data from a detector:
        a. Data from a user-specified alternate detector.
        b. Stored historical data from the failed detector.
        c. The ASCT shall switch to the alternate source in real time without operator intervention.
    3. In the event of a detector failure, the ASCT shall issue an alarm to the following:
        a. User specified recipients via email
        b. Central ATMS system
    4. In the event of a failure, the ASCT shall log details of the failure in a permanent log.
    5. The permanent failure log shall be searchable, archivable and exportable.

2. Communications Failure

    1. The ASCT shall execute user-specified actions when communications to one or more signal controllers fails within a group.
        a. In the event of loss of communication to a user-specified signal controller, the ASCT shall release control of all signal controllers within a user-specified group to local control.
        b. The ASCT shall switch to the alternate operation in real time without operator intervention.
    2. In the event of communications failure, the ASCT shall issue an alarm to the following:
        a. User specified recipients via email
        b. Central ATMS system
    3. The ASCT shall issue an alarm within a user-specified period of detection of a failure.
    4. In the event of a communications failure, the ASCT shall log details of the failure in a permanent log.
    5. The permanent failure log shall be searchable, archivable and exportable.

3. Adaptive Processor Failure

    1. The ASCT shall execute user-specified actions when adaptive control fails:
        a. The ASCT shall release control to central system control.
        b. The ASCT shall release control to local operations to operate under its own time-of-day schedule.
    2. In the event of adaptive processor failure, the ASCT shall issue an alarm to the following:
        a. User specified recipients via email

   b. Central ATMS system
3. The permanent failure log shall be searchable, archivable and exportable.
4. During adaptive processor failure, the ASCT shall provide all local detector inputs to the local controller.

Section 3.14: Software

The software requirements all relate to the statements in Section 4.15.5 of the ConOps.

1. The vendor's adaptive software shall be fully operational within the Windows-PC platform.
2. The ASCT shall fully satisfy all requirements when connected with detectors used by the City of Madison and WisDOT.
3. The ASCT shall fully satisfy all requirements when connected with controllers used by the City of Madison and WisDOT.
4. The ASCT shall be fully capable of sending the following from one single system:
   a. Adaptive control commands
   b. Controller database data

Section 3.15: Training

1. The vendor shall provide the following training to City of Madison and WisDOT staff: (ConOps 4.15.3)
   a. Operations of the adaptive system
   b. Troubleshooting the system
   c. Preventive maintenance and repair of equipment
   d. System configuration
   e. Administration of the system
   f. System calibration
   g. The vendor's training shall be delivered at a location to be determined.
   h. The location of the training shall be at a location where those being trained can interactively work with the system.
   i. The vendor shall provide training to a minimum of 8 staff for an amount of time to be determined.
   j. The vendor shall provide a minimum of 2 training sessions.

Section 3.16: Maintenance, Support, and Warranty

The maintenance, support, and warranty requirements all relate to the statements in Section 1.3, Section 4.15, and Section 6 of the ConOps.

1. If desired, the Maintenance Vendor shall provide maintenance according to a separate maintenance contract. That contract should identify repairs necessary to preserve requirements fulfillment, responsiveness in effecting those repairs, and all requirements on the maintenance provider while performing the repairs.
2. The Vendor shall provide routine updates to the software and software environment necessary to preserve the fulfillment of requirements for a minimum of 2 years and up to 7 years.

Preservation of requirements fulfillment especially includes all IT management requirements as previously identified.

3. The Vendor shall warrant the system to be free of defects in materials and workmanship for a minimum period of 2 years. Warranty is defined as correcting defects in materials and workmanship (subject to other language included in the purchase documents). Defect is defined as any circumstance in which the material does not perform according to its specification.

Section 3.17: Schedule

The schedule requirements all relate to the operational objectives in Section 5.2 of the ConOps.

1. The ASCT shall set the state of external input/output states according to a time-of-day schedule.
2. The ASCT output states shall be settable according to a time-of-day schedule
3. The ASCT operational parameters shall be settable according to a time-of-day schedule

Section 3.18: Performance Measurement, Monitoring, and Reporting

The schedule requirements all relate to the performance reporting statements in Section 4.11 of the ConOps.

1. The ASCT shall report measures of current traffic conditions on which it bases signal state alterations.
2. The ASCT shall report all intermediate calculated values that are affected by calibration parameters.
3. The ASCT shall maintain a log of all signal state alterations directed by the ASCT.
    a. The ASCT log shall include all events directed by the external inputs.
    b. The ASCT log shall include all external output state changes.
    c. The ASCT log shall include all actual parameter values that are subject to user-specified values.
    d. The ASCT shall maintain the records in this ASCT log as long as specified by the user.

Section 4: Verification Methods

Each requirement cited in Section 3 requires a method of verification. The methods of verification include the following from the Systems Engineering guidance:

Demonstration: System can demonstrate without external test equipment
Test: Requires external piece of test equipment such as a volt meter
Analysis: Uses a logical conclusion or mathematical analysis of a result
Inspection: Uses visual observation and comparison.

Using the methods described above, the verification plan will be completed with assistance from the vendor of the ASCT.

Section 5: Supporting Documentation

The following documents are located in Appendix A as supporting documentation for the ASC system requirements:

- Model Systems Engineering Documents for Adaptive Signal Control Technology (ASCT) Systems (August 2012)
- NCHRP Synthesis 403 - Adaptive Traffic Control Systems: Domestic and Foreign State of Practice (2010)
- Madison Transit Corridor Study: Investigating Bus Rapid Transit in the Madison Area. The Capitol Region Sustainable Communities Initiative and The Madison Area Transportation Planning Board (May 2013).

Section 6: Traceability Matrix

A traceability matrix that also serves as the basis for the verification plan is attached to the end of this document. The traceability matrix relates each of the statements made in Section 3 of this document to statements or sections from the Concept of Operations document.