STATE OF MICHIGAN
ENTERPRISE PROCUREMENT

Department of Technology, Management, and Budget
320 S. Walnut Street 2nd Floor Lansing, MI 48933
P.O. BOX 30026 LANSING, MICHIGAN 48909

CONTRACT CHANGE NOTICE

Change Notice Number **7**
to
Contract Number **MA190000001522**

CONTRACTOR	
	Econolite Systems, Inc.
	1250 N Tustin Ave.
	Anaheim CA 92807-1617
	Mark Case
	657-274-4036
	mcase@econolite.com
	VS0101367

STATE			
	Program Manager	Various	Various
	Contract Administrator	Corbin Montry	DTMB
		517-599-0012	
		montryc@michigan.gov	

CONTRACT SUMMARY			
Central Signal Control System			
INITIAL EFFECTIVE DATE	**INITIAL EXPIRATION DATE**	**INITIAL AVAILABLE OPTIONS**	**EXPIRATION DATE BEFORE**
October 8, 2019	October 7, 2024	5 - 12 Months	October 7, 2026
PAYMENT TERMS		**DELIVERY TIMEFRAME**	
NET 45		N/A	
ALTERNATE PAYMENT OPTIONS		**EXTENDED PURCHASING**	
☐ P-Card ☐ Direct Voucher (PRC) ☐ Other		☒ Yes ☐ No	
MINIMUM DELIVERY REQUIREMENTS			
N/A			

DESCRIPTION OF CHANGE NOTICE				
OPTION	**LENGTH OF OPTION**	**EXTENSION**	**LENGTH OF EXTENSION**	**REVISED EXP. DATE**
☐		☐		

CURRENT VALUE	VALUE OF CHANGE NOTICE	ESTIMATED AGGREGATE CONTRACT VALUE
$8,334,924.29	$311,449.70	$8,646,373.99

DESCRIPTION
Effective 4/22/2025, this Contract is increased by $311,449.70 for Michigan Department Of Transportation (MDOT) use to purchase additional communications equipment and implementation services to connect of up to an additional 112 signals onto the system. Please note the Contract Administrator has been changed to Corbin Montry. All other terms, conditions, specifications, and pricing remain the same. Per contractor and agency agreement, DTMB Central Procurement Services approval, and State Administrative Board approval on 4/22/2025.

Program Managers

for

Multi-Agency and Statewide Contracts

AGENCY	NAME	PHONE	EMAIL
DTMB	Dave Work	517-719-2250	WorkD@michigan.gov
MDOT	Nathan Bouvy	517-636-5013	BouvyN1@michigan.gov

STATE OF MICHIGAN
PROCUREMENT
Michigan.gov/MiProcurement

STATEMENT OF WORK - IT CHANGE NOTICE

Project Title: MDOT – Central Signal Control System (CSCS) - Lansing Area	**Period of Coverage:** 4/1/25 – 12/31/25
Requesting Department: Michigan Department of Transportation	**Date:** 3/25/25
Agency Project Manager: Nathan Bouvy	**Phone:** 517-256-6140
DTMB Project Manager: Dave Work	**Phone:** 517-719-2250

Brief description of services to be provided:

MDOT would like to make modifications to the Econolite Contract (190000001522) for the Central Signal Control System (CSCS) project. The primary goal is to purchase additional communications equipment and implementation services to connect of up to an additional 112 signals onto the system.

PROJECT OBJECTIVE:

Building from the efforts from Phase 1, expand the number of signals onto the CSCS to further MDOT's ability of utilizing the existing software program to remotely monitor and manage its traffic signal network.

SCOPE OF WORK:

Deployment of up to 112 MDOT-owned traffic signals located in the Lansing area. Purchases of equipment and services will be made on an as-needed basis.

Description	Qty	Unit	Unit Price (Schedule D)	Total
Controller, Install	90	EA	$664.00	$59,760.00
Signalized Intersection Implementation	112	EA	$194.00	$21,728.00
Cellular Modem, 4G, 2-Port	90	EA	$1,071.00	$96,390.00
TS, MFES, Layer 2, Copper	90	EA	$1,200.00	$108,000.00
External Antenna, Furnish	90	EA	$163.48	$14,713.20
External Antenna, Install	90	EA	$120.65	$10,858.50

			Subtotal	**$311,449.70**

The deadline to complete this work is 12/22/2025.

TASKS:

Tasks detailed in prior project phases.

DELIVERABLES:

Deliverables will not be considered complete until the Agency Project Manager has formally accepted them. Deliverables for this project include: External Antenna, Install; External Antenna, Furnish

Update cellular signal strength survey results noting the changes to signal strength for each location.

ACCEPTANCE CRITERIA:

As defined in Schedule I of the Contract.

Deliverables will not be considered complete until the Agency and DTMB Project Manager have formally accepted them.

PROJECT CONTROL AND REPORTS:

A weekly progress report must be submitted to the Agency and DTMB Project Managers throughout the life of this project. This report may be submitted with the billing invoice. Each weekly progress report must contain the following:

1. **Accomplishments**: Indicate what was worked on and what was completed during the current reporting period.

PAYMENT SCHEDULE:

Payment for the hardware will be made per Schedule 1.

Installation and Implementation work will be made upon satisfactory acceptance of the materials and installation work which includes successful completion of the applicable Local Device Acceptance Testing per the Contract.

Payment will be made on a satisfactory acceptance of each deliverable basis. DTMB will pay CONTRACTOR upon receipt of properly completed invoice(s) which shall be submitted to the billing address on the State issued purchase order not more often than monthly. DTMB Accounts Payable area will coordinate obtaining Agency and DTMB Project Manager approvals. All invoices should reflect actual work completed by payment date, and must be approved by the Agency and DTMB Project Manager prior to payment. The invoices shall describe and document to the State's satisfaction a description of the work performed, the progress of the project, and fees. When

expenses are invoiced, receipts will need to be provided along with a detailed breakdown of each type of expense.

Payment shall be considered timely if made by DTMB within forty-five (45) days after receipt of properly completed invoices.

EXPENSES:

The State will NOT pay for any travel expenses, including hotel, mileage, meals, parking, etc.

PROJECT CONTACTS:

The designated Agency Project Manager is:

Name: Nathan Bouvy
Department: Transportation
Area: Bureau of Field Services, Transportation Systems Management & Operations
Building/Floor: MDOT Creyts Rd Maintenance Facility - Statewide Signal Shop
Address: 6333 Old Lansing Rd
City/State/Zip: Lansing, Michigan 48917
Phone Number: 517-256-6140
Email Address: bouvyn1@michigan.gov

The designated DTMB Project Manager(s) is:

Name: Dave Work
Department: DTMB
Area: Agency Services supporting MDOT
Building/Floor: Murray D. Van Wagoner Building, 3rd Floor
Address: 425 W. Ottawa Street
City/State/Zip: Lansing, Michigan 48909
Phone Number: 517-719-2250
Email Address: workd@michigan.gov

AGENCY RESPONSIBILITIES:

The Agency will share the same responsibilities as outlined in the contract.

LOCATION OF WHERE THE WORK IS TO BE PERFORMED:

Consultants will work at traffic signals located statewide.

EXPECTED CONTRACTOR WORK HOURS AND CONDITIONS:

Work hours are not to exceed eight (8) hours a day, forty (40) hours a week. Normal working hours of 8:00 am to 5:00 pm are to be observed unless otherwise agreed to in writing.

No overtime will be permitted.

STATE OF MICHIGAN
ENTERPRISE PROCUREMENT

Department of Technology, Management, and Budget
320 S. Walnut Street 2nd Floor Lansing, MI 48933
P.O. BOX 30026 LANSING, MICHIGAN 48909

CONTRACT CHANGE NOTICE

Change Notice Number **6**
to
Contract Number **MA190000001522**

CONTRACTOR	
	Econolite Systems, Inc
	1250 N Tustin Ave.
	Anaheim CA 92807-1617
	Mark Case
	657-274-4036
	mcase@econolite.com
	VS0101367

STATE			
	Program Manager	Various	Various
	Contract Administrator	Robin Lampert	DTMB
		(517) 582-2746	
		LampertR1@michigan.gov	

CONTRACT SUMMARY			
Central Signal Control System			
INITIAL EFFECTIVE DATE	**INITIAL EXPIRATION DATE**	**INITIAL AVAILABLE OPTIONS**	**EXPIRATION DATE BEFORE**
October 8, 2019	October 7, 2024	5 - 12 Months	October 7, 2024
PAYMENT TERMS		**DELIVERY TIMEFRAME**	
ALTERNATE PAYMENT OPTIONS		**EXTENDED PURCHASING**	
☐ P-Card ☐ Direct Voucher (PRC) ☐ Other		☒ Yes ☐ No	
MINIMUM DELIVERY REQUIREMENTS			

DESCRIPTION OF CHANGE NOTICE				
OPTION	**LENGTH OF OPTION**	**EXTENSION**	**LENGTH OF EXTENSION**	**REVISED EXP. DATE**
☒	24 Months	☐		October 7, 2026
CURRENT VALUE	**VALUE OF CHANGE NOTICE**		**ESTIMATED AGGREGATE CONTRACT VALUE**	
$8,208,389.29	$126,535.00		$8,334,924.29	

DESCRIPTION
Effective 9/3/2024, the following amendments are incorporated into this Contract: • Additional deliverables per attached Statement of Work for $41,035.00 • Exercise the first 2 of 5 option years at $42,750.00 each Note: Collin Castle is no longer one of the Program Managers, and the Contract Administrator has changed to Robin Lampert. All other terms, conditions, specifications and pricing remain the same. Per contractor and agency agreement, and DTMB Central Procurement Services approval.

Program Managers

for

Multi-Agency and Statewide Contracts

AGENCY	NAME	PHONE	EMAIL
DTMB	Dave Work	517-719-2250	WorkD@michigan.gov
MDOT	Nathan Bouvy	517-256-6140	BouvyN1@michigan.gov

STATEMENT OF WORK -
IT CHANGE NOTICE

Project Title: MDOT – CSCS Option Years and Grand Region SPM	**Period of Coverage:** 6/21/2024-10/7/2026
Requesting Department: Michigan Department of Transportation	**Date**: 6/21/2024
Agency Project Manager: Nathan Bouvy	**Phone**: 517-256-6140
DTMB Project Manager: Dave Work	**Phone**: 517-719-2250

Brief description of services to be provided:

MDOT is requesting additional funds be added to utilize products and services, including the Centracs Signal Performance Measures (SPM) module and other services made available in contract Change Notice 5. SPM is requested to be implemented at 3 locations in the Grand Region.

Additional updates to the contract to exercise the first 2 option years.

BACKGROUND:

This Statement of Work is based on the existing contract between the State of Michigan (SOM) and Econolite Systems, Inc., see contract number 190000001522. Through this contract, Econolite provides MDOT with both cloud and on-premises software solutions, referred to as the Central Signal Control System (CSCS), that allows MDOT to manage, optimize, and maintain statewide traffic signals.

PROJECT OBJECTIVE:

This Statement of Work requires Econolite to implement SPM on 3 corridors of traffic signals in the Grand Region for MDOT's use.

SCOPE OF WORK:

Authorization to deploy SPMs at 29 intersections in the Grand Region. The overall anticipated work is below, further separated into individual jobs in the following table:

- Intersection Data Modeling at 29 locations with a cost of $525 per intersection for a subtotal of $15,225
- Data Validation at 29 locations for the pattern optimization setup with a cost of $525 per intersection for a subtotal of $15,225
- One year subscription cost for 29 locations with a cost of $365 per intersection for a subtotal of $10,585

Item No	Job Description	Cost
1	MDOT JN 205227 – 11 signals on US-31 from south of Hayes to Jackson St; Grand Haven, MI	$15,565
2	MDOT JN 205019 – 9 signals on US-31 from Central Ave to 8th St; Holland, MI	$12,735
3	MDOT Region Operations – 9 signals on US-31 from south of James to Quincy; Holland Township, MI	$12,735
	Total:	**$41,035**

TASKS:

Technical support is required to assist with the following tasks:

- Provide project schedule and task progression throughout the life of the project
- Facilitate project status meeting and minutes
- Schedule and facilitate design meetings
- Provide design documentation for review and acceptance
- Implement features/ functionality based on approved design documentation
- Production deployment of completed features
- End User Training for new features

DELIVERABLES:

The project will have 2 phases for each job location: Design Phase and Implementation Phase.

Each job can be released when ready as the items are stand alone and not depend on the others. The implementation will not begin until the milestone, Design Document is approved. Deliverables for this project include:

Design Phase Milestone:

- Design Document – Intersection Data Modeling worksheet provided by Econolite. This document shall include the general details, lane configuration inputs per each approach, and the detection configuration of each intersection on the SPM.

Implementation Phase Milestone:

- Data Validation Results Report – For each job Econolite will provide a report of satisfactory signal onboarding and SPM functionality to be verified by MDOT.

Once the Data Validation Results Report is provided by Econolite, MDOT will verify configuration and SPM functionality for the intersections that comprise each job. A meeting will be scheduled to demonstrate the function of the SPM features to MDOT. MDOT will provide any deficiencies requiring remediation to Econolite in writing.

ACCEPTANCE CRITERIA:

Deliverables will not be considered complete until the Agency and DTMB Project Manager have formally accepted them.

PROJECT CONTROL AND REPORTS:

The vendor must conduct a bi-weekly virtual project meeting. Additional project communication involving requirements clarification, construction, testing, and project schedule and status will take place via email.

SPECIFIC DEPARTMENT STANDARDS:

Agency standards, if any, in addition to DTMB standards.

PAYMENT SCHEDULE:

Payment will be made based on the **satisfactory acceptance of each Milestone**. DTMB will pay CONTRACTOR upon receipt of properly completed invoice(s) which shall be submitted to the billing address on the State issued purchase order not more often than monthly. DTMB Accounts Payable area will coordinate obtaining Agency and DTMB Project Manager approvals. All invoices should reflect actual work completed by payment date and must be approved by the Agency and DTMB Project Manager prior to payment. The invoices shall describe and document to the State's satisfaction a description of the work performed, the progress of the project, and fees. When expenses are invoiced, receipts will need to be provided along with a detailed breakdown of each type of expense.

Payment shall be considered timely if made by DTMB within forty-five (45) days after receipt of properly completed invoices.

Payment Schedule Milestones:

- Design Phase Milestone Acceptance – 50% of job item amount
- Implementation Phase Milestone Acceptance – 50% of job item amount

EXPENSES:

The State will NOT pay for any travel expenses, including hotel, mileage, meals, parking, etc.

PROJECT CONTACTS:

The designated Agency Project Manager is:
Name: Nathan Bouvy
Department: Transportation
Area: Bureau of Field Services, Transportation Systems Management & Operations
Building/Floor: MDOT Creyts Rd Maintenance Facility - Statewide Signal Shop
Address: 6333 Old Lansing Rd
City/State/Zip: Lansing, Michigan 48917
Phone Number: 517-256-6140
Email Address: bouvyn1@michigan.gov

The designated DTMB Project Manager(s) is:
Name: Dave Work
Department: DTMB
Area: Agency Services supporting MDOT
Building/Floor: Murray D. Van Wagoner Building, 3rd Floor
Address: 425 W. Ottawa Street
City/State/Zip: Lansing, Michigan 48909
Phone Number: 517-719-2250
Email Address: workd@michigan.gov

AGENCY RESPONSIBILITIES:
The Agency will share the same responsibilities as outlined in the contract.

LOCATION OF WHERE THE WORK IS TO BE PERFORMED:
Contractor will work at traffic signals located statewide.

EXPECTED CONTRACTOR WORK HOURS AND CONDITIONS:
Work hours are not to exceed eight (8) hours a day, forty (40) hours a week. Normal working hours of 8:00 am to 5:00 pm are to be observed unless otherwise agreed to in writing.

No overtime will be permitted.

STATE OF MICHIGAN
CENTRAL PROCUREMENT SERVICES
Department of Technology, Management, and Budget
320 S. WALNUT ST., LANSING, MICHIGAN 48933
P.O. BOX 30026 LANSING, MICHIGAN 48909

CONTRACT CHANGE NOTICE

Change Notice Number **5**

to

Contract Number **190000001522**

CONTRACTOR	
	Econolite Systems, Inc
	1250 N Tustin Ave.
	Anaheim, CA 92807-1617
	Mark Case
	657-274-4036
	mcase@econolite.com
	VS0101367

STATE			
	Program Manager	Various	MDOT
	Contract Administrator	Christopher Martin	DTMB
		(517) 643-2833	
		martinc20@michigan.gov	

CONTRACT SUMMARY			
CENTRAL SIGNAL CONTROL SYSTEM			
INITIAL EFFECTIVE DATE	**INITIAL EXPIRATION DATE**	**INITIAL AVAILABLE OPTIONS**	**EXPIRATION DATE BEFORE**
October 8, 2019	October 7, 2024	5 - 1 Year	October 7, 2024
PAYMENT TERMS		**DELIVERY TIMEFRAME**	
NET 45, 1% 10 DAYS			
ALTERNATE PAYMENT OPTIONS			**EXTENDED PURCHASING**
☐ P-Card	☐ PRC	☐ Other	☒ Yes ☐ No
MINIMUM DELIVERY REQUIREMENTS			

DESCRIPTION OF CHANGE NOTICE				
OPTION	**LENGTH OF OPTION**	**EXTENSION**	**LENGTH OF EXTENSION**	**REVISED EXP. DATE**
☐		☐		October 7, 2024
CURRENT VALUE	**VALUE OF CHANGE NOTICE**		**ESTIMATED AGGREGATE CONTRACT VALUE**	
$8,208,389.29	$0.00		$8,208,389.29	

DESCRIPTION

Effective 10/13/2022, the following amendments are incorporated into this Contract per attached Statement of Work. This change includes the following:

• Clarifications to the Centracs Signal Performance Measures (SPM) module and Edaptive Modules - Advisory Services, Setup/Deployment, Subscription Costs, and Software Compatibility and Customizations.
• Clarification language regarding Controller, Install in Exhibit B.
• Modification of Section 13 "Hardware" for newly approved modem substitution.
• Pricing changes and clarifications.

All other terms, conditions, specifications and pricing remain the same. Per contractor and agency agreement, and DTMB Central Procurement Services approval.

Program Managers
for
Multi-Agency and Statewide Contracts

AGENCY	NAME	PHONE	EMAIL
DTMB	Dave Work	517-719-2250	WorkD@michigan.gov
MDOT	Collin Castle	517-636-0715	CastleC@michigan.gov
MDOT	Nathan Bouvy	517-636-5013	BouvyN1@michigan.gov

MICHIGAN DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET
IT SERVICES
STATEMENT OF WORK FOR IT CHANGE NOTICES

Project Title: **Central Signal Control System (CSCS)**	**Period of Coverage:** **10/1/2022 going forward**
Requesting Department: **MDOT**	**Date:** **9/17/2022**
Agency Project Manager: **Nathan Bouvy**	**Phone:** **517-256-6140**
DTMB Project Manager: **Dave Work**	**Phone:** **517-719-2250**

Brief Description of Services to be provided:

DTMB would like to make contract modifications to the Econolite Contract (190000001522) for the central signal control system (CSCS) project. The primary goal is to modify the existing language in the contract to provide better clarity with requirements for the Centracs Signal Performance Measures (SPMs) and Edaptive modules as part of the Centracs Mobility platform including:

- Construction Advisory Services
- Mobility Setup/Deployment
    - Subdomain setup
    - Intersection Data Modeling
    - Data Validation
    - Acceptance Testing
- Subscription
- Software Compatibility and Customizations

In addition, DTMB would like to:

- Modify the existing contract language of the “Controller, Install” in Exhibit D of the Contract to capture work that is being performed by Contractor.
- Modify the existing contract language under Section 13,” Hardware,” to include the Digi Transport® IX30-00P7 (2-port) as an acceptable alternative model. Pricing will remain the same as the existing 2-port modem.

BACKGROUND:

This change notice request is intended to create a mutual and more thorough understanding of the scope of work to satisfy the above tasks and leverage the existing pricing contained in Schedule D of the Central Signal Control System (CSCS) contract along with additional services.

Each of the tasks described are inclusive of reference to the existing rate sheets or include a new proposed pricing structure and can be purchased on an as-needed basis.

PROJECT OBJECTIVE:

The work identified in this change notice will enhance MDOT’s ability to monitor and control traffic signals. These services will be procured on an as-needed basis typically occurring in coordination with MDOT-Let Construction Projects. The work performed by the Contractor will ensure that the integration of modules (SPMs and Edaptive) from the Centracs Mobility platform will be properly performed by the Contractor Team following a process of data modeling, validation, and Acceptance Testing.

SCOPE OF WORK:

Scope of work is defined below for the following:

- Construction Advisory Services
- Mobility Setup/Deployment
    - Subdomain setup
    - Intersection Data Modeling
    - Data Validation
    - Acceptance Testing
- Subscription
- Software Compatibility and Customizations

CONSTRUCTION ADVISORY SERVICES

Econolite Systems will provide construction advisory services to review intersection modernization design plans developed by third parties. The services provided will assess the planned detection layout and configuration to collect data for ATSPMs. The review will include a detailed analysis of each intersection focusing on obtaining the necessary high-resolution data for purposes of obtaining signal performance measures, pattern optimization and/or Edaptive control. Typically, red-lines will be returned to the construction engineer within ten business days of receipt of the plans depending on the number of intersections. A field review may be requested by MDOT to have Econolite Systems or its vendor on site to assist with detection layout.

MOBILITY SETUP/DEPLOYMENT

There are four necessary tasks required to successfully setup and deploy Centracs Mobility in order to obtain the greatest value and impact from the ATSPM data. Each task is described below:

I. Subdomain Setup: A subdomain is created to segregate agency data. For purposes of the Michigan Department of Transportation, there are two URLs: production and QA environment, 'mdot' and 'mdot-staging' are the respective subdomains.

As each subdomain is unique, there is a required one-time processing fee associated with each new subdomain setup. As the "mdot" subdomain already exists, there is no additional cost for intersections that are included on this site. However, should MDOT desire to segregate intersection data onto different subdomains this contract item is identified in Schedule D of the CSCS contract as "Base SPM Setup."

II. Intersection Data Modeling (IDM): IDM is a necessary task to properly represent the intersection geometry to match and align with the ATSPM data. This work is not dissimilar to modeling an intersection in Synchro with the exception that Centracs Mobility relies on real time data inputs. As these are critical inputs, the detection configuration and assignments are important and necessary to model as accurate as possible. It is anticipated that a field assessment may be necessary to ensure the as-built details match the modeling.

Modeling includes the following parameters:

1. General Details

a. Signal ID
b. Primary Street
c. Secondary Street
d. Corridor
e. Controller Type
f. Lat/Long Coordinates
g. Intersection Type

2. Lane Configuration per Approach

a. Phase
b. Phase Type
c. Number of Lanes
d. Turn Type
e. Length
f. Speed Limit
g. Right Turn on Red
h. Channelized
i. Saturation Flow
j. Ped Crossing

3. Detection Configuration

a. Enabled Status
b. Lane Type
c. Approach
d. Lane Count
e. Lane Number
f. Detector Phases
g. Protected Phase
h. Exit Detection
i. Distance to Next Signal
j. Turning Movement Count
k. Permitted Phase
l. Set Back
m. Detector Size
n. Detector Type
o. Advanced
p. Speed
q. Phase Data
r. Split Failure
s. Red Light Monitor

Once the detection is verified, data entry into Centracs Mobility to complete the modeling has been structured to simplify this process.

This work was not anticipated in Schedule D of the CSCS contract. Therefore, the following pricing is proposed:

- $265 per intersection for intersections with no detection, or stop bar detection only
- $525 per intersection for intersections with advanced detection or using Pattern Optimization or Edaptive

III. Data Validation: Data Validation is an important part of process. It ensures that all data inputs are correct and accurate to satisfy the intended purpose. This is the most critical and complex part of the process requiring specialized expertise in the entirety of the solution space. Specific steps are outlined below:

- **Step 1 – Verify As-Built:** This step will focus on ensuring the data modeling in the IDM is correct to field conditions. This is an important step in ensuring proper data are collected by Centracs Mobility. While as-builts can be useful in developing a base understanding, it is important to confirm all details are accurate to avoid any errors in the data collection process. Changes between creation of the as-built and field work completion can impact the accuracy of the as-builts, and Econolite Systems will work to verify these as-builts are accurate such that the IDM is also accurate for the purposes of ATSPM data collection.
- **Step 2 – Validate Configurations:** The field survey discussed above, post installation, will be validated with tools available to the validation team to ensure the data appears to be consistent and accurate. Step 1 and 2 of this process both focus on ATSPM data validation, which becomes the foundation of the Centracs Mobility operations.
- **Step 3 – Run Pattern Optimizer:** After the validation of data, the Contractor exercise the data through the algorithms, Pattern Optimizer (PO) will be run. The process of setting up the corridor and then running the PO typically exposes issues if things are incorrectly configured. If the PO fails, the following potential issues are investigated:

    a. **Corridor Level Plan Consistency.** The patterns need to be the same pattern for every intersection on the corridor.

b. **Too few "Good Cycles" to Calculate Optimized Splits.** The Contractor will utilize Centracs to identify potential signal operations issues due to oversized peds, high rate of preemption, occasionally controller bugs, or stuck detection. The Contractor will report the issues to MDOT and determine course of action to resolve issues.

c. **Review Data for Potential Errors.** The Contractor look for any obvious errors in data entry such as detectors that are assigned to phases/lanes that don't exist, or the directionality of lanes is incorrect. Overall, the Contractor will check any as-built documentation that is receive from the customer and compare it to the configuration on the system.

d. **Fine Tune Pattern Optimization.** Running the Pattern Optimizer often yields insights into optimal configurations based on the environment of the corridor. The Contractor will work with MDOT to consider any configuration settings within Centracs Mobility to achieve optimum results. Often, Centracs or controller-related settings changes may be effective strategies to achieve the best results as well.

When PO is successful, the Contractor will review the data to see if anything looks suspicious as follows:

e. **Nuanced Failures.** These issues require a trained human eye to assess the optimization recommendations versus our real-world understanding. For example, if the algorithm wants to add time to a left turn that usually has very limited demand.

f. **Diagnostic Data.** The Contractor will review the diagnostic data to assess if any data looks suspicious. Frequently here the Contractor will find the controller sends Mobility invalid data on detection lanes that were expected to be working. These erroneous counts can cause the algorithm to give sub optimal results. They are usually indicative of failures at the detection level. Troubleshooting here requires access to the controllers and the detection equipment. Field presence and local support may be relied upon in this step to properly diagnose any issues discovered.

- **Step 4 – Run Edaptive:** Once the Contractor has a successful PO run with results that appear correct, the next step, if desired, is to move on to Edaptive. This further exercises the data through the real time algorithms and can expose issues not previously seen. Initially, Edaptive is run in analysis mode. In analysis mode, the algorithms run and create new timings, but the system stops just short of sending the timings to the field. In this way, the Contractor can view the results without impacting traffic. If the Edaptive run fails, the Contractor employ the following troubleshooting steps:

  a. **Comm Errors.** Analysis mode will occasionally expose communication level errors that may not have shown up previously. By analyzing the Mobility and Centracs device manager logs can validate real-time communication with the intersections. Issues that are see here may need to be addressed by the configuration management board in Colorado Springs.

  b. **Firmware Version.** Occasionally, individual controllers may receive different versions of firmware to address a unique issue, and it is not listed in the as-builts. While addressing the specific issue, the change may impact the controller's ability to switch to and from 1-minute polling.

  c. **Controller Configuration.** Verification of settings in the controller is paramount to successful Edaptive operations. Controllers must be enabled to accept system command, the backup time value must be set correctly and a variety of other settings in the controller may be required.

Once Edaptive is successfully running in analysis mode, the Contractor then turn on control mode to allow further validation of the data and fine tune the operation.

d. Analysis of control requires watching real time (when possible) to validate the algorithm results are within acceptable bounds. For example, the cycle length is adjusted based upon a V/C calculation which is reliant upon having accurate saturation flow rates. Those rates are configured in the IDM. However, default values are typically used during initial setup and here the Contractor will fine tune the values to better match the real-world conditions and meet expected local operational requirements. For example, allow the cycle-length to adjust very aggressively or conservatively. This process is repeated for every corridor to yield expected results

In addition to data validation, contextualizing the data is an important step in ensuring the success of the system. As part of deploying Centracs Mobility, the Contractor will make available additional traffic engineering resources to assist MDOT engineers and personnel in interpreting and understanding the data and applications available within the Mobility environment. The Contractor will provide skilled engineering personnel can provide insight into how to use interpret and use the data as well as the Pattern Optimizer and Edaptive applications should the need arise. Including this in our proposal ensures MDOT can easily integrate Mobility into daily routines beyond the initial scope of the deployment.

Schedule D of the CSCS contract provided a Fixed Price for “Per Intersection SPM Setup” and “Per Intersection Edaptive Setup”. However, a “Per Intersection Pattern Optimization Setup” was not anticipated. Accordingly, to match to the existing pricing Schedule and include fair pricing terms for Pattern Optimization setup, the following pricing structure is proposed for the data validation services:

- $400 Per Intersection SPM Setup (Steps 1 and 2 above)
- $525 Per Intersection Pattern Optimization Setup (Steps 1, 2 and 3 above)
- $600 Per Intersection Edaptive Setup (Steps 1, 2, 3 and 4 above)

Acceptance Testing: Upon completion of data validation, Econolite will perform acceptance testing with the Department’s operational engineer. A test plan will be developed and reviewed with the Department as an early activity to assess the operational performance of the system. Acceptance testing will be completed at no additional charge for each modernization project.

SUBSCRIPTION

Mobility is offered as a software service. That is a fee charged on an annual basis to host the intersection in the cloud that changes based on the complexity of the system.

The subscription fee also includes an annual health check. The Contractor will meet with MDOT to review how the Department is currently using the system. The Econolite engineer will also introduce new enhancements and suggest methods and insights that may not have been considered. Finally, any special enhancement requests will be captured and, at Econolite’s discretion, sequenced into roadmap work for inclusion in future updates.

Schedule D of the CSCS Contract provides for the following pricing structure:

- $365 per intersection per year with SPM and Pattern Optimization
- $610 per intersection per year for Edaptive (includes SPM and Pattern Optimization)

SOFTWARE COMPATIBILITY AND CUSTOMIZATIONS

Mobility inherits entities from Centracs. Likewise, EOS is tightly coupled with both Centracs and Mobility. Accordingly, version control between these components is important. Currently, the desired minimum software versions are:

- Centracs 2.3.9 (or newer)
- EOS 3.2.7 (or newer)

The absolute minimum versions of software are:

- Centracs 2.x.x for SPM Metrics
- Centracs 2.1.x for Pattern Optimization
- Centracs 2.1.16.7 for Edaptive
- EOS 3.1.32 for Edaptive

Currently, Econolite has not invested in developing an interface to Mobility for the SEPAC controller. It is anticipated the cost of this customization work would be $195,000.

Additionally, as software and firmware versions evolve over time to address bugs or new features, it can reasonably be anticipated that some level of re-integration work will occasionally need to be performed. In this case, Econolite products would be covered under the current warranty, software maintenance, or subscription terms and there would be no need to pay additional costs to ensure future compatibility. However, DTMB may be required to update Centracs or the Department may be required to update firmware versions to ensure compatibility match.

With regard to third-party updates to SEPAC, some additional level of re-integration work would be required as versions and compatibility change. Econolite will commit to work cooperatively with Siemens to ensure the work is performed and charge $50,000 for this effort. It is noted, the Department may be requested by Siemens to be compensated for any support they provide beyond our ability to monitor or control.

“Controller, Install” Contract Change (Exhibit D):

Current Contract States:

1. "Controller Install" means programming, configuring, testing, installing MDOT-furnished CU, and removing existing CU at each of 280 signalized intersections. This includes all labor, equipment, and materials required to complete the following scope of work items:

A. Program MDOT-furnished CU with existing intersection timing parameters to provide the required traffic signal control operation in accordance with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). MDOT will provide the existing signal timing parameters in pdf format and CU loaded with firmware. The vendor may collect electronic versions of databases from in-service CU in the field at no additional cost to MDOT (see section 1.a.vi for controller cabinet access restrictions). The vendor will be responsible for any labor and equipment required for programming the new CU.
B. MDOT will furnish controllers within 30 days of written request from the vendor.
C. Deliver programmed CU, ready for field deployment, to MDOT signal shop facility for 24-hour bench testing, completed by the vendor and verified/approved by MDOT or designee. The facility currently has capacity to bench test 10 CU at one time. The vendor may provide additional equipment, materials, and/or an off-site facility, at no additional cost to MDOT, to increase the testing capacity on a temporary basis for this project, upon approval by MDOT.
D. Upon successful completion of bench testing, transport the CU from the MDOT signal shop to the job site for installation according to the approved implementation plan. Successful completion of bench testing must be confirmed by an MDOT Traffic Signals Unit representative or designee prior to the CU being transported to the field. Controllers must have remote monitoring and control capabilities available at the MDOT signals shop (through the CSCS or other MDOT-approved method) within 24 hours of installation in the field.
E. Remove and salvage the existing CU in the cabinet. All salvaged CU are to be delivered to an MDOT approved facility. including, at a minimum, the MDOT Traffic Signals Unit Shop located at 6333 Lansing Rd, Lansing, MI 48917.
F. Install the CU in the signal cabinet to provide traffic signal control operations as indicated in the signal timing parameters provided by MDOT and in accordance the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). MDOT will provide cabling/connectors required to provide interface between existing cabinet connectors and CU "ABCD" connectors. Complete this work in accordance with sections 819 and 820 of the MDOT Standard Specifications for Construction and as directed by the Engineer.

G. Execute Acceptance Test Plan (ATP) as indicated in Section 3 of this Exhibit and Schedule H.
H. Controller cabinet access restrictions: The vendor must provide a licensed electrician with traffic signal experience to be present for any on-site activity with a traffic signal cabinet opened. If the vendor cannot provide a licensed electrician, one will be provided by MDOT; however, the vendor must provide an experienced signal technician. MDOT does not guarantee the availability of MDOT qualified staff, and lack of MDOT qualified staff will not be accepted as a reason for not meeting contractual deadlines. Liquidated damages will be assessed for failure to meet contractual deadlines.
I. Controller Type: NEMA ATC Type controller refers to the two MDOT-approved controllers listed in the MDOT SP for NEMA ATC Controller: Siemens m60 NEMA ATC loaded with SEPAC v5 firmware and Econolite Cobalt loaded with EOS v03.01.28 firmware. MDOT is purchasing controllers via a separate contract. It is MDOT's choice to deploy either one or both of the approved controllers. Vendor is required to be knowledgeable and experienced with the hardware and firmware on both controllers.

Requested Change:

1. "Controller, Install" means programming, configuring, testing, installing MDOT-furnished CU or controller configuration file, and removing existing CU, if necessary, at each signalized intersection. Based on the initial field review performed by the Contractor, MDOT will determine if a new CU is required or if the existing CU can be utilized. If an existing CU will be utilized, the vendor will still be responsible to perform the work below (modified for utilization of existing CU) and will invoice MDOT for the services “Controller, Install.” The work performed below includes all labor, equipment, and materials required to complete the following scope of work items:

A. Program MDOT-furnished CU or existing CU with intersection timing parameters to provide the required traffic signal control operation in accordance with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). MDOT will provide the signal timing parameters in pdf format and CU loaded with firmware. The vendor must collect electronic versions of databases from in-service CU in the field during the initial field review at no additional cost to MDOT (see section 1.a.vi for controller cabinet access restrictions). The vendor will be responsible for any labor and equipment required for programming the new CU or new configuration file.
B. For locations receiving a new CU, MDOT will furnish controllers within 30 days of written request from the vendor.
C. Deliver programmed CU or configuration file, ready for field deployment, to MDOT signal shop facility for 24-hour bench testing, completed by the vendor and verified/approved by MDOT or designee. The facility currently has capacity to bench test 15 CU at one time. The vendor may provide additional equipment, materials, and/or an off-site facility, at no additional cost to MDOT, to increase the testing capacity on a temporary basis for this project, upon approval by MDOT.
D. Upon successful completion of bench testing, transport the CU or configuration file from the MDOT signal shop to the job site for installation according to the approved implementation plan. Successful completion of bench testing must be confirmed by an MDOT Traffic Signals Unit representative or designee prior to the CU being transported to the field. Controllers must have remote monitoring and control capabilities available at the MDOT signals shop (through the CSCS or other MDOT approved method) within 24 hours of installation in the field.
E. For locations receiving new CUs, remove and salvage the existing CU in the cabinet. All salvaged CU are to be delivered to an MDOT approved facility. Including, at a minimum, the MDOT Traffic Signals Unit Shop located at 6333 Lansing Rd, Lansing, MI 48917.
F. For new CU locations, during the second field visit, install the CU in the signal cabinet to provide traffic signal control operations as indicated in the signal timing parameters provided by MDOT and in accordance the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). MDOT will provide cabling/connectors required to provide interface between existing cabinet connectors and CU "ABCD" connectors. OR for locations where the existing controller is being used, perform the configuration file update to the controller and verify traffic signal control operations as indicated in the signal timing parameters provided by MDOT and in accordance the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). Complete this work in accordance with sections 819 and 820 of the MDOT Standard Specifications for Construction and as directed by the Engineer.
G. Execute Acceptance Test Plan (ATP) as indicated in Section 3 of this Exhibit and Schedule H.
H. Controller cabinet access restrictions: The vendor must provide a licensed electrician with traffic signal experience to be present for any on-site activity with a traffic signal cabinet opened. If the vendor cannot provide a licensed electrician, one will be provided by MDOT; however, the vendor must provide an experienced signal technician. MDOT does not guarantee the availability of MDOT

qualified staff, and lack of MDOT qualified staff will not be accepted as a reason for not meeting contractual deadlines. Liquidated damages will be assessed for failure to meet contractual deadlines.

I. Controller Type: NEMA ATC Type controller refers to the two MDOT-approved controllers listed in the MDOT SP for NEMA ATC Controller: Siemens m60 NEMA ATC loaded with SEPAC v5 firmware and Econolite Cobalt loaded with EOS v03.01.38 firmware (or as approved by the Engineer). MDOT is purchasing controllers via a separate contract. It is MDOT's choice to deploy either one or both of the approved controllers. Vendor is required to be knowledgeable and experienced with the hardware and firmware on both controllers.

"Hardware" Contract Change (Section 13):

Existing Language:
Cellular Modems: Where necessary, Contractor will use Digi Transport® WR31 (2-port) or Digi Transport® WR54 (4-port) cellular modems. Once the modems have been ordered and received, they must be tested in the C&G office to ensure they are operational and fit for deployment. Once approved, they will be programmed and configured as required, labeled and made ready for field deployment.

Requested Change:

Cellular Modems: Where necessary, Contractor will use Digi Transport® WR31 (2-port), Digi Transport® IX30-00P7 or Digi Transport® WR54 (4-port) cellular modems. Once the modems have been ordered and received, they must be tested in the C&G office to ensure they are operational and fit for deployment. Once approved, they will be programmed and configured as required, labeled and made ready for field deployment.

DELIVERABLES:

Centracs Mobility

MDOT will provide the Contractor the intersection name(s) and desired services to be performed. The Contractor shall submit for each intersection:

- **Construction Advisory Services:** Marked-up plans or e-mail indication plans need no revisions
- **Intersection Data Modeling**: Documentation indicating work has been performed
- **Data Validation:** Documentation indication work has been performed in successful results of the Acceptance Test Plan.

Software Compatibility and Customization: Successful integration of the SEPAC controller firmware or re-integration of the controller for SEPAC firmware updates.

Controller, Install and Hardware will be delivered on an as-needed basis as written in the Contract.

ACCEPTANCE CRITERIA:

As defined in Schedule I of the Contract or as stated in this Change Notice

PROJECT CONTROL AND REPORTS:

A monthly progress report must be submitted to the Agency and DTMB Project Managers throughout the life of this project. This report may be submitted with the billing invoice. Each monthly progress report must contain the following:

1. **Accomplishments**: Indicate what was worked on and what was completed during the current reporting period.

SPECIFIC DEPARTMENT STANDARDS:

Agency and Contract standards, if any, in addition to DTMB standards.

PAYMENT SCHEDULE:

Payment for services will be paid based on pricing in Schedule D or as indicated below:

Task	Price	Notes
Construction ADVISORY SERVICES	$500 per intersection	Work anticipated in Schedule D through hourly rates. Proposed as a fixed price for a minimum of 5
MOBILITY SETUP/DEPLOYMENT		
Subdomain setup	$6,000 per subdomain	Included in Schedule D
Intersection Data Modeling	$265 per intersection for intersections with no detection, or stop bar detection only	Not anticipated in Schedule D
	$525 per intersection for intersections with advanced detection or using Pattern	
Data Validation	$400 Per Intersection SPM Setup	Included in Schedule D
	$525 Per Intersection Pattern Optimization Setup	Not anticipated in Schedule D
	$600 Per Intersection Edaptive Setup	Included in Schedule D
Acceptance Testing	No charge	Incidental to Data Validation
SUBSCRIPTION	$365 per intersection per year with SPM and Pattern	Included in Schedule D
	$610 per intersection per year for Edaptive (includes SPM and Pattern Optimization)	
SOFTWARE COMPATIBILITY AND CUSTOMIZATION		
Interface to SEPAC Controller	$195,000 per interface	Work anticipated in Schedule D through hourly rates. Proposed as a fixed price.
Re-Integration with SEPAC	$50,000 per each new integration	

Payment will be made on a satisfactory acceptance of each deliverable basis. DTMB will pay CONTRACTOR upon receipt of properly completed invoice(s) which shall be submitted to the billing address on the State issued purchase order not more often than monthly. DTMB Accounts Payable area will coordinate obtaining Agency and DTMB Project Manager approvals. All invoices should reflect actual work completed by payment date and must be approved by the Agency and DTMB Project Manager prior to payment. The invoices shall describe and document to the State's satisfaction a description of the work performed, the progress of the project, and fees. When expenses are invoiced, receipts will need to be provided along with a detailed breakdown of each type of expense.

Payment shall be considered timely if made by DTMB within forty-five (45) days after receipt of properly completed invoices.

EXPENSES:

The State will NOT pay for any travel expenses, including hotel, mileage, meals, parking, etc.

PROJECT CONTACTS:

The designated Agency Project Manager is:

Nathan Bouvy
MDOT
Traffic Signals Unit
Central Maintenance
6333 Lansing Road
Lansing, MI 48917
517-636-5013
BouvyN1@michigan.gov

The designated DTMB Project Manager is:

Dave Work
DTMB
MDOT Public Services & Operations
Van Wagoner Building, 3rd floor
425 W Ottawa St
Lansing, MI 48933
517-719-2250
WorkD@michigan.gov

AGENCY RESPONSIBILITIES:

The Agency will share the same responsibilities as outlined in the contract.

LOCATION OF WHERE THE WORK IS TO BE PERFORMED:

Contractor will work at traffic signals located statewide.

EXPECTED CONTRACTOR WORK HOURS AND CONDITIONS:

Work hours are not to exceed eight (8) hours a day, forty (40) hours a week. Normal working hours of 8:00 am to 5:00 pm are to be observed unless otherwise agreed to in writing.

No overtime will be permitted.

STATE OF MICHIGAN
CENTRAL PROCUREMENT SERVICES
Department of Technology, Management, and Budget
525 W. ALLEGAN ST., LANSING, MICHIGAN 48913
P.O. BOX 30026 LANSING, MICHIGAN 48909

CONTRACT CHANGE NOTICE

Change Notice Number **4**

to

Contract Number **190000001522**

CONTRACTOR	
	Econolite Systems, Inc
	1250 N Tustin Ave.
	Anaheim, CA 92807-1617
	Mark Case
	657-274-4036
	mcase@econolite.com
	VS0101367

STATE			
	Program Manager	Various	MULTI
	Contract Administrator	Christopher Martin	DTMB
		(517) 643-2833	
		martinc20@michigan.gov	

CONTRACT SUMMARY

CENTRAL SIGNAL CONTROL SYSTEM

INITIAL EFFECTIVE DATE	INITIAL EXPIRATION DATE	INITIAL AVAILABLE OPTIONS	EXPIRATION DATE BEFORE
October 8, 2019	October 7, 2024	5 - 1 Year	October 7, 2024

PAYMENT TERMS	DELIVERY TIMEFRAME
NET 45, 1% 10 DAYS	

ALTERNATE PAYMENT OPTIONS	EXTENDED PURCHASING
☐ P-Card ☐ PRC ☐ Other	☒ Yes ☐ No

MINIMUM DELIVERY REQUIREMENTS

DESCRIPTION OF CHANGE NOTICE

OPTION	LENGTH OF OPTION	EXTENSION	LENGTH OF EXTENSION	REVISED EXP. DATE
☐		☐		October 7, 2024

CURRENT VALUE	VALUE OF CHANGE NOTICE	ESTIMATED AGGREGATE CONTRACT VALUE
$2,648,069.70	$5,560,319.59	$8,208,389.29

DESCRIPTION

Effective 2/1/2022, the following amendments are incorporated into this Contract per attached Statement of Work (SOW). This change includes the following:

Task 1: Purchase of 2220 licenses for the Enterprise License line item amount price of $108/intersection for a total $239,760.00. Deployment of 52 traffic signals along the M-1 Woodward Corrdior in Wayne County. Purchases of equipment and services will be made on an as-needed basis up to $177,482.76. Total amount for Task 1: $417,242.76.

Task 2: Deployment of 1,291 traffic signals located throughout the state onto the CSCS. Purchases of equipment and services will be made on an as-needed basis up to $4,406,350.83.

Task 3: Deployment of 200 traffic signals located in Oakland and Wayne Counties onto the CSCS with a sever-to-server (S2S) connection with the Road Commission for Oakland County (RCOC). Purchases of equipment and services will be made on an as-needed basis up to $682,626.00. Additional Server to Server Modules, installation, configuration, training, and maintenance not included in original Schedule D - $54,100.00 Total amount for Task 3: $736,726.00

Approval of Mark Case as the new Project Manager for Econolite (updated in title block).

This Contract is increased by $5,560,319.59 for MDOT use.

All other terms, conditions, specifications, and pricing remain the same. Per contractor and agency agreement, DTMB Central Procurement Services approval, and State Administrative Board approval on 2/1/2022.

Program Managers
for
Multi-Agency and Statewide Contracts

AGENCY	NAME	PHONE	EMAIL
DTMB	Dave Work	517-719-2250	WorkD@michigan.gov
MDOT	Collin Castle	517-636-0715	CastleC@michigan.gov

MICHIGAN DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET
IT SERVICES
STATEMENT OF WORK FOR IT CHANGE NOTICES

Project Title: **Central Signal Control System (CSCS)**	**Period of Coverage:** **2/1/2022-6/30/2024**
Requesting Department: **MDOT**	**Date:** **1/10/2022**
Agency Project Manager: **Nathan Bouvy**	**Phone:** **517-256-6140**
DTMB Project Manager: **Dave Work**	**Phone:** **517-719-2250**

Brief Description of Services to be provided:

DTMB would like to make contract modifications to the Econolite Contract (190000001522) for the central signal control system (CSCS) project. The primary goal is to purchase additional licenses, communications equipment, and implementation services to deploy an estimated 1543 traffic signals onto the CSCS as part of the Phase 2 deployment.

BACKGROUND:

MDOT was recently awarded and have an executed grant agreement with the U.S. Department of Transportation to deploy an additional 1291 traffic signals onto the CSCS. In addition, MDOT has project funds remaining from Phase 1 to fund additional deployments and another funding source to complete a local agency pilot where MDOT will be integrating MDOT-owned signals that are maintained by contracted maintaining agencies in Oakland and Wayne counties via a potential server-to-server connection. These tasks are collectively known as Phase 2.

PROJECT OBJECTIVE:

Building from the efforts from Phase 1, expand the number of signals onto the CSCS to further MDOT's ability of utilizing the existing software program to remotely monitor and manage its traffic signal network. In addition, provided a server-to-server connection to at least one local agency to integrate MDOT-owned, locally agency maintained signals into the CSCS.

SCOPE OF WORK:

With Phase 2 for each signal deployment independent of the task # below, it will be the Contractor's responsibility to follow the language in the contract and deployment plans developed in Phase 1 unless noted differently in this Change Notice. This includes an initial site visit at each intersection to take inventory of the existing equipment, traffic controller data, and to determine equipment needs for each intersection. Unlike Phase 1, the initial site visit will not be utilized to install the cell modem to conduct a cellular survey. The Agency has determined that an external antenna will be installed at each location making the cellular survey no longer required. While many locations will require a new controller and upgraded cellular communications, unlike Phase 1, it will not be necessary to upgrade every intersection with this equipment. After the initial field visit, the Agency will determine which equipment and services will be required for the deployment per the pricing in Schedule D. This equipment and services will be requested by the Agency based on the findings of the initial site visit.

Due to the number of signals and the lack of an existing CSCS at the locations included in this phase to identify existing equipment needs, the work below is estimated based on replacement of controllers and upgrades to communications equipment at all locations. As noted in the paragraph above, replacements of controllers and communications upgrades will likely not be required at all locations. As such, equipment and services per

Schedule D will be purchased on an as-needed basis and the total project costs will likely be below the estimated total project costs. The Agency may elect to add additional signals to each of the Tasks to reach the estimated cost in this Change Notice pending approval by the appropriate funding sources.

The tasks are identified below and are based on the funding source. The work as identified under Schedule D is provided for each task. In addition, the work and cost for the sever-to-server connection with a local agency is considered an additional service that is not in the existing contract is also provided.

Task 1: Deployment of 52 traffic signals onto CSCS and purchasing of additional licenses utilizing funds that are remaining from Phase 1

Purchase of 2220 licenses for the Enterprise License line item amount price of $108/intersection for a total **$239,760**

Deployment of 52 traffic signals along the M-1 Woodward Corridor in Wayne County. Purchases of equipment and services will be made on an as-needed basis.

Description (existing items from Schedule D)	Qty (up to)	Unit	Unit Price (Schedule D)	Total
Controller, Install	52	EA	$664.00	$34,528
Signalized Intersection Implementation	52	EA	$194.00	$10,088
Cellular Modem, 4G, 2-Port	52	EA	$1,071.00	$55,692
TS, MFES, Layer 2, Copper	52	EA	$1,200.00	$62,400
External Antenna, Furnish	52	EA	$163.48	$8,500.96
External Antenna, Install	52	EA	$120.65	$6,273.80
			Subtotal	**$177,482.76**

Task 1 Costs: $417,242.76

The deadline to complete this work is 12/22/2022.

Task 2: Better Utilizing Investments to Leverage Development (BUILD) Grant CSCS Deployment

Deployment of 1,291 traffic signals located throughout the state onto the CSCS. Purchases of equipment and services will be made on an as-needed basis.

Description (existing items from Schedule D)	Qty (up to)	Unit	Unit Price (Schedule D)	Total
Controller, Install	1291	EA	$664.00	$857,224
Signalized Intersection Implementation	1291	EA	$194.00	$250,454
Cellular Modem, 4G, 2-Port	1291	EA	$1,071.00	$1,382,661
TS, MFES, Layer 2, Copper	1291	EA	$1,200.00	$1,549,200
External Antenna, Furnish	1291	EA	$163.48	$211,052.68
External Antenna, Install	1291	EA	$120.65	$155,759.15
			Subtotal	**$4,406,350.83**

Task 2 Costs: $4,406,350.83

The deadline to complete this task is 6/30/2024

Task 3: Local Agency Pilot CSCS Deployment

Deployment of 200 traffic signals located in Oakland and Wayne Counties onto the CSCS with a sever-to-server (S2S) connection with the Road Commission for Oakland County (RCOC). Purchases of equipment and services will be made on an as-needed basis.

Description (existing items from Schedule D)	Qty (up to)	Unit	Unit Price (Schedule D)	Total
Controller, Install	200	EA	$664.00	$132,800
Signalized Intersection Implementation	200	EA	$194.00	$38,800

Cellular Modem, 4G, 2-Port	200	EA	$1,071.00	$214,200
TS, MFES, Layer 2, Copper	200	EA	$1,200.00	$240,000
External Antenna, Furnish	200	EA	$163.48	$32,696
External Antenna, Install	200	EA	$120.65	$24,130
			Subtotal	**$682,626**

The Agency has elected to pilot the server-to-server or S2S connection between Agency and RCOC. The objective of S2S is for RCOC, who is MDOT's maintaining agency in Oakland County, to have one interface that includes MDOT and RCOC owned signals. The purpose of this is to allow for ease of use and improve signal operations across jurisdictional boundaries. The Agency and DTMB are responsible for developing the appropriate network agreements to activate the S2S with RCOC. The vendor is responsible for providing the S2S licenses so MDOT and RCOC can utilize the S2S module and the associated connections for both agencies. Labor is included to setup both agency's systems, configuration, and up to 4 hours of training. Successful deployment of the S2S will be deem acceptable upon a 60-day burn-in period post deployment which shows the software module meets the following requirements for each agency:

1. One interface with both agencies signals on a single GUI
2. Interagency access to real-time controller data
3. Interagency user access, role definition and account management

S2S Additional Services not on Schedule D including initial year of maintenance per the Software Maintenance Agreement - **$54,100**

Description of Additional Services	QTY	Unit Price	Total
Agency Centracs S2S Module plus one connection license to RCOC	1	$13,300	$13,300
RCOC Centracs S2S Module plus one connection license to Agency	1	$13,300	$13,300
Installation, Configuration, and Training	1	$22,900	$22,900
Software Maintenance Agreement Adder	1-year	$4,600	$4,600
		Subtotal	**54,100**

The deadline to complete this task is 6/1/2023

Task 3 Costs: $736,726

Total Project Costs: $5,560.319.59

DELIVERABLES:

Deliverables will not be considered complete until the Agency Project Manager has formally accepted them. Deliverables for this project include:

Controller, Install
Signalized Intersection Implementation
Cellular Modem, 4G, 2-Port
TS, MFES, Layer 2, Copper
External Antenna, Furnish
External Antenna, Install
S2S Module

ACCEPTANCE CRITERIA:

As defined in Schedule I of the Contract or as stated in this Change Notice

PROJECT CONTROL AND REPORTS:

A weekly progress report must be submitted to the Agency and DTMB Project Managers throughout the life of this project. This report may be submitted with the billing invoice. Each weekly progress report must contain the following:

1. **Accomplishments**: Indicate what was worked on and what was completed during the current reporting period.

SPECIFIC DEPARTMENT STANDARDS:

Agency and Contract standards, if any, in addition to DTMB standards.

PAYMENT SCHEDULE:

Payment for the hardware will be made per Schedule I.

Installation work will be made upon satisfactory acceptance of the materials and installation work which includes successful completion of the applicable Bench Testing and Local Device Acceptance Testing per the Contract.

Payment for the Signalized Intersection Implementation will be made upon successful implementation of the intersection and successful 60-day burn-in testing as identified in the contract.

Payment for the S2S model and associated services will be made upon after completion of a 60-day burn-in period post deployment which shows the module meets the following requirements for each agency:

1. One interface with both agencies signals on a single GUI
2. Interagency access to real-time controller data
3. Interagency user access, role definition and account management

Payment will be made on a satisfactory acceptance of each deliverable basis. DTMB will pay CONTRACTOR upon receipt of properly completed invoice(s) which shall be submitted to the billing address on the State issued purchase order not more often than monthly. DTMB Accounts Payable area will coordinate obtaining Agency and DTMB Project Manager approvals. All invoices should reflect actual work completed by payment date, and must be approved by the Agency and DTMB Project Manager prior to payment. The invoices shall describe and document to the State's satisfaction a description of the work performed, the progress of the project, and fees. When expenses are invoiced, receipts will need to be provided along with a detailed breakdown of each type of expense.

Payment shall be considered timely if made by DTMB within forty-five (45) days after receipt of properly completed invoices.

EXPENSES:

The State will NOT pay for any travel expenses, including hotel, mileage, meals, parking, etc.

PROJECT CONTACTS:

The designated Agency Project Manager is:

Nathan Bouvy
MDOT
Traffic Signals Unit
Central Maintenance
6333 Lansing Road
Lansing, MI 48917
517-636-5013
BouvyN1@michigan.gov

The designated DTMB Project Manager is:

Dave Work
DTMB
MDOT Public Services & Operations
Van Wagoner Building, 3rd floor
425 W Ottawa St
Lansing, MI 48933
517-719-2250
WorkD@michigan.gov

AGENCY RESPONSIBILITIES:

The Agency will share the same responsibilities as outlined in the contract.

LOCATION OF WHERE THE WORK IS TO BE PERFORMED:

Consultants will work at traffic signals located statewide.

EXPECTED CONTRACTOR WORK HOURS AND CONDITIONS:

Work hours are not to exceed eight (8) hours a day, forty (40) hours a week. Normal working hours of 8:00 am to 5:00 pm are to be observed unless otherwise agreed to in writing.

No overtime will be permitted.

STATE OF MICHIGAN
CENTRAL PROCUREMENT SERVICES
Department of Technology, Management, and Budget
525 W. ALLEGAN ST., LANSING, MICHIGAN 48913
P.O. BOX 30026 LANSING, MICHIGAN 48909

CONTRACT CHANGE NOTICE

Change Notice Number **3**

to

Contract Number **190000001522**

CONTRACTOR	
	Econolite Systems, Inc
	1250 N Tustin Ave.
	Anaheim, CA 92807-1617
	Jon Ringler
	714-575-5750
	jringler@econolite.com
	VS0101367

STATE			
Program Manager	Various	DTMB	
Contract Administrator	Christopher Martin	DTMB	
	(517) 643-2833		
	martinc20@michigan.gov		

CONTRACT SUMMARY			
CENTRAL SIGNAL CONTROL SYSTEM			
INITIAL EFFECTIVE DATE	**INITIAL EXPIRATION DATE**	**INITIAL AVAILABLE OPTIONS**	**EXPIRATION DATE BEFORE**
October 8, 2019	October 7, 2024	5 - 1 Year	October 7, 2024
PAYMENT TERMS		**DELIVERY TIMEFRAME**	
NET 45, 1% 10 DAYS			
ALTERNATE PAYMENT OPTIONS			**EXTENDED PURCHASING**
☐ P-Card	☐ PRC	☐ Other	☒ Yes ☐ No
MINIMUM DELIVERY REQUIREMENTS			

DESCRIPTION OF CHANGE NOTICE				
OPTION	**LENGTH OF OPTION**	**EXTENSION**	**LENGTH OF EXTENSION**	**REVISED EXP. DATE**
☐		☐		October 7, 2024
CURRENT VALUE	**VALUE OF CHANGE NOTICE**	**ESTIMATED AGGREGATE CONTRACT VALUE**		
$1,983,010.00	$665,059.70	$2,648,069.70		

DESCRIPTION

Effective 1/4/2021, the following amendment for the use of Automated Traffic Signal Performance Measures (ATSPM) along the M-3 and US-12 corridors is incorporated into this Contract per attached Statement of Work. This Contract is increased by $665,059.70 for MDOT use.

All other terms, conditions, specifications, and pricing remain the same. Per contractor and agency agreement, DTMB Central Procurement Services approval, and State Administrative Board approval on 1/19/2021.

Program Managers
for
Multi-Agency and Statewide Contracts

AGENCY	NAME	PHONE	EMAIL
DTMB	Dave Work	517-719-2250	WorkD@michigan.gov
MDOT	Collin Castle	517-636-0715	CastleC@michigan.gov

MICHIGAN DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET
IT SERVICES
STATEMENT OF WORK FOR IT CHANGE NOTICES

Project Title: **I-94 Moderniztion - ATDM Package 2**	**Period of Coverage:** **12/1/2020-12/31/2026**
Requesting Department: **Michigan Department of Transportation**	**Date:** **12/02/2020**
Agency Project Manager: **Aaron Raymond**	**Phone:** **313-477-1044**
DTMB Project Manager: **Dave Work**	**Phone:** **517-719-2250**

BRIEF DESCRIPTION OF SERVICES TO BE PROVIDED:
DTMB would like to make contract modifications to the Econolite Contract (190000001522) for the central signal control system (CSCS) project. The primary goal is to purchase the Automated Traffic Signal Performance Measures (ATSPM) module to deploy an active signal system along the M-3 and US-12 corridors in the City of Detroit, Michigan. A detailed scope of work is provided in Attachment A.

BACKGROUND:

Michigan Department of Transportation

MDOT staff, with the assistance of their Owners Representative Consultant (ORC) (HNTB, Michigan, Inc.) and design consultant (AECOM), are in the process of preparing design plans and specifications necessary to complete a bid package for the installation of signal system infrastructure as part of a signal modernization project to be constructed by a MDOT selected low-bid Contractor. As part of the project, MDOT is interested in deploying an active signal system along the following two corridors in the City of Detroit, Michigan:

- M-3 (Gratiot Avenue), from Broadway Street/Randolph Street to Harper Avenue. The M-3 corridor is comprised of 25 signalized intersections.
- US-12 (Michigan Avenue), from Cass Avenue to I-94 (Exit 210). The US-12 corridor is comprised of 22 signalized intersections.

MDOT and DTMB recently procured Econolite's Centracs CSCS to remotely manage and control traffic signals. A Request for Information (RFI) was distributed by MDOT to determine if Econolite's software suite includes an Adaptive Signal Control Technology (ASCT) and/or Automated Traffic Signal Performance Measures (ATSPM) module that meets the needs and requirements of the M-3 and US-12 corridors. The list of benefits expected to be gained through using a single software platform includes, but is not limited, to the following:

- Complement and provide operational synergies between MDOT's CSCS and the M-3 and US-12 enhanced signal systems.
- Deploy a solution that will further enhance MDOT's ability to manage the dynamic traffic patterns impacted by nearby roadway construction, special events, weather, and/or unplanned incidents.
- Provide MDOT with a greater ability to effectively manage existing corridor capacity, remotely monitor/diagnose/adjust signal operations, and develop pre-defined operational strategies that the system will use to adapt to changing traffic demands.

The RFI process and timeline is summarized below:

1. February 3, 2020 – MDOT issued RFI to Econolite.
2. February 14, 2020 – Econolite submitted completed Product Compliance Matrix.
3. February 21, 2020 – MDOT reviewed Product Compliance Matrix and confirmed the response did not have any fatal flaws that would warrant terminating the RFI process.
4. February 21, 2020 – Econolite submitted proposal in response to RFI.

5. March 10, 2020 – MDOT reviewed the proposal and requested clarification and supporting information on six items.
6. March 23, 2020 – Econolite submitted responses to the requested clarification items.
7. April 30, 2020 – MDOT determined Econolite's proposed solution meets the needs of the US-12 and M-3 corridors, with the approach to initially deploy ATSPM, gather data, and determine if Edaptive is warranted on US-12 and M-3. Therefore, MDOT requested DTMB move forward with contracting.

PROJECT OBJECTIVE:

Deploy an active signal system that will further enhance MDOT's ability to manage the dynamic traffic patterns impacted by nearby roadway construction, special events, weather, and/or unplanned incidents. The system shall be capable of providing MDOT with a greater ability to effectively manage existing corridor capacity, remotely monitor/diagnose/adjust signal operations, and develop pre-defined operational strategies that the system will use to adapt to changing traffic demands.

SCOPE OF WORK:

The scope of work consists of three tasks to deploy an active signal system along the M-3 and US-12 corridors in the City of Detroit, Michigan. An overview of the three tasks is provided below, with a detailed scope of work and task description provided in Attachment A.

Task 1: Design Support Services
Econolite will work with MDOT and the design team during the construction plan development to identify equipment needs and provide guidance on the requirements for the active signal system on the M-3 and US-12 corridors. Services include developing system architecture, providing design commentary and developing operating procedures.

Task 2: System Setup, Configuration, and Fine Tuning; Training; Software Purchasing; and Construction Advisory Services
Econolite will set up MDOT's cloud-based Centracs ATSPM site and configure, integrate, and fine-tune all forty-seven (47) intersections within the project area. Econolite will provide draft verification and acceptance procedures to MDOT for system testing and acceptance during construction of the signal system infrastructure. In addition, Econolite will prepare material and conduct system training for MDOT users, procure the software, and provide construction advisory services.

Task 3: Maintenance and Support Services
Once construction is complete and the system goes live, Econolite will provide software maintenance, data collection, and technical support as needed to optimize the system and ensure it is functioning properly for the duration of the contract. In addition, Econolite will be responsible for providing as-needed operational support to fine tune the system to accommodate changes in travel patterns and attendance at stakeholder meetings over the duration of the contract.

DELIVERABLES:

Deliverables will not be considered complete until the Agency Project Manager has formally accepted them. Deliverables for this project include:

Task 1:
- Technical Memorandum for System Architecture
- Design Commentary from design reviews
- Technical Memorandum for Operations

Task 2:
- ATSPM Software Module
- Verification and Acceptance Test Plan
- Training and System Documentation

Task 3:
- Summary response to software issues and resolution
- Summary of operational evaluation and adjustments as requested by MDOT

ACCEPTANCE CRITERIA:

Task 1:
- Document-based deliverables will be accepted upon MDOT/DTMB review and comment resolution.

Task 2:
- Document-based deliverables will be accepted upon MDOT/DTMB review and comment resolution.
- Software solution will be accepted based on successful completion of the Acceptance Test Plan that demonstrates traceability to each system requirement per the ATSPM Product Compliance Matrix.

Task 3:
- Software issues and resolution acceptance criteria to be defined per contract requirements.
- As-needed operational evaluation and adjustment acceptance to be defined per request.

PROJECT CONTROL AND REPORTS:

A bi-weekly progress report must be submitted to the Agency and DTMB Project Managers throughout the life of this project. This report may be submitted with the billing invoice. Each bi-weekly progress report must contain the following:

1. **Hours**: For time and material tasks, indicate the number of hours expended during the past two weeks, and the cumulative total to date for the project. Also state whether the remaining hours are sufficient to complete the project.

2. **Accomplishments**: Indicate what was worked on and what was completed during the current reporting period.

3. **Funds**: Indicate the amount of funds expended during the current reporting period, and the cumulative total to date for the project.

SPECIFIC DEPARTMENT STANDARDS:

Agency standards in addition to DTMB standards are provided below.

Work shall conform to current MDOT, FHWA, and AASHTO practices, guidelines, policies, and standards (i.e., Road Design Manual, Standard Plans, Published MDOT Design Advisories, Drainage Manual, Special Details, Special Provisions (both standard and unique), Roadside Design Guide, A Policy on Geometric Design of Highways and Streets, Michigan Manual of Uniform Traffic Control Devices, etc.). Work shall address and adhere to all federal, state, and local permitting and environmental requirements.

PAYMENT SCHEDULE:

Payment will be made on the following basis per each Task:

Task I: Satisfactory acceptance of each deliverable
Task II-A: Satisfactory acceptance of each Milestone
Task II-B: Time and Materials
Task III: Satisfactory acceptance of each Milestone

DTMB will pay CONTRACTOR upon receipt of properly completed invoice(s) which shall be submitted to the billing address on the State issued purchase order not more often than monthly. DTMB Accounts Payable area will coordinate obtaining Agency and DTMB Project Manager approvals. All invoices should reflect actual work completed by payment date, and must be approved by the Agency and DTMB Project Manager prior to payment. The invoices shall describe and document to the State's satisfaction a description of the work performed, the progress of the project, and fees. When expenses are invoiced, receipts will need to be provided along with a detailed breakdown of each type of expense.

Payment shall be considered timely if made by DTMB within forty-five (45) days after receipt of properly completed invoices.

EXPENSES:

The State will NOT pay for any travel expenses, including hotel, mileage, meals, parking, etc.

PROJECT CONTACTS:

The designated Agency Project Manager is:

Aaron Raymond
Michigan Department of Transportation
Southeast Michigan Transportation Operations Center
SEMTOC
1060 W Fort St
Detroit MI 48226
313-477-1044
Fax Number: N/A
RaymondA2@michigan.gov

The designated DTMB Project Manager is:

Dave Work
Department of Technology, Management and Budget
Agency Services MDOT – Public Services and Field Operations Section
Van Wagoner Bldg. 3rd Floor
425 West Ottawa St
Lansing, MI 48909
517-719-2250
Fax Number: N/A
WorkD@michigan.gov

AGENCY RESPONSIBILITIES:

- Schedule and/or conduct project meetings
- Make decisions or provide input for the following items:
    - Resolve political issues
    - Resolve issues related to funding
    - Review of Acceptance Test Plan
    - External communications
- Furnish pertinent reference materials and existing plans
- Review and approve all budget, schedule, and design aspects
- Support public involvement and stakeholder engagement

LOCATION OF WHERE THE WORK IS TO BE PERFORMED:

Consultants will work at the list of traffic signals provided in Attachment A, MDOT facilities in Lansing and Metro Region; and Contractor facilities.

EXPECTED CONTRACTOR WORK HOURS AND CONDITIONS:

Work hours are not to exceed eight (8) hours a day, forty (40) hours a week. Normal working hours of 8:00 am to 5:00 pm are to be observed unless otherwise agreed to in writing.

No overtime will be permitted.

PROJECT PLAN:

Tasks & Deliverables	Requirements	Anticipated Start Date	Anticipated Completion Date	Contractor Staff	Role	Hours	Rate	Total	Acceptance / Signoff	Total Payment
Task I	**Design Support Services**					**Gratiot**				**Gratiot**
						Michigan				**Michigan**
Task I	System Architecture	Jan-21	Jun-21	Various	Document Architecture	47	-	-	State PM & Project Sponsor	$11,571.81
						41				$10,183.20
Task I	Design Advisory Services	Jan-21	Jun-21	Various	Provide Design Commentary	171	-	-	State PM & Project Sponsor	$35,490.50
						150				$31,231.64
Task I	Operational Procedures	Jan-21	Jun-21	Various	Document Operational Procedures	57	-	-	State PM & Project Sponsor	$12,285.18
						50				$10,810.96
Task II-A	**System Setup, Configuration, and Fine Tuning; Training; and Software Purchasing**					**Gratiot**				**Gratiot**
						Michigan				**Michigan**
Task II-A	System Set-up, Acceptance Testing, and Training	Sep-21	Dec-22	Various	Acceptance Testing, Set-up, Configuration and Training	211	-	-	State PM & Project Sponsor	$68,774.73
						185				$60,521.76
Task II-A	Software Service	Jan-23	Dec-27	Various	Hosting and Software Subscription (over five years)	n/a	-	-	State PM & Project Sponsor	$45,625.00
						n/a				$40,150.00
Task II-B	**Construction Advisory Services**					**Gratiot**				**Gratiot**
						Michigan				**Michigan**
Task II-B	Technical Support (Construction)	Sep-21	Dec-22	Various	Technical Support during Construction	140	-	-	State PM & Project Sponsor	$33,546.33
						124				$29,520.77
Task III	**Maintenance and Support Services**									**Gratiot**
										Michigan
Task III	Year 1 Support of Software	Jan-23	Dec-23	Support	Annual Support (Year 1)	200	-	-	State PM & Project Sponsor	$29,292.32
										$25,777.24
Task III	Year 2 Support of Software	Jan-24	Dec-24	Support	Annual Support (Year 2)	200	-	-	State PM & Project Sponsor	$29,292.32
										$25,777.24
Task III	Year 3 Support of Software	Jan-25	Dec-25	Support	Annual Support (Year 3)	200	-	-	State PM & Project Sponsor	$29,292.32
										$25,777.24
Task III	Year 4 Support of Software	Jan-26	Dec-26	Support	Annual Support (Year 4)	200	-	-	State PM & Project Sponsor	$29,292.32
										$25,777.24
Task III	Year 5 Support of Software	Jan-27	Dec-27	Support	Annual Support (Year 5)	200	-	-	State PM & Project Sponsor	$29,292.32
										$25,777.24
									TOTAL	$665,059.70

ATTACHMENT A – PROJECT SCOPE OF WORK

1 PROJECT SCOPE OF WORK

The scope of work consists of three tasks to deploy an active signal system along the following two corridors in the City of Detroit, Michigan.

- M-3 (Gratiot Avenue), from Broadway Street/Randolph Street to Harper Avenue. The M-3 corridor is comprised of 25 signalized intersections.
- US-12 (Michigan Avenue), from Cass Avenue to I-94 (Exit 210). The US-12 corridor is comprised of 22 signalized intersections.

A complete list of intersections included in the scope of work is provided in the following table.

ID	Intersection
Gratiot Ave	
1G	M-3 @ Randolph St / Broadway St
2G	M-3 @ Brush St
3G	M-3 @ Beaubien St
4G	M-3 @ St Antoine St
5G	I-375 (Chrysler Fwy) SB Off-Ramp @ Madison St / St Antoine St
6G	M-3 @ Antietam Ave
7G	M-3 @ Russell St
8G	M-3 @ I-75 Ramps / Jay St / Fisher Fwy
9G	M-3 @ Vernor Hwy/Adelaide St
10G	Vernor Hwy @ St Aubin St*
11G	M-3 @ St Aubin St
12G	M-3 @ Chene St
13G	M-3 @ McDougall St
14G	M-3 @ Mack Ave
15G	M-3 @ Mt Elliott St
16G	M-3 @ Forest Ave
17G	M-3 @ E Grand Blvd
18G	E Grand Blvd @ Warren Ave*
19G	M-3 @ Warren Ave
20G	M-3 @ Van Dyke Ave
21G	M-3 @ Burns Ave
22G	M-3 @ McClellan Ave
23G	M-3 @ I-94 EB Ramps
24G	M-3 @ I-94 WB Ramps
25G	M-3 @ Harper Ave

ID	Intersection
Michigan Ave	
1M	US-12 @ Cass Ave
2M	US-12 @ 3rd St
3M	3rd St @ Bagley St*
4M	US-12 @ 6th St
5M	US-12 @ Trumbull Ave
6M	US-12 @ Rosa Parks Blvd
7M	US-12 @ Vernor Hwy / 14th St
8M	US-12 @ I-96 EB Service Dr
9M	US-12 @ 24th St
10M	US-12 @ W Grand Blvd
11M	US-12 @ Clark Ave
12M	US-12 @ Junction Ave
13M	US-12 @ Livernois Ave
14M	US-12 @ Martin Rd
15M	US-12 @ Cecil Ave / Parkinson St
16M	US-12 @ Central Ave
17M	US-12 @ Lonyo Ave
18M	US-12 @ Trenton St
19M	US-12 @ Addison Ave / St James St
20M	US-12 @ Weir St
21M	US-12 @ M-153 (Wyoming Ave)
22M	US-12 @ Eastbound I-94 Off-Ramp

1.1 TASK 1 – DESIGN ADVISORY SERVICES

Econolite shall work with the Project Team during the design phase in order to develop, implement, and maintain a spirit of cooperation and open communication among parties so that goals and objectives are clearly understood, potential problems are proactively identified and resolved promptly, and upon completion, the Project is deemed successful.

Econolite shall deliver Design Advisory Services by performing the following:

- System Architecture Technical Memorandum
    - Propose the system/software architecture, specific equipment, quantities, and installation locations and procedures for each device for optimal operation of the proposed software to meet both current and future operational needs.
    - Develop a baseline schedule, which may include:
        - Material delivery and handling
        - System/Software installation

        - Integration, fine tuning, and system activation durations
        - User access and permission level
        - Classroom and hands-on training for system use, maintenance, reporting, troubleshooting, etc.
- Design Commentary
    - Review the project site with the Project Team.
    - Review existing traffic signal and ITS plans and provide input and/or alternate concepts or offer suggestions with respect to future design considerations, means and methods, materials, and innovations to improve efficiency, cost effectiveness, completeness, or clarity.
    - Notify the MDOT Project Manager, in writing, of all problems, conflicts, and/or deficiencies identified during the review and evaluation of design drawings.
    - Assist the MDOT Project Manager and Project Team in resolving problems, conflicts, and/or deficiencies identified during the review and evaluation of design drawings.
    - Provide input to the Project Team regarding device and software installation procedures, detection type/locations, physical space within the cabinets and on poles, end-user hardware requirements, and communication limitations such as bandwidth issues, cellular signal/reliability, latency, potential data charges, etc.
    - Identify any potential construction and constructability issues and risks to assist the Project Team in selecting the appropriate design for the project.
    - Provide a written final review of the proposed software, devices, locations, etc. to demonstrate that the final recommendations, specifications, items of work, and quantities have been reviewed and are reasonable and accurate to complete the project.
    - Attend all design advisory coordination meetings with the Project Team. The following meetings are expected:
        - Project Kickoff meeting
        - Plan Review Meetings
        - Progress Meetings (held monthly via phone or WebEx)
        - Up to 2 Field Review Meetings
        - Up to 2 progress review or specialty meetings.
        - Other meetings identified at the kickoff meeting
- Operations Technical Memorandum
    - Identify and provide recommendations for the number of system users, hierarchy for permissions, and operating procedures.

1.2 TASK 2 – SYSTEM SETUP, CONFIGURATION, AND FINE TUNING; CONSTRUCTION ADVISORY SERVICES; AND SOFTWARE PURCHASING

As part of Task 2, Econolite will set up MDOT's cloud-based Centracs ATSPM and configure, integrate, and fine-tune all forty-seven (47) intersections to provide high-resolution ATSPM data. All equipment required for the system to operate shall have been identified during Task 1 – Design Advisory Services and included in the construction plans and specifications. No additional equipment shall be purchased during this phase of the project.

1.2.1 TASK 2 – A

The following steps will be required for the successful deployment and operation of the system:
<u>System Setup, Configuration, and Fine-Tuning,:</u>

- Perform system setup, configuration, and fine tuning of software and devices/equipment to provide a fully functioning system.
    - Review existing intersection and detector layouts, taking notes on what detector is assigned to what input in the controller, the location of the detector on the street, and what function the detector is serving (e.g., stop bar, advance, departure, left turn).

- Site setup and configuration. During this step, field verification of the detector layouts will be reviewed in the field to confirm they match the corresponding plans. Should deficiencies be identified, the plan set will be redlined showing differences.
- Support to project/construction team to program controllers/switches as necessary to make the system ready for initial deployment.
- Configure Intersection Data Maps (IDMs) for each intersection based on detection and controller configuration information.
- Setup corridors in ATSPM, including grouping and defining corridors and operational parameters in consultation with the MDOT Project Manager.

- Collect data, evaluate, and fine-tune the system based on field observations and traffic demands.
  - Run ATSPM for two weeks to ensure ATSPM graph data is valid. Review data and modify settings as necessary.
  - Run ATSPM Optimization for two or three 2-3-week intervals. Push the "best" Optimization result to the field to update base signal timings.

<u>System Testing and Acceptance:</u>

- Econolite will provide a Draft Verification and Acceptance Test Plan (ATP) to MDOT for approval at least thirty (30) days before the scheduled System Acceptance Test is to begin. The document will provide traceability back to every MDOT system requirement, per the Product Compliance Matrix. MDOT will review the ATP and provide review comments within fourteen (14) days. Upon approval by MDOT, the acceptance testing shall begin and will include a step-by-step walkthrough of every procedure documented in the ATP. Each test in the ATP will state the requirement and expected outcome. MDOT will perform the ATP will assistance from Econolite.
- As MDOT conducts the ATP, each outcome will be recorded as pass, defect, or deferred.
  - Each test in the ATP will be conducted via one (or more) of the following methods: demonstration, analysis, and/or inspection.
  - MDOT will conduct, document, and record all test results while being witnessed by Econolite.
  - Any defects identified will be documented by MDOT and must be resolved by Econolite, retested, and corrections documented.
- Testing shall ensure the Standard Centracs ATSPM Test Procedures and the specific additional functional and performance requirements of MDOT are observed and proven to successfully function.

<u>Training:</u>

- Provide written instructions and train a State of Michigan employee to install and integrate the system's software module into MDOT's CSCS. Training sessions may be recorded.
- Coordinate and perform a classroom-style hands-on training session at a location determined by MDOT.
- Econolite will provide all training and system documentation necessary for MDOT to successfully operate and manage the Centracs ATSPM system. At a minimum, training session should include setup, system, operations, fine-tuning, maintenance, and troubleshooting. System training shall include a lesson plan for each course detailing the literature, standard operating procedures, manuals, and test materials that will be used. Econolite will submit the Training Plan to MDOT for review and approval thirty (30) days prior to the scheduled start of any training.
  - Econolite will provide initial and final training sessions, utilizing in-person training sessions at MDOT's facilities.
  - Initial training to be provided upon deployment of the first group of signals, in consultation with, and upon approval by MDOT. This training will step through the data collection process, how it is stored, in-depth use of metrics in monitoring and operations of the traffic network, and the use of other tools, such as Compare and the Plan Optimizer.
  - The second training session will be conducted six (6) to twelve (12) months later, and at MDOT's discretion. Should additional training be needed, web-hosted seminars will be provided.
- Provide training materials to the Project Manager. Training materials shall include at least 2 (two) bound hard

copies, as well as a Flash Drive. All materials provided shall be organized with a table of contents and/or electronic bookmarks.

Software Purchasing:

- Provide all software needed for the system.
- Provide necessary licensing, enable accounts, and provide access instructions to identified users.
-

1.2.2 TASK 2 – B

Construction Advisory Services:

- Provide technical support for system users as-needed during system integration.
- Support MDOT and the Project Team with any questions and/or clarifications related to device selection, quantity, installation location, communication requirements, and other design-related issues.

The Contractor, in coordination with MDOT, will be responsible for the installation of all components (detectors, controllers, and communication devices) as specified in the construction plans and proposal. This task is not considered complete, and Econolite is not allowed to perform maintenance services until the system has been tested and accepted by MDOT. This is also dependent on the Contractor-installed equipment being accepted by MDOT.

1.3 TASK 3 – MAINTENANCE AND SUPPORT SERVICES

Once all work associated with Task 2 has completed, Econolite shall:

- Provide software support and respond to all software issues and questions within 24 business hours, unless otherwise approved by MDOT. Critical issues impacting system operation shall be responded to within 4 business hours.
- Provide Technical support for system users as-needed during a 90-day warranty period commencing on the date of project acceptance.
- Perform as-needed data collection, evaluation, and fine-tuning needed to accommodate impacts from the I-94 Modernization project construction traffic volumes. Multiple evaluations and adjustments may be required, as determined by MDOT.
- Attend Stakeholder meetings as requested by MDOT to review progress, present before/after data, and answer questions/provide feedback.
- The monthly vulnerability scans required as part of ATSPM requirement Section 4 will be completed per the original contract terms, with the vendor being responsible, at their cost, to remediate and deficiencies.
- Annual on-going support is estimated at 200 hours per year based on the following hours by staff:

Staff	Estimated Hours (per year)	
	Support	Stakeholder Meeting
Project Management	12	24
Central System Integrator	24	
Controller Programmer	24	
Senior ITS Engineer	24	24
Systems Engineer	24	
Journeyman Electrician	24	
Local Technical Support	20	
Notes: Stakeholder Meeting assumed 2 hours/month. As-needed data collection (excluding data collected through SPM) would be at additional cost, based on data collection type.		

STATE OF MICHIGAN
CENTRAL PROCUREMENT SERVICES
Department of Technology, Management, and Budget

525 W. ALLEGAN ST., LANSING, MICHIGAN 48913
P.O. BOX 30026 LANSING, MICHIGAN 48909

CONTRACT CHANGE NOTICE

Change Notice Number **2**

to

Contract Number **190000001522**

CONTRACTOR	
	Econolite Systems, Inc
	1250 N Tustin Ave.
	Anaheim, CA 92807-1617
	Jon Ringler
	714-575-5750
	jringler@econolite.com
	VS0101367

STATE			
	Program Manager	Various	MULTI
	Contract Administrator	Christopher Martin	DTMB
		(517) 643-2833	
		martinc20@michigan.gov	

CONTRACT SUMMARY			
CENTRAL SIGNAL CONTROL SYSTEM			
INITIAL EFFECTIVE DATE	**INITIAL EXPIRATION DATE**	**INITIAL AVAILABLE OPTIONS**	**EXPIRATION DATE BEFORE**
October 8, 2019	October 7, 2024	5 - 1 Year	October 7, 2024
PAYMENT TERMS		**DELIVERY TIMEFRAME**	
NET 45, 1% 10 DAYS			
ALTERNATE PAYMENT OPTIONS			**EXTENDED PURCHASING**
☐ P-Card	☐ PRC	☐ Other	☒ Yes ☐ No
MINIMUM DELIVERY REQUIREMENTS			

DESCRIPTION OF CHANGE NOTICE				
OPTION	**LENGTH OF OPTION**	**EXTENSION**	**LENGTH OF EXTENSION**	**REVISED EXP. DATE**
☐		☐		October 7, 2024
CURRENT VALUE	**VALUE OF CHANGE NOTICE**		**ESTIMATED AGGREGATE CONTRACT VALUE**	
$1,983,010.00	$0.00		$1,983,010.00	

DESCRIPTION

Effective 10/21/2020, the following amendments are incorporated into this Contract per the attached statement of work. This change includes the following:

1. Provision for the installation of External Antennas as needed to achieve acceptable bandwidth.
2. Provision for the installation of External Amplifiers as needed to achieve acceptable bandwidth.

All other terms, conditions, specifications and pricing remain the same. Per contractor and agency agreement, and DTMB Central Procurement Services approval.

Program Managers
for
Multi-Agency and Statewide Contracts

AGENCY	NAME	PHONE	EMAIL
DTMB	Dave Work	517-719-2250	WorkD@michigan.gov
MDOT	Collin Castle	517-636-0715	CastleC@michigan.gov

MICHIGAN DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET
IT SERVICES
STATEMENT OF WORK FOR IT CHANGE NOTICES

Project Title: **Central Signal Control System (CSCS)**	**Period of Coverage:** **10/21/2020-10/7/2024**
Requesting Department: **MDOT**	**Date:** **6/18/20**
Agency Project Manager: **Nathan Bouvy**	**Phone:** **517-636-5013**
DTMB Project Manager: **Dave Work**	**Phone:** **517-719-2250**

Brief Description of Services to be provided:

BACKGROUND: The project is updating traffic signal field communications from dial-up and serial communications to cell modem communications. In the RFP Addendum the Contractor was to provide a cell modem antenna for each location to be installed inside the signal cabinet. Unacceptable bandwidth was discovered during the initial field deployment of cell modems at some locations. Contractor to furnish external antennas to be installed outside of the signal cabinet to provide better cell service at these locations.

PROJECT OBJECTIVE: At the selected locations, furnish and install external cell modem antennas in order to achieve acceptable bandwidth. The initial estimate is that approximately 100 locations in Phase 1 will require an external antenna based on the results of the cellular site survey.

SCOPE OF WORK: Furnish and install external cell modem at selected locations based on the results of a cellular service survey.

Current contract states:

4. Antenna.
   A. Provide modem-mountable omnidirectional external antennas rated for outdoor usage as defined in **subsection b.7** of this special provision to be mounted inside the cabinet. Specific antenna type to be used at each site is to be determined by the Contractor to provide required throughput and maximize received signal level. Antenna for each site must be approved by the Engineer. If Site Survey as defined in **subsection c.1.A** of this special provision indicates that required throughput or received signal strength cannot be achieved with antennas mounted inside the cabinet, furnish to MDOT antennas and surge protection rated for outdoor usage as defined in subsection b.7 of this special provision, suitable for pole mounting, and approved by the Engineer.

   B. 50 Ohm SMA male connector.

   C. If antenna is provided to MDOT for mounting outside of the cabinet, provide an antenna cable with surge protection and required adapters per the manufacturer's recommendation. Signal loss due to cable length must be minimized in order to meet throughput requirements.

Requested change:

4. Antenna.
   A. Provide modem-mountable omnidirectional antennas rated for outdoor usage as defined in **subsection b.7** of this special provision to be mounted inside the cabinet. Specific internally

mounted antenna type to be determined by the Contractor to provide required throughput and maximize received signal level. Antenna must be approved by the Engineer.

B. 50 Ohm SMA male connector.

C. In the event that that the standard internally-installed antenna does not provide acceptable or reliable cellular signal strength, at the request of the Engineer furnish MDOT with an externally-mountable antenna rated for outdoor usage as defined in subsection b.7. Specific externally mounted antenna type to be determined by the Contractor to provide required throughput and maximize received signal level. Provide the external antenna, an antenna cable with surge protection rated for outdoor usage, installation hardware, and required adapters per the manufacturer's recommendation. Payment for "External Antenna, Furnish" shall include the external atenna, cable, adapter, installation hardware, and surge protection. This payment will be made separately when Contractor furnishes product for project and is included in Scheduled D.

At the requrest of the Engineer, install the external antenna onto the outside of the signal cabinet during the controller install. Installation will include labor and materials required to install the external antenna using standards approved by the Engineer. Payment for "External Antenna, Install" shall include labor and materials required to install the external antenna by the Contractor; and be completed during the same trip to the location during the controller install. Payment for "External Antenna, Install_Standalone" shall include labor and materials required to install the external antenna by the Contractor; and necessitate a separate trip to the location to complete the work. This payment will be made separately when Contractor acceptably completes the installation in the field.

In the event that the external antenna does not provide acceptable or reliable cellular signal strength, the Engineer may request the Contractor to furnish a cellular Amplifier to boost the cell signal strength. The amplifier must be compatible with the cellular modem model(s) selected for the project and meet outdoor usage ratings as defined in subsection b. 7. Payment for "Amplifier, Furnish" shall include cables, adapters, installation hardware, surege protection and power supply. This payment will be made separately when Contractor furnishes product for project and is included in Scheduled D.

Schedule D Pricing

Implementation Services
External Antenna, Install (add rows in existing table)

Description	Qty	Unit	Unit Price
External Antenna, Install	1-49	EA	$120.65
External Antenna, Install	50 or more	EA	$120.65
External Antenna, Install Standalone	1-49	EA	$723.88
External Antenna, Install Standalone	50 or more	EA	$723.88

Hardware
External Antenna, Furnish (add rows in existing table)

Description	Qty	Unit	Unit Price
External Antenna, Furnish	1-49	EA	$176.14
External Antenna, Furnish	50 or more	EA	$163.48
External Amplifier, Furnish	1-49	EA	$395.30
External Amplifier, Furnish	50 or more	EA	$364.90

Misc Change under Contract Terms

"Engineer" means the Director of the Department or the Engineer designated by the Director, acting directly or through authorized representatives, who is responsible for engineering supervision of the construction, when the State is the awarding authority.

TASKS:

Technical support is required to assist with the following tasks:
External Antenna and Amplifier installation standards and details

DELIVERABLES:

Deliverables will not be considered complete until the Agency Project Manager has formally accepted them.
Deliverables for this project include: External Antenna, Install; External Antenna, Furnish
Update cellular signal strength survey results noting the changes to signal strength for each location

ACCEPTANCE CRITERIA:

As defined in Schedule I of the Contract

PROJECT CONTROL AND REPORTS:

A weekly progress report must be submitted to the Agency and DTMB Project Managers throughout the life of this project. This report may be submitted with the billing invoice. Each weekly progress report must contain the following:

1. **Accomplishments**: Indicate what was worked on and what was completed during the current reporting period.

SPECIFIC DEPARTMENT STANDARDS:

Agency standards, if any, in addition to DTMB standards.

PAYMENT SCHEDULE:

Payment will be made on a satisfactory acceptance of each deliverable basis. DTMB will pay CONTRACTOR upon receipt of properly completed invoice(s) which shall be submitted to the billing address on the State issued purchase order not more often than monthly. DTMB Accounts Payable area will coordinate obtaining Agency and DTMB Project Manager approvals. All invoices should reflect actual work completed by payment date, and must be approved by the Agency and DTMB Project Manager prior to payment. The invoices shall describe and document to the State's satisfaction a description of the work performed, the progress of the project, and fees. When expenses are invoiced, receipts will need to be provided along with a detailed breakdown of each type of expense.

Payment shall be considered timely if made by DTMB within forty-five (45) days after receipt of properly completed invoices.

EXPENSES:

The State will NOT pay for any travel expenses, including hotel, mileage, meals, parking, etc.

PROJECT CONTACTS:

The designated Agency Project Manager is:

Nathan Bouvy
MDOT
Traffic Signals Unit
Central Maintenance
6333 Lansing Road
Lansing, MI 48917
517-636-5013
bouvyn@michigan.gov

The designated DTMB Project Manager is:

Dave Work
DTMB
MDOT Public Services & Operations
Van Wagoner Building, 3rd floor
425 W Ottawa St
Lansing, MI 48933
517-719-2250
workd@michigan.gov

AGENCY RESPONSIBILITIES: Approve external antenna type and direct Contractor when/where to furnish and/or install external antenna(s)

LOCATION OF WHERE THE WORK IS TO BE PERFORMED:

Consultants will work at traffic signals located statewide.

EXPECTED CONTRACTOR WORK HOURS AND CONDITIONS:

Work hours are not to exceed eight (8) hours a day, forty (40) hours a week. Normal working hours of 8:00 am to 5:00 pm are to be observed unless otherwise agreed to in writing.

No overtime will be permitted.

STATE OF MICHIGAN
CENTRAL PROCUREMENT SERVICES
Department of Technology, Management, and Budget
525 W. ALLEGAN ST., LANSING, MICHIGAN 48913
P.O. BOX 30026 LANSING, MICHIGAN 48909

CONTRACT CHANGE NOTICE

Change Notice Number **1**

to

Contract Number **190000001522**

CONTRACTOR	
	Econolite Systems, Inc
	1250 N Tustin Ave.
	Anaheim, CA 92807-1617
	Jon Ringler
	714-575-5750
	jringler@econolite.com
	VS0101367

STATE			
	Program Manager	Various	MULTI
	Contract Administrator	Christopher Martin	DTMB
		(517) 643-2833	
		martinc20@michigan.gov	

CONTRACT SUMMARY

CENTRAL SIGNAL CONTROL SYSTEM

INITIAL EFFECTIVE DATE	INITIAL EXPIRATION DATE	INITIAL AVAILABLE OPTIONS	EXPIRATION DATE BEFORE
October 8, 2019	October 7, 2024	5 - 1 Year	October 7, 2024

PAYMENT TERMS	DELIVERY TIMEFRAME
Net 45, 1% 10 Days	

ALTERNATE PAYMENT OPTIONS			EXTENDED PURCHASING	
☐ P-Card	☐ PRC	☐ Other	☒ Yes	☐ No

MINIMUM DELIVERY REQUIREMENTS

DESCRIPTION OF CHANGE NOTICE

OPTION	LENGTH OF OPTION	EXTENSION	LENGTH OF EXTENSION	REVISED EXP. DATE
☐		☐		October 7, 2024

CURRENT VALUE	VALUE OF CHANGE NOTICE	ESTIMATED AGGREGATE CONTRACT VALUE
$1,983,010.00	$0.00	$1,983,010.00

DESCRIPTION

Effective 4/6/2020, the following amendments are incorporated into this Contract per attached SOW. This change includes the following:

1. Updated Milestones/Payment amounts, year one maintenance and support included in final milestone.
2. Removal of Line Item - Equipment from original Contract, replace with 4-port modem - refer to commodity pricing in Schedule D, pg. 167 - $1,717.00 ea. Quantity as needed.
3. On-going Maintenance and Support payable at the start of years 2-5 in the amount of $17,202.60.
4. Phase one only requires completion of Options 90, 272, 273, and 305. Options 243, 278, 282, 297, 299 will be authorized at a later date.

The net value change to the Contract is zero. Any excess funds will be reallocated for future use.

All other terms, conditions, specifications and pricing remain the same. Per contractor and agency agreement, and DTMB Central Procurement Services approval.

Program Managers
for
Multi-Agency and Statewide Contracts

AGENCY	NAME	PHONE	EMAIL
DTMB	Dave Work	517-719-2250	WorkD@michigan.gov
MDOT	Collin Castle	517-636-0715	CastleC@michigan.gov

MICHIGAN DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET
IT SERVICES
STATEMENT OF WORK

Project Title: **Central Signal Control System (CSCS)**	**Period of Coverage:**
Requesting Department: **DTMB**	**Date:** **03/10/20**
Agency Project Manager: **Nathan Bouvy**	**Phone:** **517-636-5013**
DTMB Project Manager: **Dave Work**	**Phone:** **517-719-2250**

BRIEF DESCRIPTION OF SERVICES TO BE PROVIDED:
DTMB would like to make contract modifications for the Econolite Contract (190000001522) for the CSCS project. The primary goal is to remove requirements and costs that aren't within scope for Phase 1. Additionally, the change will update the recommended modem configuration to use 4 port modems rather than 2 port modems with a switch. Lastly there is a need to adjust the project schedule to reflect a more accurate timeline which will impact the current project completion date.

BACKGROUND:
MDOT Econolite Contract (190000001522) is in place and would like to modify it. We would like to incorporate the items above.

PROJECT OBJECTIVE:
The purpose of this Statement of Work (SOW) is to modify the project contract to reflect the changes in the scope of work**.**

SCOPE OF WORK:
1. Reducing the number of optional requirements to reduce the software development changes
2. Changing from 2-port to 4-port modem as the primary configuration
3. Adjusting the project schedule to reflect a more accurate timeline with a new completion date.

TASKS:

ASSUMPTIONS:
1. There will be no changes to the Econolite contract value.

OUT OF SCOPE:
The following items have been identified as out of scope and will not be required tasks within this scope of work:
- N/A

DELIVERABLES:
Deliverables will not be considered complete until the Agency Project Manager has formally accepted them. Refer to table under Project Plan for Milestones/Deliverables for this project and related payments.

PROJECT CONTROL AND REPORTS:
A progress status updated will be added to the State's CSCS Project Team planning meeting that meets every two weeks throughout the life of this project. Each progress update shall contain the following:

1. Equipment: Indicate the model, type, and quantity of equipment (modems and/or switches) delivered to the State so the DTMB-Project Manager can cross reference against invoices since equipment is not tied to Milestones.

SPECIFIC DEPARTMENT STANDARDS:
Agency standards, if any, in addition to DTMB standards.

PAYMENT SCHEDULE:
Payment will be made according to the milestones and equipment provided. DTMB will pay CONTRACTOR upon receipt of properly completed invoice(s) which shall be submitted to the billing address on the State issued purchase order not more often than monthly. DTMB Accounts Payable area will coordinate obtaining Agency and DTMB Project Manager approvals. All invoices should reflect actual work completed by payment date and must be approved by the Agency and DTMB Project Manager prior to payment. The invoices shall describe and document to the State's satisfaction a description of the work performed, the progress of the project, and fees.

Payment shall be considered timely if made by the DTMB within forty-five (45) days after receipt of properly completed invoices.

EXPENSES:
The State will NOT pay for any travel expenses, including hotel, mileage, meals, parking, etc.

PROJECT CONTACTS:
The designated Agency Project Manager is:

Nathan Bouvy
MDOT
Signal Operations
Signal Shop
6333 Old Lansing Rd
Lansing, MI 48917
517-636-5013
BouvyN1@michigan.gov

The designated DTMB Project Manager(s) is:

Dave Work
DTMB
Agency Services
Van Wagoner Building, 3rd Floor
Lansing, MI
517-719-2250
WorkD@michigan.gov

PROJECT PLAN:
The table below outlines the specific changes for the implementation milestones and corresponding changes to the payment amounts.

Milestone Event	Description	Milestone Payment *(revised)*	Unit	Revised Payment Amount
Testing and Acceptance of Software	**Successful completion of UAT**	**25%**	**LS**	**$275,828.15**
Testing and Acceptance of Solution (5%)	**Successful completion of SAT for 5% of Phase 1 Intersections**	**20%**	**LS**	**$220,662.52**
Testing and Acceptance of Solution (25%)	**Successful completion of SAT for 25% of Phase 1 Intersections**	**10%**	**LS**	**$110,331.26**
Testing and Acceptance of Solution (50%)	**Successful completion of SAT for 50% of Phase 1 Intersections**	**10%**	**LS**	**$110,331.26**
Testing and Acceptance of Solution (75%)	**Successful completion of SAT for 75% of Phase 1 Intersections**	**10%**	**LS**	**$110,331.26**
Testing and Acceptance of Solution (100%)	**Successful completion of SAT for 100% of Phase 1 Intersections**	**15%**	**LS**	**$165,496.89**
Burn-In Completion	**Successful completion of 60-day burn-in for 100% of Phase 1 Intersections**	**10%**	**LS**	**$110,331.26**
			TOTAL	**$1,103,312.60**

STATE OF MICHIGAN PROCUREMENT

Department of Technology, Management, and Budget
525 West Allegan Street
PO Box 30026
Lansing, MI 48909

NOTICE OF CONTRACT

NOTICE OF CONTRACT NO. **190000001522**
between
THE STATE OF MICHIGAN
and

CONTRACTOR	
	Econolite Systems, Inc.
	1250 N Tustin Ave.
	Anaheim, CA 92807-1617
	Jon Ringler
	714-575-5750
	jringler@econolite.com
	VS0101367

STATE			
	Program Manager	Multi	Multi
		Multi	
		Multi	
	Contract Administrator	Christopher Martin	DTMB
		517-643-2833	
		martinc20@michigan.gov	

CONTRACT SUMMARY			
DESCRIPTION: Central Signal Control System			
INITIAL EFFECTIVE DATE	**INITIAL EXPIRATION DATE**	**INITIAL AVAILABLE OPTIONS**	**EXPIRATION DATE BEFORE CHANGE(S) NOTED BELOW**
10/8/2019	10/7/2024	5, 1-year	10/7/2024
PAYMENT TERMS		**DELIVERY TIMEFRAME**	
Net 45, 1% if paid in 10 days		Per Milestones	
ALTERNATE PAYMENT OPTIONS			**EXTENDED PURCHASING**
☐ P-card ☐ Payment Request (PRC) ☐ Other			☒ Yes ☐ No
MINIMUM DELIVERY REQUIREMENTS			
N/A			
MISCELLANEOUS INFORMATION			
Per base proposal, plus development of all optional software requirements and annual maintenance for first five years.			
ESTIMATED CONTRACT VALUE AT TIME OF EXECUTION			**$1,983,010.00**

Program Managers

for

Multi-Agency and Statewide Contracts

AGENCY	NAME	PHONE	EMAIL
DTMB	Dave Work	517-241-4604	workd@michigan.gov
MDOT	Colin Castle	517-636-0715	castlec@michigan.gov

FOR THE CONTRACTOR:

Econolite Systems, Inc.
Company Name

Authorized Agent Signature

Abbas Mohaddes, President & COO
Authorized Agent (Print or Type)

09-27-2019
Date

FOR THE STATE:

Signature

Christopher Martin
Name & Title

DTMB Central Procurement
Agency

10/8/2019
Date

STATE OF MICHIGAN

CONTRACT TERMS

This Software and Hardware Contract (this "**Contract**") is agreed to between the State of Michigan (the "**State**") and Econolite Systems, Inc. ("**Contractor**"), a California corporation. This Contract is effective on October 1, 2019 ("**Effective Date**"), and unless earlier terminated, will expire on September 30, 2024 (the "**Term**").

This Contract may be renewed for up to five additional one-year periods. Renewal must be by written notice from the State and will automatically extend the Term of this Contract.

1. Definitions. For the purposes of this Contract, the following terms have the following meanings:

"**Acceptance**" has the meaning set forth in **Schedules H and I**.

"**Acceptance Tests**" means such tests as may be conducted in accordance with **Schedules H and I**, **Section 12** and the Statement of Work to determine whether the Software and Hardware meets the requirements of this Contract and the Documentation.

"**Affiliate**" of a Person means any other Person that directly or indirectly, through one or more intermediaries, controls, is controlled by, or is under common control with, such Person. For purposes of this definition, the term "control" (including the terms "controlled by" and "under common control with") means the direct or indirect ownership of more than fifty percent (50%) of the voting securities of a Person.

"**Allegedly Infringing Materials**" has the meaning set forth in **Section 28.3(c)(i)**.

"**API**" means all Application Programming Interfaces and associated API Documentation provided by Contractor, and as updated from time to time, to allow the Software to integrate with various State and Third -Party Software.

"**Approved Open-Source Components**" means Open-Source Components that may be included in or used in connection with the Software and are specifically identified in an exhibit to the Statement of Work and approved by the State.

"**Authorized Users**" means all Persons authorized by the State to access and use the Software under this Contract, subject to the maximum number of users specified in the applicable Statement of Work.

"**Business Day**" means a day other than a Saturday, Sunday or other day on which the State is authorized or required by Law to be closed for business.

"Business Owner" is the individual appointed by the agency buyer to (a) act as the agency's representative in all matters relating to the Contract, and (b) co-sign off on notice of Acceptance for the Software. The Business Owner will be identified in the Statement of Work.

"**Business Requirements Specification**" means the initial specification setting forth the State's business requirements regarding the features and functionality of the Software, as set forth in the Statement of Work.

"Change" has the meaning set forth in **Section 2.2.**

"Change Notice" has the meaning set forth in **Section 2.2(b).**

"Change Proposal" has the meaning set forth in **Section 2.2(a).**

"Change Request" has the meaning set forth in **Section 2.2.**

"Confidential Information" has the meaning set forth in **Section 23.1.**

"**Configuration**" means State-specific changes made to the Software without Source Code or structural data model changes occurring.

"**Contract**" has the meaning set forth in the preamble.

"**Contract Administrator**" is the individual appointed by each party to (a) administer the terms of this Contract, and (b) approve any Change Notices under this Contract. Each party's Contract Administrator will be identified in the Statement of Work.

"**Contractor**" has the meaning set forth in the preamble.

"**Contractor's Bid Response**" means the Contractor's proposal submitted in response to the RFP.

"**Contractor Personnel**" means all employees of Contractor or any Permitted Subcontractors involved in the performance of Services hereunder.

"**Contractor's Test Package**" has the meaning set forth in **Section 14.2**.

"**Deliverables**" means the Software and Hardware, and all other documents and other materials that Contractor is required to or otherwise does provide to the State under this Contract and otherwise in connection with any Services, including all items specifically identified as Deliverables in the Statement of Work.

"**Dispute Resolution Procedure**" has the meaning set forth in **Section 33.1**.

"**Documentation**" means all user manuals, operating manuals, technical manuals and any other instructions, specifications, documents or materials, in any form or media, that describe the functionality, installation, testing, operation, use, maintenance, support, technical or other components, features or requirements of the Software and Hardware.

"**DTMB**" means the Michigan Department of Technology, Management and Budget.

"**Effective Date**" has the meaning set forth in the preamble.

"**Fees**" means collectively, the License Fees, Implementation Fees, and Support Services Fees.

"**Financial Audit Period**" has the meaning set forth in **Section 31.1**.

"**Force Majeure**" has the meaning set forth in **Section 34.1.**

"Hardware" means all Hardware required to be supplied by Contractor, including but not limited to center to field communications equipment installed in each signal cabinet to provide Ethernet connectivity from CU to the central software, as defined in **Exhibit A – Project Scope** and **Exhibit C - Pricing**.

"**Harmful Code**" means any: (a) virus, trojan horse, worm, backdoor or other software or hardware devices the effect of which is to permit unauthorized access to, or to disable, erase, or otherwise harm, any computer, systems or software; or (b) time bomb, drop dead device, or other software or hardware device designed to disable a computer program automatically with the passage of time or under the positive control of any Person, or otherwise prevent, restrict or impede the State's or any Authorized User's use of such software.

"**Implementation Fees**" has the meaning set forth in **Section 19.2**.

"**Implementation Plan**" means the schedule included in the Statement of Work setting forth the sequence of events for the performance of Services under the Statement of Work, including the Milestones and Milestone Dates.

"**Intellectual Property Rights**" means all or any of the following: (a) patents, patent disclosures, and inventions (whether patentable or not); (b) trademarks, service marks, trade dress, trade names, logos, corporate names, and domain names, together with all of the associated goodwill; (c) copyrights and copyrightable works (including computer programs), mask works and rights in data and databases; (d) trade secrets, know-how and other confidential information; and (e) all other intellectual property rights, in each case whether registered or unregistered and including all applications for, and renewals or extensions of, such rights, and all similar or equivalent rights or forms of protection provided by applicable Law in any jurisdiction throughout the world.

"**Key Personnel**" means any Contractor Personnel identified as key personnel in the Statement of Work.

"**Law**" means any statute, law, ordinance, regulation, rule, code, order, constitution, treaty, common law, judgment, decree or other requirement or rule of any federal, state, local or foreign government or political subdivision thereof, or any arbitrator, court or tribunal of competent jurisdiction.

"**License Agreement**" has the meaning set forth in **Section 3.**

"**License Fee**" has the meaning set forth in **Section 19.1**.

"**Loss or Losses**" means all losses, damages, liabilities, deficiencies, claims, actions, judgments, settlements, interest, awards, penalties, fines, costs or expenses of whatever kind, including reasonable attorneys' fees and the costs of enforcing any right to indemnification hereunder and the cost of pursuing any insurance providers.

"**Maintenance and Support Schedule**" means, if applicable, the schedule attached as **Schedule B**, setting forth the Support Services Contractor will provide to the State, and the parties' additional rights and obligations with respect thereto.

"**Maintenance Release**" means any update, upgrade, release or other adaptation or modification of the Software, including any updated Documentation, that Contractor may generally provide to its licensees from time to time during the Term, which may contain, among other things, error corrections, enhancements, improvements or other changes to the user interface, functionality, compatibility, capabilities, performance, efficiency or quality of the Software.

"**Milestone**" means an event or task described in the Implementation Plan under the Statement of Work that must be completed by the corresponding Milestone Date.

"**Milestone Date**" means the date by which a particular Milestone must be completed as set forth in the Implementation Plan under the Statement of Work.

"**New Version**" means any new version of the Software that the Contractor may from time to time introduce and market generally as a distinct licensed product, as may be indicated by Contractor's designation of a new version number.

"**Nonconformity**" or **"Nonconformities"** means any failure or failures of the Software to conform to the requirements of this Contract, including any applicable Documentation.

"**Open-Source Components**" means any software component that is subject to any open-source copyright license agreement, including any GNU General Public License or GNU Library or Lesser Public License, or other obligation, restriction or license agreement that substantially conforms to the Open Source Definition as prescribed by the Open Source Initiative or otherwise may require disclosure or licensing to any third party of any source code with which such software component is used or compiled.

"**Open-Source License**" has the meaning set forth in **Section 4.**

"**Operating Environment**" means, collectively, the platform, environment and conditions on, in or under which the Software is intended to be installed and operate, as set forth in the Statement of Work, including such structural, functional and other features, conditions and components as hardware, operating software and system architecture and configuration.

"**Permitted Subcontractor**" has the meaning set forth in **Section 12.4**.

"**Person**" means an individual, corporation, partnership, joint venture, limited liability company, governmental authority, unincorporated organization, trust, association or other entity.

"**Pricing**" means any and all fees, rates and prices payable under this Contract, including pursuant to any Schedule or Exhibit hereto.

"**Pricing Schedule**" means the schedule attached as **Schedule D**, setting forth the License Fees, Implementation Fees, Support Services Fees, and any other fees, rates and prices payable under this Contract.

"**Project Manager**" is the individual appointed by each party to (a) monitor and coordinate the day-to-day activities of this Contract, and (b) for the State, to co-sign off on its notice of Acceptance for the Software and Hardware. Each party's Project Manager will be identified in the Statement of Work.

"**Representatives**" means a party's employees, officers, directors, partners, shareholders, agents, attorneys, successors and permitted assigns.

"**RFP**" means the State's request for proposal designed to solicit responses for Services under this Contract. "**Services**" means any of the services Contractor is required to or otherwise does provide under this Contract, the Statement of Work, the Maintenance and Support Schedule (if applicable), or the Service Level Agreement (if applicable).

"**Service Level Agreement**" means, if applicable, the service level agreement attached as **Schedule E** to this Contract, setting forth Contractor's obligations with respect to the hosting, management and operation of the Software.

"**Site**" means the physical location designated by the State in, or in accordance with, this Contract or the Statement of Work for delivery and installation of the Software or Hardware, as applicable.

"**Software**" means Contractor's software set forth in the Statement of Work, and any Maintenance Releases or New Versions provided to the State and any Configurations made by or for the State pursuant to this Contract, and all copies of the foregoing permitted under this Contract and the License Agreement.

"**Source Code**" means the human readable source code of the Software to which it relates, in the programming language in which the Software was written, together with all related flow charts and technical documentation, including a description of the procedure for generating object code, all of a level sufficient to enable a programmer reasonably fluent in such programming language to understand, build, operate, support, maintain and develop modifications, upgrades, updates, adaptations, enhancements, new versions and other derivative works and improvements of, and to develop computer programs compatible with, the Software.

"**Specifications**" means, for the Software and Hardware, the specifications collectively set forth in the Business Requirements Specification, Technical Specification, Documentation, RFP or Contractor's Bid Response, if any, for such Software, or elsewhere in the Statement of Work.

"**State**" means the State of Michigan.

"**State Data**" has the meaning set forth in **Section 22.1**.

"**State Materials**" means all materials and information, including documents, data, know-how, ideas, methodologies, specifications, software, content and technology, in any form or media, directly or indirectly provided or made available to Contractor by or on behalf of the State in connection with this Contract.

"**State Resources**" has the meaning set forth in **Section 13.1(a)**.

"**Statement of Work**" means any statement of work entered into by the parties and attached as a schedule to this Contract. The initial Statement of Work is attached as **Exhibit A**, and subsequent Statements of Work shall be sequentially identified and attached as **Schedules A-1, A-2, A-3**, etc.

"**Stop Work Order**" has the meaning set forth in **Section 26**.

"**Support Services**" means the software maintenance and support services Contractor is required to or otherwise does provide to the State under the Maintenance and Support Schedule (if applicable) or the Service Level Agreement (if applicable).

"**Support Services Commencement Date**" means, with respect to the Software, the date on which the Warranty Period for the Software expires, or such other date as may be set forth in the Statement of Work.

"**Support Services Fees**" has the meaning set forth in **Section 19.3**.

"**Technical Specification**" means, with respect to any Software, the document setting forth the technical specifications for such Software and included in the Statement of Work.

"**Term**" has the meaning set forth in the preamble.

"**Test Data**" has the meaning set forth in **Section 14.2**.

"**Test Estimates**" has the meaning set forth in **Section 14.2**.

"**Third Party**" means any Person other than the State or Contractor.

"**Transition Period**" has the meaning set forth in **Section 25.3.**

"**Transition Responsibilities**" has the meaning set forth in **Section 25.3**.

"**Unauthorized Removal**" has the meaning set forth in **Section 12.3(b)**.

"**Unauthorized Removal Credit**" has the meaning set forth in **Section 12.3(c)**.

"**User Data**" means all data, information and other content of any type and in any format, medium or form, whether audio, visual, digital, screen, GUI or other, that is input, uploaded to, placed into or collected, stored, processed, generated or output by any device, system or network by or on behalf of the State, including any and all works, inventions, data, analyses and other information and materials resulting from any use of the Software by or on behalf of the State under this Contract, except that User Data does not include the Software or data, information or content, including any GUI, audio, visual or digital or other display or output, that is generated automatically upon executing the Software without additional user input.

"**Warranty Period**" means the ninety (90) calendar-day period commencing on the date of the State's Acceptance of the Software. Warranty Period for Controller Install and Signalized Intersection Implementation means the ninety (90) calendar-day period commencing on the date of the Acceptance of each intersection as defined in **Schedule H**. Hardware Warranty Period is defined per **Schedule H**, **Schedule I**, and applicable **Exhibits**.

"**Work Product**" means all State-specific deliverables that Contractor is required to, or otherwise does, provide to the State under this Contract including but not limited to computer scripts, macros, user interfaces, reports, project management documents, forms, templates, and other State-specific documents and related materials together with all ideas, concepts, processes, and methodologies developed in connection with this Contract whether or not embodied in this Contract.

2. Statements of Work. Contractor shall provide Services and Deliverables pursuant to Statements of Work entered into under this Contract. No Statement of Work shall be effective unless signed by each party's Contract Administrator. The term of each Statement of Work shall commence on the parties' full execution of the Statement of Work and terminate when the parties have fully performed their obligations. The Contract Terms of this Contract will apply at all times to any Statements of Work entered into by the parties and attached as a schedule to this Contract. The State shall have the right to terminate such Statement of Work as set forth in **Section 25**. Contractor acknowledges that time is of the essence with respect to Contractor's obligations under each Statement of Work and agrees that prompt and timely performance of all such obligations in accordance with this Contract and the Statements of Work (including the Implementation Plan and all Milestone Dates) is strictly required.

2.1 Statement of Work Requirements. Each Statement of Work will include the following:

(a) names and contact information for Contractor's Contract Administrator, Project Manager and Key Personnel;

(b) names and contact information for the State's Contract Administrator, Project Manager and Business Owner;

(c) a detailed description of the Services to be provided under this Contract, including any training obligations of Contractor;

(d) a detailed description of the Software to be provided under this Contract, including the:

(i) version and release number of the Software;

(ii) Business Requirements Specification;

(iii) Technical Specification; and

(iv) a description of the Documentation to be provided;

(e) a detailed description of the Hardware to be provided under this Contract;

(f) an Implementation Plan, including all Milestones, the corresponding Milestone Dates and the parties' respective responsibilities under the Implementation Plan;

(g) the due dates for payment of Fees and any invoicing requirements, including any Milestones on which any such Fees are conditioned, and such other information as the parties deem necessary;

(h) disclosure of all Open-Source Components (each identified on a separate exhibit to the Statement of Work), in each case accompanied by such related documents as may be required by this Contract;

(i) description of all liquidated damages associated with this Contract; and

(j) a detailed description of all State Resources required to complete the Implementation Plan.

2.2 Change Control Process. The State may at any time request in writing (each, a "**Change Request**") changes to the Statement of Work, including changes to the Services and Implementation Plan (each, a "**Change**"). Upon the State's submission of a Change Request, the parties will evaluate and implement all Changes in accordance with this **Section 2.2**.

(a) As soon as reasonably practicable, and in any case within twenty (20) Business Days following receipt of a Change Request, Contractor will provide the State with a written proposal for implementing the requested Change ("**Change Proposal**"), setting forth:

(i) a written description of the proposed Changes to any Services or Deliverables;

(ii) an amended Implementation Plan reflecting: (A) the schedule for commencing and completing any additional or modified Services or Deliverables; and (B) the effect of such Changes, if any, on completing any other Services under the Statement of Work;

(iii) any additional State Resources Contractor deems necessary to carry out such Changes; and

(iv) any increase or decrease in Fees resulting from the proposed Changes, which increase or decrease will reflect only the increase or decrease in time and expenses Contractor requires to carry out the Change.

(b) Within thirty (30) Business Days following the State's receipt of a Change Proposal, the State will by written notice to Contractor, approve, reject, or propose modifications to such Change Proposal. If the State proposes modifications, Contractor must modify and re-deliver the Change Proposal reflecting such modifications, or notify the State of any disagreement, in which event the parties will negotiate in good faith to resolve their disagreement. Upon the State's approval of the Change Proposal or the parties' agreement on all proposed modifications, as the case may be, the parties will execute a written agreement to the Change Proposal ("**Change Notice**"), which Change Notice will be signed by the State's Contract Administrator and will constitute an amendment to the Statement of Work to which it relates; and

(c) If the parties fail to enter into a Change Notice within fifteen (15) Business Days following the State's response to a Change Proposal, the State may, in its discretion:

(i) require Contractor to perform the Services under the Statement of Work without the Change;

(ii) require Contractor to continue to negotiate a Change Notice;

(iii) initiate a Dispute Resolution Procedure; or

(iv) notwithstanding any provision to the contrary in the Statement of Work, terminate this Contract under **Section 25**.

(d) No Change will be effective until the parties have executed a Change Notice. Except as the State may request in its Change Request or otherwise in writing, Contractor must continue to perform its obligations in accordance with the Statement of Work pending negotiation and execution of a Change Notice. Contractor will use its best efforts to limit any delays or Fee increases from any Change to those necessary to perform the Change in accordance with the applicable Change Notice. Each party is responsible for its own costs and expenses of preparing, evaluating, negotiating, and otherwise processing any Change Request, Change Proposal, and Change Notice.

(e) The performance of any functions, activities, tasks, obligations, roles and responsibilities comprising the Services as described in this Contract are considered part of the Services and, thus, will not be considered a Change. This includes the delivery of all Deliverables in accordance with their respective Specifications, and the diagnosis and correction of Non-Conformities discovered in Deliverables prior to their Acceptance by the State or, subsequent to their Acceptance by the State, as necessary for Contractor to fulfill its associated warranty requirements and its Support Services under this Contract.

(f) Contractor may, on its own initiative and at its own expense, prepare and submit its own Change Request to the State. However, the State will be under no obligation to approve or otherwise respond to a Change Request initiated by Contractor.

3. Software License. Contractor hereby grants to the State and its Authorized Users the right and license to use the Software and Documentation in accordance with the Contract Terms of this Contract and the License Agreement set forth in **Schedule C** (the "**License Agreement**").

4. Open-Source Licenses. Any use hereunder of Open-Source Components shall be governed by, and subject to, the terms and conditions of the applicable open-source license ("**Open-Source License**"). Contractor shall identify and describe in an exhibit to the Statement of Work each of the Approved Open-Source Components of the Software, and include an exhibit attaching all applicable Open-Source Software Licenses or identifying the URL where these licenses are publicly available.

5. Software Implementation.

5.1 Implementation. Contractor will deliver, install, configure, integrate, and otherwise provide and make fully operational the Software on or prior to the applicable Milestone Date in accordance with the criteria set forth in the Statement of Work.

5.2 Site Preparation. Unless otherwise set forth in the Statement of Work, Contractor is responsible for ensuring the relevant Operating Environment is set up and in working order to allow Contractor to deliver and install the Software on or prior to the applicable Milestone Date. Contractor will provide the State with such notice as is specified in the Statement of Work, prior to delivery of the Software to give the State sufficient time to prepare for Contractor's delivery and installation of the Software. If the State is responsible for Site preparation, Contractor will provide such assistance as the State requests to complete such preparation on a timely basis.

6. Hardware Installation. Per requirements in **Exhibit A – Statement of Work (SOW)**.

7. Signalized Intersection Implementation. Per requirements in **Exhibit D – CU Requirements**.

8. CU, Install. Per requirements in **Exhibit D – CU Requirements**.

9. Hosting. If the Operating Environment for the Software is externally hosted by Contractor or a subcontractor, Contractor will maintain the Availability Requirement and the Support Service Level Requirement set forth in the Service Level Agreement attached as **Schedule E** to this Contract.

10. Support Services

10.1 Support Services for On-Premise Software. If the Operating Environment for the Software is internally hosted by the State, Contractor shall provide the State with the Support Services described in the Maintenance and Support Schedule attached as **Schedule B** to this Contract. Such Support Services shall be provided:

(a) Free of charge during the Warranty Period, it being acknowledged and agreed that the License Fee includes full consideration for such Services during such period.

(b) Thereafter, for so long as the State elects to receive Support Services for the Software, in consideration of the State's payment of Support Services Fees in accordance with **Section 19** and the rates set forth in the Pricing Schedule.

10.2 Support Services for Externally Hosted Software. If the Operating Environment for the Software is externally hosted by Contractor or a subcontractor, Contractor shall provide the State with the Support Services described in the Service Level Agreement attached as **Schedule E** to this Contract. Such Support Services shall be provided:

(a) Free of charge during the Warranty Period, it being acknowledged and agreed that the License Fee includes full consideration for such Services during such period.

(b) Thereafter, for so long as the State elects to receive Support Services for the Software, in consideration of the State's payment of Support Services Fees in accordance with **Section 19** and the rates set forth in the Pricing Schedule.

11. Data Privacy and Information Security.

11.1 Undertaking by Contractor. Without limiting Contractor's obligation of confidentiality as further described, Contractor is responsible for establishing and maintaining a data privacy and information security program, including physical, technical, administrative, and organizational safeguards, that is designed to: (a) ensure the security and confidentiality of the State Data; (b) protect against any anticipated threats or hazards to the security or integrity of the State Data; (c) protect against unauthorized disclosure, access to, or use of the State Data; (d) ensure the proper disposal of State Data; and (e) ensure that all Contractor Representatives comply with all of the foregoing. In no case will the safeguards of Contractor's data privacy and information security program be less stringent than the safeguards used by the State, and Contractor must at all times comply with all applicable State IT policies and standards, which are available at http://www.michigan.gov/dtmb/0,4568,7-150-56355_56579_56755---,00.html and as otherwise provided to the Contractor if not publicly available.

11.2 To the extent that Contractor has access to the State's computer system, Contractor must comply with the State's Acceptable Use Policy, see https://www.michigan.gov/documents/dtmb/1340.00.01_Acceptable_Use_of_Information_Technology_St

andard_458958_7.pdf. All Contractor Personnel will be required, in writing, to agree to the State's Acceptable Use Policy before accessing the State's system. The State reserves the right to terminate Contractor's access to the State's system if a violation occurs.

11.3 Right of Audit by the State. Without limiting any other audit rights of the State, the State has the right to review Contractor's data privacy and information security program prior to the commencement of Services and from time to time during the term of this Contract. During the providing of Services, on an ongoing basis from time to time and without notice, the State, at its own expense, is entitled to perform, or to have performed, an on-site audit of Contractor's data privacy and information security program. In lieu of an on-site audit, upon request by the State, Contractor agrees to complete, within forty-five (45) calendar days of receipt, an audit questionnaire provided by the State regarding Contractor's data privacy and information security program.

11.4 Audit Findings. With respect to State Data, Contractor must implement any required safeguards as identified by the State or by any audit of Contractor's data privacy and information security program.

11.5 State's Right to Termination for Deficiencies. The State reserves the right, at its sole election, to immediately terminate this Contract or the Statement of Work without limitation and without liability if the State determines that Contractor fails or has failed to meet its obligations under this **Section 12**.

11.6 Security Requirements for Externally Hosted Software. If the Operating Environment for the Software is externally hosted by Contractor or a subcontractor, Contractor shall comply with the security requirements set forth in **Schedule F** to this Contract.

12. Performance of Services. Contractor will provide all Services and Deliverables in a timely, professional and workmanlike manner and in accordance with the terms, conditions, and Specifications set forth in this Contract and the Statement of Work.

12.1 Contractor Personnel.

(a) Contractor is solely responsible for all Contractor Personnel and for the payment of their compensation, including, if applicable, withholding of income taxes, and the payment and withholding of social security and other payroll taxes, unemployment insurance, workers' compensation insurance payments and disability benefits.

(b) Prior to any Contractor Personnel performing any Services, Contractor will:

(i) ensure that such Contractor Personnel have the legal right to work in the United States;

(ii) upon request, require such Contractor Personnel to execute written agreements, in form and substance acceptable to the State, that bind such Contractor Personnel to confidentiality provisions that are at least as protective of the State's information (including all Confidential Information) as those contained in this Contract; and

(iii) upon request, perform background checks on all Contractor Personnel prior to their assignment. The scope is at the discretion of the State and documentation must be provided as requested. Contractor is responsible for all costs associated with the requested background checks. The State, in its sole discretion, may also perform background checks on Contractor Personnel.

(c) Contractor and all Contractor Personnel will comply with all rules, regulations, and policies of the State that are communicated to Contractor in writing, including security procedures concerning systems and data and remote access, building security procedures, including the restriction of access by the State to certain areas of its premises or systems, and general health and safety practices and procedures.

(d) The State reserves the right to require the removal of any Contractor Personnel found, in the judgment of the State, to be unacceptable. The State's request must be written with reasonable detail outlining the reasons for the removal request. Replacement personnel for the removed person must be fully qualified for the position. If the State exercises this right, and Contractor cannot immediately replace the removed personnel, the State agrees to negotiate an equitable adjustment in schedule or other terms that may be affected by the State's required removal.

12.2 Contractor's Project Manager. Throughout the Term of this Contract, Contractor must maintain a Contractor employee acceptable to the State to serve as Contractor's Project Manager, who will be considered Key Personnel of Contractor. Contractor's Project Manager will be identified in the Statement of Work.

(a) Contractor's Project Manager must:

(i) have the requisite authority, and necessary skill, experience, and qualifications, to perform in such capacity;

(ii) be responsible for overall management and supervision of Contractor's performance under this Contract; and

(iii) be the State's primary point of contact for communications with respect to this Contract, including with respect to giving and receiving all day-to-day approvals and consents.

(b) Contractor's Project Manager must attend all regularly scheduled meetings as set forth in the Implementation Plan and will otherwise be available as set forth in the Statement of Work.

(c) Contractor will maintain the same Project Manager throughout the Term of this Contract, unless:

(i) the State requests in writing the removal of Contractor's Project Manager;

(ii) the State consents in writing to any removal requested by Contractor in writing;

(iii) Contractor's Project Manager ceases to be employed by Contractor, whether by resignation, involuntary termination or otherwise.

(d) Contractor will promptly replace its Project Manager on the occurrence of any event set forth in **Section 12.2(c)**. Such replacement will be subject to the State's prior written approval.

12.3 Contractor's Key Personnel.

(a) The State has the right to recommend and approve in writing the initial assignment, as well as any proposed reassignment or replacement, of any Key Personnel. Before assigning an

individual to any Key Personnel position, Contractor will notify the State of the proposed assignment, introduce the individual to the State's Project Manager, and provide the State with a resume and any other information about the individual reasonably requested by the State. The State reserves the right to interview the individual before granting written approval. In the event the State finds a proposed individual unacceptable, the State will provide a written explanation including reasonable detail outlining the reasons for the rejection.

(b) Contractor will not remove any Key Personnel from their assigned roles on this Contract without the prior written consent of the State. The Contractor's removal of Key Personnel without the prior written consent of the State is an unauthorized removal ("**Unauthorized Removal**"). An Unauthorized Removal does not include replacing Key Personnel for reasons beyond the reasonable control of Contractor, including illness, disability, leave of absence, personal emergency circumstances, resignation, or for cause termination of the Key Personnel's employment. Any Unauthorized Removal may be considered by the State to be a material breach of this Contract, in respect of which the State may elect to terminate this Contract for cause under **Section 25.1**.

(c) It is further acknowledged that an Unauthorized Removal will interfere with the timely and proper completion of this Contract, to the loss and damage of the State, and that it would be impracticable and extremely difficult to fix the actual damage sustained by the State as a result of any Unauthorized Removal. Therefore, Contractor and the State agree that in the case of any Unauthorized Removal in respect of which the State does not elect to exercise its rights under **Section 25.1**, Contractor will issue to the State an amount equal to $25,000 per individual (each, an "**Unauthorized Removal Credit**").

(d) Contractor acknowledges and agrees that each of the Unauthorized Removal Credits assessed under **Subsection (c)** above: (i) is a reasonable estimate of and compensation for the anticipated or actual harm to the State that may arise from the Unauthorized Removal, which would be impossible or very difficult to accurately estimate; and (ii) may, at the State's option, be credited or set off against any Fees or other charges payable to Contractor under this Contract.

12.4 Subcontractors. Contractor will not, without the prior written approval of the State, which consent may be given or withheld in the State's sole discretion, engage any Third Party to perform Services. The State's approval of any such Third Party (each approved Third Party, a "**Permitted Subcontractor**") does not relieve Contractor of its representations, warranties or obligations under this Contract. Without limiting the foregoing, Contractor will:

(a) be responsible and liable for the acts and omissions of each such Permitted Subcontractor (including such Permitted Subcontractor's employees who, to the extent providing Services or Deliverables, shall be deemed Contractor Personnel) to the same extent as if such acts or omissions were by Contractor or its employees;

(b) name the State a third-party beneficiary under Contractor's Contract with each Permitted Subcontractor with respect to the Services;

(c) be responsible for all fees and expenses payable to, by or on behalf of each Permitted Subcontractor in connection with this Contract, including, if applicable, withholding of income

taxes, and the payment and withholding of social security and other payroll taxes, unemployment insurance, workers' compensation insurance payments and disability benefits; and

(d) notify the State of the location of the Permitted Subcontractor and indicate if it is located within the continental United States.

13. State Obligations.

13.1 State Resources and Access. The State is responsible for:

(a) providing the State Materials and such other resources as may be specified in the Statement of Work (collectively, "**State Resources**"); and

(b) if the Software is internally hosted on State systems, providing Contractor Personnel with such access to the Site(s) and Operating Environment as is necessary for Contractor to perform its obligations on a timely basis as set forth in the Statement of Work.

13.2 State Project Manager. Throughout the Term of this Contract, the State will maintain a State employee to serve as the State's Project Manager under this Contract. The State's Project Manager will be identified in the Statement of Work. The State's Project Manager will be available as set forth in the Statement of Work.

14. Pre-Delivery Testing.

14.1 Testing by Contractor. Before delivering and installing the Software, Contractor must:

(a) test the Software to confirm that it is fully operable, meets all applicable Specifications and will function in accordance with the Specifications and Documentation when properly installed in the Operating Environment;

(b) scan the Software using industry standard scanning software and definitions to confirm it is free of Harmful Code; and

(c) remedy any Non-Conformity or Harmful Code identified and retest and rescan the Software.

14.2 Test Data and Estimates. Unless otherwise specified in the Statement of Work, Contractor shall provide to the State all test data and testing scripts used by Contractor for its pre-delivery testing ("**Test Data**"), together with the results Contractor expects to be achieved by processing the Test Data using the Software ("**Test Estimates**," and together with Test Data, "**Contractor's Test Package**").

15. Acceptance Testing.

15.1 Acceptance of the Software or System. Requirements for Acceptance Testing of the Solution are set forth in **Schedule H**.

15.2 Delivery, Acceptance and Warranty of Hardware. Requirements for delivery, acceptance and warranty of Hardware are set forth in **Schedule I**.

15.3 Acceptance of Installation and Integration. The successful installation and integration as outlined in **Schedule H**

16. Training. Contractor shall provide, at no additional charge, training on all uses of the Software and Hardware permitted hereunder in accordance with the times, locations and other terms set forth in the Statement of Work. Upon the State's request, Contractor shall timely provide training for additional Authorized Users or other additional training on all uses of the Software or Hardware for which the State requests such training, at such reasonable times and locations and pursuant to such rates and other terms as are set forth in the Pricing Schedule.

17. Maintenance Releases; New Versions

17.1 Maintenance Releases. Provided that the State is current on its Support Services Fees, during the Term, Contractor shall provide the State, at no additional charge, with all Maintenance Releases, each of which will constitute Software and be subject to the Contract Terms of this Contract.

17.2 New Versions. Provided that the State is current on its Support Services Fees, during the Term, Contractor shall provide the State, at no additional charge, with all New Versions, each of which will constitute Software and be subject to the Contract Terms of this Contract.

17.3 Installation. The State has no obligation to install or use any Maintenance Release or New Versions. If the State wishes to install any Maintenance Release or New Version, the State shall have the right to have such Maintenance Release or New Version installed, in the State's discretion, by Contractor or other authorized party as set forth in the Statement of Work. Contractor shall provide the State, at no additional charge, adequate Documentation for installation of the Maintenance Release or New Version, which has been developed and tested by Contractor and Acceptance Tested by the State. The State's decision not to install or implement a Maintenance Release or New Version of the Software will not affect its right to receive Support Services throughout the Term of this Contract.

18. Source Code Escrow

18.1 Escrow Contract. The parties will enter into a separate intellectual property escrow agreement. Such escrow agreement will govern all aspects of Source Code escrow and release.

18.2 Deposit. Within ___ business days of the Effective Date, Contractor shall deposit with the Escrow Agent, pursuant to the procedures of the Escrow Agreement, the source code for the Software, as well as the Documentation and names and contact information for each author or other creator of the Software. Promptly after release of any update, upgrade, patch, bug fix, enhancement, new version, or other revision to the Software, Contractor shall deposit updated source code, documentation, names, and contact information with the Escrow Agent. ("Deposit Material" refers to material required to be deposited pursuant to this Subsection (18.2)).

18.3 Verification. At State's request and expense, the Escrow Agent may at any time verify the Deposit Material, including without limitation by compiling source code, comparing it to the Software, and reviewing the completeness and accuracy of any and all material. In the event that the Deposit Material does not conform to the requirements of Subsection 18.2 above: (i) Contractor shall promptly deposit conforming Deposit Material; and (ii) Contractor shall pay the Escrow Agent for subsequent verification of the new Deposit Material. Any breach of the provisions of Subsection 18.3(i) above will constitute material breach of this Agreement, and no further payments will be due from the State until such breach is cured, in addition to such other remedies as the State may have.

18.4 License grant. Contractor hereby grants the State a license to use, reproduce, and create derivative works from the Deposit Material, provided the State may not distribute or sublicense the Deposit Material or make any use of it whatsoever except for such internal use as is necessary to maintain and support the Software and Solution. Copies of the Deposit Material created or transferred pursuant to this Agreement are licensed, not sold, and the State receives no title to or ownership of any copy or of the Deposit Material itself. The Deposit Material constitutes Confidential Information of Contractor pursuant to **Section 23** of this Contract (provided no provision of **Section 23.5** calling for return or destruction of Confidential Information before termination of this Contract will apply to the Deposit Material).

19. Fees

19.1 License Fee. In consideration of, and as payment in full for, the rights and license to use the Software and Documentation as provided in this Contract and the License Agreement, the State shall pay to Contractor the license fees (the "**License Fee**") set forth on the Pricing Schedule, subject to and in accordance with the Contract Terms of this Contract and the License Agreement, including the applicable timetable and other provisions of the Statement of Work and this **Section 19**.

19.2 Implementation Fees. In consideration of, and as payment in full for, Contractor's provision of implementation services as provided in this Contract and the Statement of Work, the State shall pay to Contractor the implementation fees (the "**Implementation Fees**") set forth on the Pricing Schedule, subject to and in accordance with the Contract Terms of this Contract, including the applicable timetable and other provisions of the Statement of Work and this **Section 19**.

19.3 Support Service Fees. In consideration of Contractor providing the Support Services as required under the Maintenance and Support Schedule (as applicable) or the Service Level Agreement (as applicable), the State shall pay to Contractor the Support Services fees (the "**Support Service Fees**") set forth in the Pricing Schedule, subject to and in accordance with the Contract Terms of this Contract, including the applicable provisions of the Maintenance and Support Schedule (as applicable) or the Service Level Agreement (as applicable) and this **Section 19**.

19.4 Firm Pricing/Fee Changes. All Pricing set forth in this Contract is firm and will not be increased, except as otherwise expressly provided in this **Section 19.4**.

(a) The License Fee will not be increased at any time except for the addition of additional licenses, the fees for which licenses will also remain firm in accordance with the Pricing set forth in the Pricing Schedule.

20. Invoices and Payment.

20.1 Invoices. Contractor will invoice the State for Fees in accordance with the requirements set forth in the Statement of Work, including any requirements that condition the rendering of invoices and the payment of Fees upon the successful completion of Milestones. Contractor must submit each invoice in both hard copy and electronic format, via such delivery means and to such address as are specified by the State in the Statement of Work. Each separate invoice must:

(a) clearly identify the Contract and purchase order number to which it relates, in such manner as is required by the State;

(b) list each Fee item separately;

(c) include sufficient detail for each line item to enable the State to satisfy its accounting and charge-back requirements;

(d) for Fees determined on a time and materials basis, report details regarding the number of hours performed during the billing period, the skill or labor category for such Contractor Personnel and the applicable hourly billing rates;

(e) include such other information as may be required by the State as set forth in the Statement of Work; and

(f) Itemized invoices must be submitted to DTMB-Accounts-Payable@michigan.gov.

20.2 Payment. Invoices are due and payable by the State, in accordance with the State's standard payment procedures as specified in 1984 Public Act no. 279, MCL 17.51, et seq., within forty-five (45) calendar days after receipt, provided the State determines that the invoice was properly rendered. The State will only disburse payments under this Contract through Electronic Funds Transfer (EFT). Contractor must register with the State at http://www.michigan.gov/SIGMAVSS to receive electronic fund transfer payments. If Contractor does not register, the State is not liable for failure to provide payment

20.3 Taxes. The State is exempt from State sales tax for direct purchases and may be exempt from federal excise tax, if Services or Deliverables purchased under this Contract are for the State's exclusive use. Notwithstanding the foregoing, all Fees are inclusive of taxes, and Contractor is responsible for all sales, use and excise taxes, and any other similar taxes, duties and charges of any kind imposed by any federal, state, or local governmental entity on any amounts payable by the State under this Contract.

20.4 Payment Disputes. The State may withhold from payment any and all payments and amounts the State disputes in good faith, pending resolution of such dispute, provided that the State:

(a) timely renders all payments and amounts that are not in dispute;

(b) notifies Contractor of the dispute prior to the due date for payment, specifying in such notice:

(i) the amount in dispute; and

(ii) the reason for the dispute set out in sufficient detail to facilitate investigation by Contractor and resolution by the parties;

(c) works with Contractor in good faith to resolve the dispute promptly; and

(d) promptly pays any amount determined to be payable by resolution of the dispute.

Contractor shall not withhold any Services or fail to perform any obligation hereunder by reason of the State's good faith withholding of any payment or amount in accordance with this **Section 20.4** or any dispute arising therefrom.

20.5 Right of Setoff. Without prejudice to any other right or remedy it may have, the State reserves the right to set off at any time any amount owing to it by Contractor against any amount payable by the State to Contractor under this Contract.

21. Intellectual Property Rights

21.1 Ownership Rights in Software

(a) Subject to the rights and licenses granted by Contractor in this Contract and the License Agreement, and the provisions of **Section 21(b)**:

(i) Contractor reserves and retains its entire right, title and interest in and to all Intellectual Property Rights arising out of or relating to the Software; and

(ii) none of the State or Authorized Users acquire any ownership of Intellectual Property Rights in or to the Software or Documentation as a result of this Contract.

(b) As between the State, on the one hand, and Contractor, on the other hand, the State has, reserves and retains, sole and exclusive ownership of all right, title and interest in and to User Data, including all Intellectual Property Rights arising therefrom or relating thereto.

21.2 Rights in Open-Source Components. Ownership of all Intellectual Property Rights in Open-Source Components shall remain with the respective owners thereof, subject to the State's rights under the applicable Open-Source Licenses.

21.3 The State is and will be the sole and exclusive owner of all right, title, and interest in and to all API and Work Product developed exclusively for the State under this Contract, including all Intellectual Property Rights. In furtherance of the foregoing:

(a) Contractor will create all API and Work Product as work made for hire as defined in Section 101 of the Copyright Act of 1976; and

(b) to the extent any API, Work Product, or Intellectual Property Rights do not qualify as, or otherwise fails to be, work made for hire, Contractor hereby:

(i) assigns, transfers, and otherwise conveys to the State, irrevocably and in perpetuity, throughout the universe, all right, title, and interest in and to such API or Work Product, including all Intellectual Property Rights; and

(ii) irrevocably waives any and all claims Contractor may now or hereafter have in any jurisdiction to so-called “moral rights” or rights of *droit moral* with respect to the API or Work Product.

22. State Data.

22.1 Ownership. The State’s data (“**State Data**”), which will be treated by Contractor as Confidential Information, includes: (a) User Data; and (b) any other data collected, used, processed, stored, or generated by the State in connection with the Services. State Data is and will remain the sole and exclusive property of the State and all right, title, and interest in the same is reserved by the State. This **Section 22.1** survives termination or expiration of this Contract.

22.2 Contractor Use of State Data. Contractor is provided a limited license to State Data for the sole and exclusive purpose of providing the Services, including a license to collect, process, store, generate, and display State Data only to the extent necessary in the provision of the Services. Contractor must: (a) keep and maintain State Data in strict confidence, using such degree of care as is appropriate and consistent with its obligations as further described in this Contract and applicable law to avoid unauthorized access, use, disclosure, or loss; (b) use and disclose State Data solely and exclusively for

the purpose of providing the Services, such use and disclosure being in accordance with this Contract, any applicable Statement of Work, and applicable law; and (c) not use, sell, rent, transfer, distribute, or otherwise disclose or make available State Data for Contractor's own purposes or for the benefit of anyone other than the State without the State's prior written consent. This **Section 22.2** survives termination or expiration of this Contract.

22.3 Loss or Compromise of Data. In the event of any act, error or omission, negligence, misconduct, or breach on the part of Contractor that compromises or is suspected to compromise the security, confidentiality, or integrity of State Data or the physical, technical, administrative, or organizational safeguards put in place by Contractor that relate to the protection of the security, confidentiality, or integrity of State Data, Contractor must, as applicable: (a) notify the State as soon as practicable but no later than twenty-four (24) hours of becoming aware of such occurrence; (b) cooperate with the State in investigating the occurrence, including making available all relevant records, logs, files, data reporting, and other materials required to comply with applicable law or as otherwise required by the State; (c) perform or take any other actions required to comply with applicable law as a result of the occurrence; (d) pay for any costs associated with the occurrence, including but not limited to any costs incurred by the State in investigating and resolving the occurrence, including reasonable attorney's fees associated with such investigation and resolution; (e) without limiting Contractor's obligations of indemnification as further described in this Contract, indemnify, defend, and hold harmless the State for any and all claims, including reasonable attorneys' fees, costs, and incidental expenses, which may be suffered by, accrued against, charged to, or recoverable from the State in connection with the occurrence; (f) be responsible for recreating lost State Data in the manner and on the schedule set by the State without charge to the State; and (g) provide to the State a detailed plan within ten (10) calendar days of the occurrence describing the measures Contractor will undertake to prevent a future occurrence. Notification to affected individuals, as described above, must comply with applicable law, be written in plain language, not be tangentially used for any solicitation purposes, and contain, at a minimum: name and contact information of Contractor's representative; a description of the nature of the loss; a list of the types of data involved; the known or approximate date of the loss; how such loss may affect the affected individual; what steps Contractor has taken to protect the affected individual; what steps the affected individual can take to protect himself or herself; contact information for major credit card reporting agencies; and, information regarding the credit and identity monitoring services to be provided by Contractor. The State will have the option to review and approve any notification sent to affected individuals prior to its delivery. Notification to any other party, including but not limited to public media outlets, must be reviewed and approved by the State in writing prior to its dissemination. This **Section 22.3** survives termination or expiration of this Contract.

23. Confidential Information. Each party acknowledges that it may be exposed to or acquire communication or data of the other party that is confidential in nature and is not intended to be disclosed to third parties. This **Section 23** survives termination or expiration of this Contract.

23.1 Meaning of Confidential Information. The term "**Confidential Information**" means all information and documentation of a party that: (a) has been marked "confidential" or with words of similar meaning, at the time of disclosure by such party; (b) if disclosed orally or not marked "confidential" or with words of similar meaning, was subsequently summarized in writing by the disclosing party and marked "confidential" or with words of similar meaning; and, (c) should reasonably be recognized as confidential information of the disclosing party. The term "Confidential Information" does not include any information or documentation that was or is: (a) in the possession of the State and subject to disclosure under the Michigan Freedom of Information Act (FOIA); (b) already in the possession of the receiving party without

an obligation of confidentiality; (c) developed independently by the receiving party, as demonstrated by the receiving party, without violating the disclosing party's proprietary rights; (d) obtained from a source other than the disclosing party without an obligation of confidentiality; or, (e) publicly available when received, or thereafter became publicly available (other than through any unauthorized disclosure by, through, or on behalf of, the receiving party). Notwithstanding the above, in all cases and for all matters, State Data is deemed to be Confidential Information.

23.2 Obligation of Confidentiality. The parties agree to hold all Confidential Information in strict confidence and not to copy, reproduce, sell, transfer, or otherwise dispose of, give or disclose such Confidential Information to third parties other than employees, agents, or subcontractors of a party who have a need to know in connection with this Contract or to use such Confidential Information for any purposes whatsoever other than the performance of this Contract. The parties agree to advise and require their respective employees, agents, and subcontractors of their obligations to keep all Confidential Information confidential. Disclosure to the Contractor's subcontractor is permissible where: (a) the subcontractor is a Permitted Subcontractor; (b) the disclosure is necessary or otherwise naturally occurs in connection with work that is within the Permitted Subcontractor's responsibilities; and (c) Contractor obligates the Permitted Subcontractor in a written contract to maintain the State's Confidential Information in confidence. At the State's request, any of the Contractor's Representatives may be required to execute a separate agreement to be bound by the provisions of this **Section 23.2**.

23.3 Cooperation to Prevent Disclosure of Confidential Information. Each party must use its best efforts to assist the other party in identifying and preventing any unauthorized use or disclosure of any Confidential Information. Without limiting the foregoing, each party must advise the other party immediately in the event either party learns or has reason to believe that any person who has had access to Confidential Information has violated or intends to violate the terms of this Contract. Each party will cooperate with the other party in seeking injunctive or other equitable relief against any such person.

23.4 Remedies for Breach of Obligation of Confidentiality. Each party acknowledges that breach of its obligation of confidentiality may give rise to irreparable injury to the other party, which damage may be inadequately compensable in the form of monetary damages. Accordingly, a party may seek and obtain injunctive relief against the breach or threatened breach of the foregoing undertakings, in addition to any other legal remedies which may be available, to include, in the case of the State, at the sole election of the State, the immediate termination, without liability to the State, of this Contract or any Statement of Work corresponding to the breach or threatened breach.

23.5 Surrender of Confidential Information upon Termination. Upon termination or expiration of this Contract or a Statement of Work, in whole or in part, each party must, within five (5) Business Days from the date of termination, return to the other party any and all Confidential Information received from the other party, or created or received by a party on behalf of the other party, which are in such party's possession, custody, or control. If Contractor or the State determine that the return of any Confidential Information is not feasible, such party must destroy the Confidential Information and certify the same in writing within five (5) Business Days from the date of termination to the other party.

24. ADA Compliance. The State is required to comply with the Americans with Disabilities Act of 1990 (ADA), and has adopted a formal policy regarding accessibility requirements for websites and software applications. Contractor's Service Software must comply, where relevant, with level AA of the World Wide Web Consortium (W3C) Web Content Accessibility Guidelines (WCAG) 2.0.

25. Termination, Expiration, Transition. The State may terminate this Contract, the Support Services, or any Statement of Work, in accordance with the following:

25.1 Termination for Cause. In addition to any right of termination set forth elsewhere in this Contract:

(a) The State may terminate this Contract for cause, in whole or in part, if Contractor, as determined by the State: (i) endangers the value, integrity, or security of State Systems, State Data, or the State's facilities or personnel; (ii) becomes insolvent, petitions for bankruptcy court proceedings, or has an involuntary bankruptcy proceeding filed against it by any creditor; or (iii) breaches any of its material duties or obligations under this Contract. Any reference to specific breaches being material breaches within this Contract will not be construed to mean that other breaches are not material.

(b) If the State terminates this Contract under this **Section 25.1**, the State will issue a termination notice specifying whether Contractor must: (a) cease performance immediately, or (b) continue to perform for a specified period. If it is later determined that Contractor was not in breach of this Contract, the termination will be deemed to have been a termination for convenience, effective as of the same date, and the rights and obligations of the parties will be limited to those provided in **Section 25.2**.

(c) The State will only pay for amounts due to Contractor for Services accepted by the State on or before the date of termination, subject to the State's right to set off any amounts owed by the Contractor for the State's reasonable costs in terminating this Contract. Contractor must promptly reimburse to the State any Fees prepaid by the State prorated to the date of such termination, including any prepaid Support Services Fees. Further, Contractor must pay all reasonable costs incurred by the State in terminating this Contract for cause, including administrative costs, attorneys' fees, court costs, transition costs, and any costs the State incurs to procure the Services from other sources.

25.2 Termination for Convenience. The State may immediately terminate this Contract in whole or in part, without penalty and for any reason, including but not limited to, appropriation or budget shortfalls. The termination notice will specify whether Contractor must: (a) cease performance immediately, or (b) continue to perform in accordance with **Section 25.3**. If the State terminates this Contract for convenience, the State will pay all reasonable costs, as determined by the State, for State approved Transition Responsibilities to the extent the funds are available.

25.3 Transition Responsibilities. Upon termination or expiration of this Contract for any reason, Contractor must, for a period of time specified by the State (not to exceed 90 calendar days; the "**Transition Period**"), provide all reasonable transition assistance requested by the State, to allow for the expired or terminated portion of the Contract to continue without interruption or adverse effect, and to facilitate the orderly transfer of the Services to the State or its designees. Such transition assistance may include but is not limited to: (a) continuing to perform the Services at the established Contract rates; (b) taking all reasonable and necessary measures to transition performance of the work, including all applicable Services to the State or the State's designee; (c) taking all necessary and appropriate steps, or such other action as the State may direct, to preserve, maintain, protect, or return to the State all State Data; and (d) preparing an accurate accounting from which the State and Contractor may reconcile all outstanding accounts (collectively, the "**Transition Responsibilities**"). The Term of this Contract is automatically extended through the end of the Transition Period.

25.4 Survival. This **Section 25** survives termination or expiration of this Contract.

26. Stop Work Order. The State may, at any time, order the Services of Contractor fully or partially stopped for its own convenience for up to ninety (90) calendar days at no additional cost to the State. The State will provide Contractor a written notice detailing such suspension (a "**Stop Work Order**"). Contractor must comply with the Stop Work Order upon receipt. Within 90 days, or any longer period agreed to by Contractor, the State will either: (a) issue a notice authorizing Contractor to resume work, or (b) terminate this Contract. The State will not pay for any Services, Contractor's lost profits, or any additional compensation during a stop work period.

27. Contractor Representations and Warranties.

27.1 Authority. Contractor represents and warrants to the State that:

(a) It is duly organized, validly existing, and in good standing as a corporation or other entity as represented under this Contract under the laws and regulations of its jurisdiction of incorporation, organization, or chartering;

(b) It has the full right, power, and authority to enter into this Contract, to grant the rights and licenses granted under this Contract, and to perform its contractual obligations;

(c) The execution of this Contract by its Representative has been duly authorized by all necessary organizational action; and

(d) When executed and delivered by Contractor, this Contract will constitute the legal, valid, and binding obligation of Contractor, enforceable against Contractor in accordance with its terms.

27.2 Bid Response. Contractor represents and warrants to the State that:

(a) The prices proposed by Contractor were arrived at independently, without consultation, communication, or agreement with any other Contractor for the purpose of restricting competition; the prices quoted were not knowingly disclosed by Contractor to any other Contractor to the RFP; and no attempt was made by Contractor to induce any other Person to submit or not submit a proposal for the purpose of restricting competition;

(b) All written information furnished to the State by or for Contractor in connection with this Contract, including Contractor's Bid Response, is true, accurate, and complete, and contains no untrue statement of material fact or omits any material fact necessary to make the information not misleading;

(c) Contractor is not in material default or breach of any other contract or agreement that it may have with the State or any of its departments, commissions, boards, or agencies. Contractor further represents and warrants that it has not been a party to any contract with the State or any of its departments that was terminated by the State within the previous five (5) years for the reason that Contractor failed to perform or otherwise breached an obligation of the contract; and

(d) If any of the certifications, representations, or disclosures made in Contractor's Bid Response change after contract award, the Contractor is required to report those changes immediately to the Contract Administrator.

27.3 Software Representations and Warranties. Contractor further represents and warrants to the State that:

(a) it is the legal and beneficial owner of the entire right, title and interest in and to the Software, including all Intellectual Property Rights relating thereto;

(b) it has, and throughout the license term, will retain the unconditional and irrevocable right, power and authority to grant and perform the license hereunder;

(c) the Software, and the State's use thereof, is and throughout the license term will be free and clear of all encumbrances, liens and security interests of any kind;

(d) neither its grant of the license, nor its performance under this Contract does or to its knowledge will at any time:

(i) conflict with or violate any applicable Law;

(ii) require the consent, approval or authorization of any governmental or regulatory authority or other third party; or

(iii) require the provision of any payment or other consideration to any third party;

(e) when used by the State or any Authorized User in accordance with this Contract and the Documentation, the Software or Documentation as delivered or installed by Contractor does not or will not:

(i) infringe, misappropriate or otherwise violate any Intellectual Property Right or other right of any third party; or

(ii) fail to comply with any applicable Law;

(f) as provided by Contractor, the Software does not or will not at any time during the license term contain any:

(i) Harmful Code; or

(ii) Open-Source Components or operate in such a way that it is developed or compiled with or linked to any Open-Source Components, other than Approved Open-Source Components specifically described in the Statement of Work.

(g) all Documentation is and will be complete and accurate in all material respects when provided to the State such that at no time during the license term will the Software have any material undocumented feature; and

(h) it will perform all Services in a timely, skillful, professional and workmanlike manner in accordance with commercially reasonable industry standards and practices for similar services, using personnel with the requisite skill, experience and qualifications, and will devote adequate resources to meet its obligations under this Contract.

(i) when used in the Operating Environment (or any successor thereto) in accordance with the Documentation, all Software as provided by Contractor, will be fully operable, meet all

applicable specifications, and function in all respects, in conformity with this Contract and the Documentation; and

(j) no Maintenance Release or New Version, when properly installed in accordance with this Contract, will have a material adverse effect on the functionality or operability of the Software.

27.4 Hardware Representations and Warranties.

(a) all Hardware is delivered free from any security interest, lien, or encumbrance and will continue in that respect;

(b) the Hardware will not infringe the patent, trademark, copyright, trade secret, or other proprietary rights of any third party;

(c) Contractor must assign or otherwise transfer to the State or its designee any manufacturer's warranty for the Hardware.

27.5 Disclaimer. EXCEPT FOR THE EXPRESS WARRANTIES SET FORTH IN THIS AGREEMENT, CONTRACTOR HEREBY DISCLAIMS ALL WARRANTIES, WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE, WITH RESPECT TO THIS CONTRACT.

28. Indemnification

28.1 General Indemnification. Contractor must defend, indemnify and hold the State, its departments, divisions, agencies, offices, commissions, officers, and employees harmless, without limitation, from and against any and all actions, claims, losses, liabilities, damages, costs, attorney fees, and expenses (including those required to establish the right to indemnification), arising out of or relating to: (a) any breach by Contractor (or any of Contractor's employees, agents, subcontractors, or by anyone else for whose acts any of them may be liable) of any of the promises, agreements, representations, warranties, or insurance requirements contained in this Contract; (b) any infringement, misappropriation, or other violation of any Intellectual Property Right or other right of any Third Party; and (c) any bodily injury, death, or damage to real or tangible personal property occurring wholly or in part due to action or inaction by Contractor (or any of Contractor's employees, agents, subcontractors, or by anyone else for whose acts any of them may be liable).

28.2 Indemnification Procedure. The State will notify Contractor in writing if indemnification is sought; however, failure to do so will not relieve Contractor, except to the extent that Contractor is materially prejudiced. Contractor must, to the satisfaction of the State, demonstrate its financial ability to carry out these obligations. The State is entitled to: (i) regular updates on proceeding status; (ii) participate in the defense of the proceeding; (iii) employ its own counsel; and to (iv) retain control of the defense, at its own cost and expense, if the State deems necessary. Contractor will not, without the State's prior written consent (not to be unreasonably withheld), settle, compromise, or consent to the entry of any judgment in or otherwise seek to terminate any claim, action, or proceeding. Any litigation activity on behalf of the State or any of its subdivisions, under this **Section 28**, must be coordinated with the Department of Attorney General. An attorney designated to represent the State may not do so until approved by the Michigan Attorney General and appointed as a Special Assistant Attorney General.

28.3 Infringement Remedies.

(a) The remedies set forth in this **Section 28.3** are in addition to, and not in lieu of, all other remedies that may be available to the State under this Contract or otherwise, including the State's right to be indemnified for such actions.

(b) If any Software or any component thereof, other than State Materials, is found to be infringing or if any use of any Software or any component thereof is enjoined, threatened to be enjoined or otherwise the subject of an infringement claim, Contractor must, at Contractor's sole cost and expense:

(i) procure for the State the right to continue to use such Software or component thereof to the full extent contemplated by this Contract; or

(ii) modify or replace the materials that infringe or are alleged to infringe ("**Allegedly Infringing Materials**") to make the Software and all of its components non-infringing while providing fully equivalent features and functionality.

(c) If neither of the foregoing is possible notwithstanding Contractor's best efforts, then Contractor may direct the State to cease any use of any materials that have been enjoined or finally adjudicated as infringing, provided that Contractor will:

(i) refund to the State all amounts paid by the State in respect of such Allegedly Infringing Materials and any other aspects of the Software provided under the Statement of Work for the Allegedly Infringing Materials that the State cannot reasonably use as intended under this Contract; and

(ii) in any case, at its sole cost and expense, secure the right for the State to continue using the Allegedly Infringing Materials for a transition period of up to six (6) months to allow the State to replace the affected features of the Software without disruption.

(d) If Contractor directs the State to cease using any Software under **subsection (c)**, the State may terminate this Contract for cause under **Section 25.1**.

(e) Contractor will have no liability for any claim of infringement arising solely from:

(i) Contractor's compliance with any designs, specifications, or instructions of the State; or

(ii) modification of the Software by the State without the prior knowledge and approval of Contractor;

unless the claim arose against the Software independently of any of the above specified actions.

29. Liquidated Damages.

29.1 The parties agree that any delay or failure by Contractor to timely perform its obligations in accordance with the Implementation Plan and Milestone Dates agreed to by the parties will interfere with the proper and timely implementation of the Software and/or Hardware, to the loss and damage of the State. Further, the State will incur major costs to perform the obligations that would have otherwise been

performed by Contractor. The parties understand and agree that any liquidated damages Contractor must pay to the State as a result of such nonperformance are described in the Statement of Work, and that these amounts are reasonable estimates of the State's damages in accordance with applicable Law.

29.2 The parties acknowledge and agree that Contractor could incur liquidated damages for more than one event if Contractor fails to timely perform its obligations by each Milestone Date.

29.3 The assessment of liquidated damages will not constitute a waiver or release of any other remedy the State may have under this Contract for Contractor's breach of this Contract, including without limitation, the State's right to terminate this Contract for cause under **Section 25.1**, and the State will be entitled in its discretion to recover actual damages caused by Contractor's failure to perform its obligations under this Contract. However, the State will reduce such actual damages by the amounts of liquidated damages received for the same events causing the actual damages.

29.4 Amounts due the State as liquidated damages may be set off against any Fees payable to Contractor under this Contract, or the State may bill Contractor as a separate item and Contractor will promptly make payments on such bills.

30. Damages Disclaimers and Limitations.

30.1 The State's Disclaimer of Damages. NEITHER PARTY WILL BE LIABLE, REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY OR BY STATUTE OR OTHERWISE, FOR ANY CLAIM RELATED TO OR ARISING UNDER THIS CONTRACT FOR CONSEQUENTIAL, INCIDENTAL, INDIRECT, OR SPECIAL DAMAGES, INCLUDING WITHOUT LIMITATION LOST PROFITS AND LOST BUSINESS OPPORTUNITIES.

30.2 The State's Limitation of Liability. IN NO EVENT WILL THE STATE'S AGGREGATE LIABILITY TO CONTRACTOR UNDER THIS CONTRACT, REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY OR BY STATUTE OR OTHERWISE, FOR ANY CLAIM RELATED TO OR ARISING UNDER THIS CONTRACT, EXCEED THE MAXIMUM AMOUNT OF FEES PAYABLE UNDER THIS CONTRACT.

31. Records Maintenance, Inspection, Examination, and Audit.

31.1 Right of Audit. The State or its designee may audit Contractor to verify compliance with this Contract. Contractor must retain and provide to the State or its designee and the auditor general upon request, all financial and accounting records related to this Contract through the Term of this Contract and for four (4) years after the latter of termination, expiration, or final payment under this Contract or any extension ("**Financial Audit Period**"). If an audit, litigation, or other action involving the records is initiated before the end of the Financial Audit Period, Contractor must retain the records until all issues are resolved.

31.2 Right of Inspection. Within ten (10) calendar days of providing notice, the State and its authorized representatives or designees have the right to enter and inspect Contractor's premises or any other places where Services are being performed, and examine, copy, and audit all records related to this Contract. Contractor must cooperate and provide reasonable assistance. If financial errors are revealed, the amount in error must be reflected as a credit or debit on subsequent invoices until the amount is paid or refunded. Any remaining balance at the end of this Contract must be paid or refunded within forty-five (45) calendar days.

31.3 Application. This **Section 31** applies to Contractor, any Affiliate, and any Permitted Subcontractor that performs Services in connection with this Contract.

32. Insurance

32.1 Required Coverage.

(a) **Insurance Requirements.** Contractor must maintain the insurances identified below and is responsible for all deductibles. All required insurance must: (a) protect the State from claims that may arise out of, are alleged to arise out of, or result from Contractor's or a subcontractor's performance; (b) be primary and non-contributing to any comparable liability insurance (including self-insurance) carried by the State; and (c) be provided by an company with an A.M. Best rating of "A" or better and a financial size of VII or better.

Insurance Type	Additional Requirements
Commercial General Liability Insurance	
Minimal Limits: $1,000,000 Each Occurrence Limit $1,000,000 Personal & Advertising Injury Limit $2,000,000 General Aggregate Limit $2,000,000 Products/Completed Operations Deductible Maximum: $50,000 Each Occurrence	Contractor must have their policy endorsed to add "the State of Michigan, its departments, divisions, agencies, offices, commissions, officers, employees, and agents" as additional insureds using endorsement CG 20 10 11 85, or both CG 2010 07 04 and CG 2037 07 0.
Umbrella or Excess Liability Insurance	
Minimal Limits: $5,000,000 General Aggregate	Contractor must have their policy endorsed to add "the State of Michigan, its departments, divisions, agencies, offices, commissions, officers, employees, and agents" as additional insureds.
Automobile Liability Insurance	
Minimal Limits: $1,000,000 Per Occurrence	

Workers' Compensation Insurance	
Minimal Limits: Coverage according to applicable laws governing work activities.	Waiver of subrogation, except where waiver is prohibited by law.
Employers Liability Insurance	
Minimal Limits: $500,000 Each Accident $500,000 Each Employee by Disease $500,000 Aggregate Disease.	
Privacy and Security Liability (Cyber Liability) Insurance	
Minimal Limits: $1,000,000 Each Occurrence $1,000,000 Annual Aggregate	Contractor must have their policy: (1) endorsed to add “the State of Michigan, its departments, divisions, agencies, offices, commissions, officers, employees, and agents” as additional insureds; and (2) cover information security and privacy liability, privacy notification costs, regulatory defense and penalties, and website media content liability.
Minimal Limits: $1,000,000 Employee Theft Per Loss	Contractor must have their policy: (1) cover forgery and alteration, theft of money and securities, robbery and safe burglary, computer fraud, funds transfer fraud, money order and counterfeit currency, and (2) endorsed to add “the State of Michigan, its departments, divisions, agencies, offices, commissions, officers, employees, and agents” as Loss Payees.
Minimal Limits: $3,000,000 Each Occurrence $3,000,000 Annual Aggregate	

Deductible Maximum: $50,000 Per Loss	

(b) If Contractor's policy contains limits higher than the minimum limits, the State is entitled to coverage to the extent of the higher limits. The minimum limits are not intended and may not be construed to limit any liability or indemnity of Contractor to any indemnified party or other persons.

(c) If any of the required policies provide claim-made coverage, the Contractor must: (a) provide coverage with a retroactive date before the effective date of the contract or the beginning of contract work; (b) maintain coverage and provide evidence of coverage for at least three (3) years after completion of the contract of work; and (c) if coverage is canceled or not renewed, and not replaced with another claims-made policy form with a retroactive date prior to the contract effective date, Contractor must purchase extended reporting coverage for a minimum of three (3) years after completion of work.

(d) Contractor must: (a) provide insurance certificates to the Contract Administrator, containing the agreement or purchase order number, at Contract formation and within 20 calendar days of the expiration date of the applicable policies; (b) require that subcontractors maintain the required insurances contained in this Section; (c) notify the Contract Administrator within 5 business days if any insurance is cancelled; and (d) waive all rights against the State for damages covered by insurance. Failure to maintain the required insurance does not limit this waiver.

32.2 Non-waiver. This **Section 32** is not intended to and is not be construed in any manner as waiving, restricting or limiting the liability of either party for any obligations under this Contract (including any provisions hereof requiring Contractor to indemnify, defend and hold harmless the State).

33. Dispute Resolution.

33.1 Unless otherwise specified in the Statement of Work, the parties will endeavor to resolve any Contract dispute in accordance with **Section 33** (the "**Dispute Resolution Procedure**"). The initiating party will reduce its description of the dispute to writing (including all supporting documentation) and deliver it to the responding party's Project Manager. The responding party's Project Manager must respond in writing within five (5) Business Days. The initiating party has five (5) Business Days to review the response. If after such review resolution cannot be reached, both parties will have an additional five (5) Business Days to negotiate in good faith to resolve the dispute. If the dispute cannot be resolved within a total of fifteen (15) Business Days, the parties must submit the dispute to the parties' Contract Administrators. The parties will continue performing while a dispute is being resolved, unless the dispute precludes performance. A dispute involving payment does not preclude performance.

33.2 Litigation to resolve the dispute will not be instituted until after the dispute has been elevated to the parties' Contract Administrators, and either Contract Administrator concludes that resolution is unlikely, or fails to respond within fifteen (15) Business Days. The parties are not prohibited from instituting formal proceedings: (a) to avoid the expiration of statute of limitations period; (b) to preserve a superior position with respect to creditors; or (c) where a party makes a determination that a temporary

restraining order or other injunctive relief is the only adequate remedy. This **Section 33** does not limit the State's right to terminate this Contract.

34. General Provisions

34.1 Force Majeure.

(a) Force Majeure Events. Subject to **Subsection (b)** below, neither party will be liable or responsible to the other party, or be deemed to have defaulted under or breached this Contract, for any failure or delay in fulfilling or performing any term hereof, when and to the extent such failure or delay is caused by: acts of God, flood, fire or explosion, war, terrorism, invasion, riot or other civil unrest, embargoes or blockades in effect on or after the date of this Contract, national or regional emergency, or any passage of law or governmental order, rule, regulation or direction, or any action taken by a governmental or public authority, including imposing an embargo, export or import restriction, quota or other restriction or prohibition (each of the foregoing, a "**Force Majeure**"), in each case provided that: (a) such event is outside the reasonable control of the affected party; (b) the affected party gives prompt written notice to the other party, stating the period of time the occurrence is expected to continue; (c) the affected party uses diligent efforts to end the failure or delay and minimize the effects of such Force Majeure Event.

(b) State Performance; Termination. In the event of a Force Majeure Event affecting Contractor's performance under this Contract, the State may suspend its performance hereunder until such time as Contractor resumes performance. The State may terminate this Contract by written notice to Contractor if a Force Majeure Event affecting Contractor's performance hereunder continues substantially uninterrupted for a period of five (5) Business Days or more. Unless the State terminates this Contract pursuant to the preceding sentence, any date specifically designated for Contractor's performance under this Contract will automatically be extended for a period up to the duration of the Force Majeure Event.

34.2 Further Assurances. Each party will, upon the reasonable request of the other party, execute such documents and perform such acts as may be necessary to give full effect to the terms of this Contract.

34.3 Relationship of the Parties. The relationship between the parties is that of independent contractors. Nothing contained in this Contract is to be construed as creating any agency, partnership, joint venture or other form of joint enterprise, employment or fiduciary relationship between the parties, and neither party has authority to contract for or bind the other party in any manner whatsoever.

34.4 Media Releases. News releases (including promotional literature and commercial advertisements) pertaining to this Contract or project to which it relates must not be made without the prior written approval of the State, and then only in accordance with the explicit written instructions of the State.

34.5 Notices. All notices, requests, consents, claims, demands, waivers and other communications under this Contract must be in writing and addressed to the parties as follows (or as otherwise specified by a party in a notice given in accordance with this **Section 34.5**):

If to Contractor: Econolite Systems, Inc.
1250 N. Tustin Ave.
Anaheim, CA 92807

Email: jringler@econolite.com

Attention: Jon Ringler, Vice President

If to State: State of Michigan
DTMB Central Procurement,
525 W. Allegan St.
PO Box 30026
Lansing, MI 48909

Email: martinc20@michigan.gov

Attention: Christopher Martin, Category Analyst

Notices sent in accordance with this **Section 34.5** will be deemed effectively given: (a) when received, if delivered by hand (with written confirmation of receipt); (b) when received, if sent by a nationally recognized overnight courier (receipt requested); (c) on the date sent by e-mail (with confirmation of transmission), if sent during normal business hours of the recipient, and on the next Business Day, if sent after normal business hours of the recipient; or (d) on the fifth (5^{th}) day after the date mailed, by certified or registered mail, return receipt requested, postage prepaid.

34.6 Headings. The headings in this Contract are for reference only and do not affect the interpretation of this Contract.

34.7 Assignment. Contractor may not assign or otherwise transfer any of its rights, or delegate or otherwise transfer any of its obligations or performance, under this Contract, in each case whether voluntarily, involuntarily, by operation of law or otherwise, without the State's prior written consent. The State has the right to terminate this Contract in its entirety or any Services or Statements of Work hereunder, pursuant to **Section 25.1**, if Contractor delegates or otherwise transfers any of its obligations or performance hereunder, whether voluntarily, involuntarily, by operation of law or otherwise, and no such delegation or other transfer will relieve Contractor of any of such obligations or performance. For purposes of the preceding sentence, and without limiting its generality, any merger, consolidation or reorganization involving Contractor (regardless of whether Contractor is a surviving or disappearing entity) will be deemed to be a transfer of rights, obligations, or performance under this Contract for which the State's prior written consent is required. Any purported assignment, delegation, or transfer in violation of this **Section 34.7** is void.

34.8 No Third-party Beneficiaries. This Contract is for the sole benefit of the parties and their respective successors and permitted assigns. Nothing herein, express or implied, is intended to or will confer on any other person or entity any legal or equitable right, benefit or remedy of any nature whatsoever under or by reason of this Contract.

34.9 Amendment and Modification; Waiver. No amendment to or modification of this Contract is effective unless it is in writing, identified as an amendment to this Contract and signed by both parties

Contract Administrator. Further, certain amendments to this Contract may require State Administrative Board Approval. No waiver by any party of any of the provisions of this Contract will be effective unless explicitly set forth in writing and signed by the party so waiving. Except as otherwise set forth in this Contract, no failure to exercise, or delay in exercising, any right, remedy, power, or privilege arising from this Contract will operate or be construed as a waiver. Nor will any single or partial exercise of any right, remedy, power or privilege under this Contract preclude the exercise of any other right, remedy, power or privilege.

34.10 Severability. If any term or provision of this Contract is invalid, illegal or unenforceable in any jurisdiction, such invalidity, illegality or unenforceability will not affect any other term or provision of this Contract or invalidate or render unenforceable such term or provision in any other jurisdiction. Upon such determination that any term or other provision is invalid, illegal or unenforceable, the parties hereto will negotiate in good faith to modify this Contract so as to effect the original intent of the parties as closely as possible in a mutually acceptable manner in order that the transactions contemplated hereby be consummated as originally contemplated to the greatest extent possible.

34.11 Governing Law. This Contract is governed, construed, and enforced in accordance with Michigan law, excluding choice-of-law principles, and all claims relating to or arising out of this Contract are governed by Michigan law, excluding choice-of-law principles. Any dispute arising from this Contract must be resolved in the Michigan Court of Claims. Complaints against the State must be initiated in Ingham County, Michigan. Contractor waives any objections, such as lack of personal jurisdiction or forum non conveniens. Contractor must appoint agents in Michigan to receive service of process.

34.12 Equitable Relief. Each party to this Contract acknowledges and agrees that (a) a breach or threatened breach by such party of any of its obligations under this Contract may give rise to irreparable harm to the other party for which monetary damages would not be an adequate remedy and (b) in the event of a breach or a threatened breach by such party of any such obligations, the other party hereto is, in addition to any and all other rights and remedies that may be available to such party at law, at equity or otherwise in respect of such breach, entitled to equitable relief, including a temporary restraining order, an injunction, specific performance and any other relief that may be available from a court of competent jurisdiction, without any requirement to post a bond or other security, and without any requirement to prove actual damages or that monetary damages will not afford an adequate remedy. Each party to this Contract agrees that such party will not oppose or otherwise challenge the appropriateness of equitable relief or the entry by a court of competent jurisdiction of an order granting equitable relief, in either case, consistent with the terms of this **Section 34.12**.

34.13 Nondiscrimination. Under the Elliott-Larsen Civil Rights Act, 1976 PA 453, MCL 37.2101, et seq., the Persons with Disabilities Civil Rights Act, 1976 PA 220, MCL 37.1101, et seq., and Executive Directive 2019-09, Vendor and its subcontractors agree not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of race, color, religion, national origin, age, sex (as defined in Executive Directive 2019-09), height, weight, marital status, partisan considerations, any mental or physical disability, or genetic information that is unrelated to the person's ability to perform the duties of a particular job or position. Breach of this covenant is a material breach of the Contract.

34.14 Unfair Labor Practice. Under MCL 423.324, the State may void any Contract with a Contractor or Permitted Subcontractor who appears on the Unfair Labor Practice register compiled under MCL 423.322.

34.15 Schedules All Schedules that are referenced herein and attached hereto are hereby incorporated by reference. The following Schedules are attached hereto and incorporated herein:

Schedule A	Statement of Work and Requirements
Schedule B	Maintenance and Support
Schedule C	Licensing Agreement
Schedule D	Pricing
Schedule E	Service Level Agreement
Schedule F	Data Security Requirements
Schedule G	Disaster Recovery Plan
Schedule H	Acceptance Testing
Schedule I	Terms for On-Site Hardware
Schedule J	Server Hardware Requirements
Exhibit D	Controller Unit (CU) Requirements
Exhibit E	Cellular Modem Requirements
Exhibit F	Managed Ethernet Field Switch Requirements
Exhibit G	Phase 1 Intersections

34.16 Counterparts. This Contract may be executed in counterparts, each of which will be deemed an original, but all of which together are deemed to be one and the same agreement and will become effective and binding upon the parties as of the Effective Date at such time as all the signatories hereto have signed a counterpart of this Contract. A signed copy of this Contract delivered by facsimile, e-mail or other means of electronic transmission (to which a signed copy is attached) is deemed to have the same legal effect as delivery of an original signed copy of this Contract.

34.17 Effect of Contractor Bankruptcy. All rights and licenses granted by Contractor under this Contract are and will be deemed to be rights and licenses to "intellectual property," and all Software and Deliverables are and will be deemed to be "embodiments" of "intellectual property," for purposes of, and as such terms are used in and interpreted under, Section 365(n) of the United States Bankruptcy Code (the "**Code**"). If Contractor or its estate becomes subject to any bankruptcy or similar proceeding, the State retains and has the right to fully exercise all rights, licenses, elections, and protections under this Contract, the Code and all other applicable bankruptcy, insolvency, and similar Laws with respect to all Software and other Deliverables. Without limiting the generality of the foregoing, Contractor acknowledges and agrees that, if Contractor or its estate shall become subject to any bankruptcy or similar proceeding:

(a) all rights and licenses granted to the State under this Contract will continue subject to the Contract Terms of this Contract, and will not be affected, even by Contractor's rejection of this Contract; and

(b) the State will be entitled to a complete duplicate of (or complete access to, as appropriate) all such intellectual property and embodiments of intellectual property comprising or relating to any Software or other Deliverables, and the same, if not already in the State's possession, will be promptly delivered to the State, unless Contractor elects to and does in fact continue to perform all of its obligations under this Contract.

34.18 Compliance with Laws. Contractor and its Representatives must comply with all Laws in connection with this Contract.

34.19 Non-Exclusivity. Nothing contained in this Contract is intended nor is to be construed as creating any requirements contract with Contractor. This Contract does not restrict the State or its agencies from acquiring similar, equal, or like Services from other sources.

34.20 Administrative Fee and Reporting Contractor must pay an administrative fee of 1% on all payments made to Contractor under the Contract including transactions with the State (including its departments, divisions, agencies, offices, and commissions), MiDEAL members, and other states (including governmental subdivisions and authorized entities). Administrative fee payments must be made by check payable to the State of Michigan and mailed to:

Department of Technology, Management and Budget
Cashiering
P.O. Box 30681
Lansing, MI 48909

Contractor must submit an itemized purchasing activity report, which includes at a minimum, the name of the purchasing entity and the total dollar volume in sales. Reports should be mailed to MiDeal@michigan.gov.

The administrative fee and purchasing activity report are due within 30 calendar days from the last day of each calendar quarter

34.21 Extended Purchasing Program. This contract is extended to MiDEAL members. MiDEAL members include local units of government, school districts, universities, community colleges, and nonprofit hospitals. A current list of MiDEAL members is available at www.michigan.gov/mideal. Upon written agreement between the State and Contractor, this contract may also be extended to: (a) State of Michigan employees and (b) other states (including governmental subdivisions and authorized entities).

If extended, Contractor must supply all Contract Activities at the established Contract prices and terms. The State reserves the right to impose an administrative fee and negotiate additional discounts based on any increased volume generated by such extensions.

Contractor must submit invoices to, and receive payment from, extended purchasing program members on a direct and individual basis.

34.22 Entire Agreement. This Contract, together with all Schedules, Exhibits, and the Statement of Work constitutes the sole and entire agreement of the parties to this Contract with respect to the subject matter contained herein, and supersedes all prior and contemporaneous understandings and agreements, representations and warranties, both written and oral, with respect to such subject matter. In the event of any inconsistency between the statements made in the body of this Contract, the Schedules, Exhibits, and the Statement of Work, the following order of precedence governs: (a) first, this Contract, excluding its Exhibits and Schedules, and the Statement of Work; and (b) second, the Statement of Work as of the Effective Date; and (c) third, the Exhibits and Schedules to this Contract as of the Effective Date. NO TERMS ON CONTRACTORS INVOICES, WEBSITE, BROWSE-WRAP, SHRINK-WRAP, CLICK-WRAP, CLICK-THROUGH OR OTHER NON-NEGOTIATED TERMS AND CONDITIONS PROVIDED WITH ANY OF THE SERVICES, OR DOCUMENTATION HEREUNDER WILL CONSTITUTE A PART OR AMENDMENT OF THIS CONTRACT OR IS BINDING ON THE STATE OR ANY AUTHORIZED USER FOR ANY PURPOSE. ALL SUCH OTHER TERMS AND CONDITIONS HAVE NO FORCE AND EFFECT AND ARE DEEMED REJECTED BY THE STATE AND THE AUTHORIZED USER, EVEN IF ACCESS TO OR USE OF SUCH SERVICE OR DOCUMENTATION REQUIRES AFFIRMATIVE ACCEPTANCE OF SUCH TERMS AND CONDITIONS.

STATE OF MICHIGAN

Contract No. 190000001522
Central Signal Control System

Schedule A
PROJECT SCOPE

1. DEFINITIONS

The following terms have the meanings set forth below. All initial capitalized terms that are not defined below shall have the respective meanings given to them in **Section 1** of the Contract Terms. "Solution" means the software (Commercial-Off-the-Shelf (COTS) or a Software as a Service (SaaS)) and Hardware (includes but is not limited to cellular modems – **Schedule E & F**) CU install (**Schedule D**), and Signalized Intersection Integration.

Term	Definition
API	Application Programming Interface
ATC	Advanced Traffic Controller
ATMS	Advanced Traffic Management System
C2C	Center to Center
C2F	Center-to-Field
CCTV	Closed Circuit Television
CMU	Conflict Monitor Unit
COTS	Commercial Off-The-Shelf
CSCS	Central Signal Control System
CU	Controller Unit
CV	Connected Vehicles
DMS	Dynamic Message Signs
DOW	Day of Week
DSRC	Dedicated Short-Range Communication
DTMB	Department of Technology, Management, and Budget
FIPS	Federal Information Processing Standards
GIS	Geographic Information Systems
GUI	Graphical User Interface
Hardware	Hardware required to be supplied by Contractor, including but not limited to center to field communications equipment installed in each signal cabinet to provide Ethernet connectivity from CU to the central software
IDS	Intrusion Detection System
IPS	Intrusion Prevention System
ITS	Intelligent Transportation System
LOS	Level of Service
MDOT	Michigan Department of Transportation
MIB	Management Information Bases
MMU	Malfunction Management Unit
MOE	Measures of Effectiveness
NEMA	National Electrical Manufacturers Association

Term	Definition
NIST	National Institute of Standards and Technology
NMS	Network Management System
NTCIP	National Transportation Communications for Intelligent Transportation System Protocol
NTP	Network Time Protocol
ODBC	Open Database Capability
PTZ	Pan/Tilt/Zoom
QA	Quality Assurance
RFP	Request for Proposal
RPM	Remote Power Management
SaaS	Software as a Service
SAE	Society of Automotive Engineers
SAML	Security Assertion Markup Language
SMS	Text
SNMP	Simple Network Management Protocol
Software	COTS or SaaS.
Solution	The combination of Software and Hardware, CU Install, and Signalized Intersection Integration.
SSO	Single Sign-on
TMDD	Traffic Management Data Dictionary
TOD	Time of Day
TSD	Time Space Diagrams
UPS	Uninterruptible Power Supply
VPN	Virtual Private Network
WBS	Work Breakdown Structure
WDT	Watchdog Timer

2. BACKGROUND

The Michigan Department of Transportation (MDOT) has identified the need to implement a central signal control system (CSCS) to provide the ability to remotely manage and monitor traffic signals and optimize operations and maintenance (O&M) procedures. MDOT recently developed a competitive controller unit (CU) specification based on the NEMA Advanced Transportation Controller (ATC) type to meet current operational and future connected vehicle needs. MDOT's current NEMA ATC Special Provision (SP) allows for the use of the following two CUs, which provide functionality that meets or exceeds operational characteristics as described in *NEMA TS-2-2016*, including *National Transportation Communications for ITS Protocol (NTCIP)*:

- Siemens m60 NEMA ATC loaded with Siemen's SEPAC controller firmware version 5 over Linux using NTCIP communications.
- Econolite Cobalt NEMA ATC loaded with Econolite's EOS controller firmware version 03.01.28 over NTCIP communications.

A critical element of the CSCS is to function seamlessly with both controllers. Therefore, the CSCS must be integrated with all the features of the two controllers/firmware listed in MDOT's NEMA ATC SP. Integration must include all the base features available through NTCIP or other open protocols/data object definitions (e.g., NTCIP 1202 mandatory objects) as well as all vendor-specific features available

through vendor-specific Management Information Bases (MIBs). All functionality that is available locally at the controller must also be available remotely through the Software.

MDOT will provide and make available to the Contractor the MIBs of the two controllers listed above. The MIBs will be made available in industry standard electronic and Portable Document Format (PDF) formats to allow for custom integration into the CSCS software to provide all controller functionality via remote software application.

MDOT's Traffic Signals Unit currently has remote monitoring and management capability to approximately 16% (500) of its nearly 3,200 traffic signals through a workstation using Siemens TACTICS software. Access to this workstation located in Lansing, Michigan will be made available to the selected Contractor to support the data migration and implementation of the CSCS.

Due to budget constraints, the CSCS deployment will be phased over several years. MDOT has obligated funding for Phase 1, which includes the CSCS deployment and integration of 280 traffic signal locations. Future phases are planned to occur following Phase 1, but funding has not been allocated, as identified in the below table. Therefore, this Contract is for Phase 1. See **Schedule D – Pricing**. Pricing for future expansion items will be valid for the duration of this contract, and MDOT is under no obligation to authorize any of the future expansion items.

Phase	Number of Signals	Notes
Phase 1	280 MDOT owned, operated, and maintained	Funded
Future Phases	Approximately 1,365 MDOT owned, operated and maintained signals Approximately 1,498 MDOT owned and local agency operated and maintained signals	Dependent on future funding and local agency participation

Schedule A (and the accompanying Schedules and Exhibits) defines the services, hardware, software, and integration for the CSCS. MDOT will procure traffic signal CUs for the Contractor to configure, install, and integrate.

Phase 1 intersection locations are provided in **Exhibit G – Phase 1 Intersections**. All signals within an identified common group must be deployed together to avoid negatively impacting traffic operations. A finalized a list of locations will be provided at project kickoff and locations are subject to change during project but if a change out of a location is necessary, it will be done in the same region of the state. **Exhibit G – Phase 1 Intersections** identifies the 16 signals (5%) that must be prioritized as the first deployment group.

3. PURPOSE

Contractor is providing a hybrid system consisting of a COTS (on-premise for operational control) and a SaaS portion for data analytics (collectively, "Software"). State of Michigan will provide the hardware (severs, firewalls, switches) necessary for local hosting per requirements provided by the Contractor. SaaS portion will be hosted and maintained by the Contractor.

As roadway technology continues to advance at an unprecedented pace, MDOT's traffic signal system requires an investment to overhaul the aging signal system and prepare for the future of traffic signal management. The ability to remotely manage and control traffic signals is the nucleus to provide the enhanced capabilities to optimize traffic signal operations, improve safety, provide quick and effective responses to disruptive incidents, reduce system maintenance costs, and prepare for future traffic management (i.e. performance metrics, connected vehicles, and adaptive traffic signal timings). MDOT has established the following goals for the CSCS:

- Increase the efficiency of Michigan's roadways
    - Provide active and remote traffic signal monitoring
    - Improve safety, enhance reliability, and reduce congestion
- Streamline the management of a critical asset

    - DOT staff responsibilities
    - Arterial performance
- Prepare for the future of traffic signal management
    - Provide interoperability with controller specification
    - Adaptive timings, signal priority, multi-modal
    - Active traffic management and integrated corridor management
    - Provide structure for future connected vehicle operations
- Bring MDOT up to a level of service and functionality compared to peer states

4. Legacy Controller Firmware Compatibility

The Solution must provide full remote, functionality with the 280 Phase 1 CUs loaded with Siemens and Econolite ATC firmwares listed in the Background and as described **Exhibit A – Table 1 – Business Specification Worksheet**. In addition, the Contractor has described their Solution's compatibility/functionality with legacy equipment in the following table:

Controller/Firmware	Functionality Provided by CSCS
M60/SEPAC v5	**Centracs support currently under development**
M50/SEPAC v4	**Supported**
M50/SEPAC v3	**Proprietary, non-NTCIP protocol, not supported**

5. CONTRACT TERM

The contract overall term is 5 years with 5, 1-year options

6. SPECIFIC STANDARDS

IT Policies, Standards and Procedures (PSP)

Contractors are advised that the State has methods, policies, standards and procedures that have been developed over the years. Contractors are expected to conform to State IT policies and standards. All services and products provided must comply with all applicable State IT policies and standards. Contractor is required to review all applicable links provided below:

Public IT Policies, Standards and Procedures (PSP):
https://www.michigan.gov/dtmb/0,5552,7-358-82547_56579_56755---,00.html

Acceptable Use Policy

To the extent that Contractor has access to the State's computer system, Contractor must comply with the State's Acceptable Use Policy, see https://www.michigan.gov/documents/dtmb/1340.00.01_Acceptable_Use_of_Information_Technology_Standard_458958_7.pdf. All Contractor Personnel will be required, in writing, to agree to the State's Acceptable Use Policy before accessing the State's system. The State reserves the right to terminate Contractor's access to the State's system if a violation occurs.

Mobile Responsiveness

The Contractor's Solution must utilize responsive design practices where possible to ensure the application is accessible via a mobile device where possible. Contractor must provide a list of all mobile devices that are compatible with the Solution. Additionally, Contractor must provide list of features that can be performed via a mobile device.

ADA Compliance

The State is required to comply with the Americans with Disabilities Act of 1990 (ADA), and has adopted a formal policy regarding accessibility requirements for websites and software applications. The State is requiring that Contractor's Solution, where relevant, to level AA of the World Wide Web Consortium (W3C) Web Content Accessibility Guidelines (WCAG) 2.0. Contractor may consider, where relevant, the W3C's Guidance on Applying WCAG 2.0 to Non-Web Information and Communications Technologies (WCAG2ICT) for non-web software and content. The State may require that Contractor complete a Voluntary Product Accessibility Template for WCAG 2.0 (WCAG 2.0 VPAT) or other comparable

document for the Solution.
http://www.michigan.gov/documents/dmb/1650.00_209567_7.pdf?20151026134621

7. USER TYPE AND CAPACITY

Type of User	Access Type	Number of Users	Number of Concurrent Users
State Employees	Least Privileged	100	50
Trusted Third Parties	Least Privileged	100	50

Contractor must be able to meet the expected number of concurrent Users. Contractor must also scale up or down without affecting performance.

Project Phase	Total Number of Signals
Phase 1	280
Future Planned Phases	1635
	3143
Maximum Capacity (Potential Expansion)	5,000

Contractor must meet the total expected number of signals in Phase 1 Contractor must be able to scale up or down to accommodate future phases and maximum capacity without affecting performance.

Contractor provided hardware requirements that details minimums for meeting latency response time (i.e., Generate Page Load, standardized reporting, ad hoc reporting). The Contractor identified what network connectivity and equipment the State must have to meet the expected latency response time. See **Schedule J – Vendor System Hardware Requirements**

8. ACCESS CONTROL AND AUDIT

The Contractor's Solution must integrate with the State's IT Identity and Access Management (IAM) environment as described in the State of Michigan Digital Strategy (http://www.michigan.gov/dtmb/0,5552,7-150-56345_56351_69611-336646--,00.html), which consist of:

1. MILogin/Michigan Identity, Credential, and Access Management (MICAM)
    a. An enterprise single sign-on and identity management solution based on IBM's Identity and Access Management products including, IBM Security Identity Manager (ISIM), IBM Security Access Manager for Web (ISAM), IBM Tivoli Federated Identity Manager (TFIM), IBM Security Access Manager for Mobile (ISAMM), and IBM DataPower, which enables the State to establish, manage, and authenticate user identities for the State's Information Technology (IT) systems.
2. MILogin Identity Federation
    a. Allows federated single sign-on (SSO) for business partners, as well as citizen-based applications.
3. MILogin Multi Factor Authentication (MFA, based on system data classification requirements)
    a. Required for those applications where data classification is Confidential and Restricted as defined by the 1340.00 Michigan Information Technology Information Security standard (i.e. the proposed Solution must comply with PHI, PCI, CJIS, IRS, and other standards).

4. MILogin Identity Proofing Services (based on system data classification requirements)
    a. A system that verifies individual's identities before the State allows access to its IT system. This service is based on "life history" or transaction information aggregated from public and proprietary data sources. A leading credit bureau provides this service.

To integrate with the SOM MILogin solution, the Contractor's Solution must support HTTP Headers based SSO, or SAML, or OAuth or OpenID interfaces for the SSO purposes.

The Solution must support Federal Information Processing Standards (FIPS)/National Institute of Standards and Technology (NIST) compliant multi-factor authentication for privileged/administrative or other identified access.

9. DATA RETENTION

The Contractor must collect and archive data elements such as historic and current traffic timing parameters, system events, alerts, user activity, and high-resolution and/or detector data.

10. SECURITY

The NIST cybersecurity framework (See Figure 1) outlines the Functions, Categories, Subcategories and Informative Reference standards.

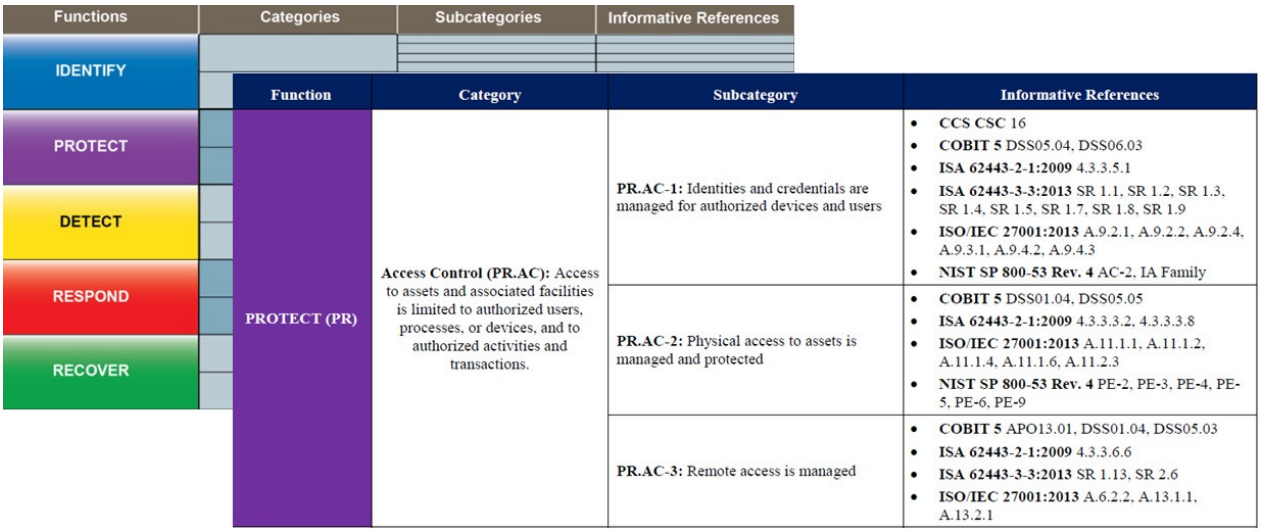


Figure 1 - NIST Cybersecurity Framework

Table 1 - Security Recommendations

Key Vulnerability	Remedial Actions
Openness of NTCIP standards with default community names, published SNMP objects, and unsecure FTP offer documented and simple means for unauthorized access to systems.	Econolite is actively working with the NTCIP committees to adopt secure transport layers within these base standards. We additionally support secure access methods within our traffic controller, however, need to harmonize our approaches with the national standards.

Key Vulnerability	Remedial Actions
Long standing design of center-to-field networks as serial/private infrastructure has set precedence for poor network design and maintenance practices as they are converted to IP/public network access.	Centracs ATMS has been designed to provide isolation/Protection of C2F network from Agency WAN. • Econolite services provides review of field network to ensure best practices are implemented. • Management of open device ports is performed wherever possible. • Cellular VPN services are utilized where cellular connections are needed. (APN/VPN) • Firewalled cloud interfaces are unidirectional from servers to cloud where possible
ATC controller standards offer a common hardware/OS platform but facilitate hacking via clear documentation of system design and components.	Econolite recommendation: • 3rd party penetration testing of OS/BSP/Hardware susceptibilities is recommended. • Econolite defaults configuration of software with closure of all unnecessary ports/services. • Network device monitoring (SNMP) support within traffic controllers is offered.
Cabinet Standards increase risks via: • More network devices within cabinet that seek remote management (Detection, MMU/CMU, RSU) • Cheap (unmanaged) network devices commonly applied. • Cabinet Door Keys are commonly keyed the same and provide access risks. • Technician USB usage presents risk of physical infection of network devices. • Wireless devices work even with door closed.	Econolite recommends: • 3rd party security validation of all networked devices • Careful protection of MMU as last resort to critical safety failure • Abandon #2 Cabinet key as a locking solution • Mandate and monitor dedicated USB/Datakeys for file management • Secure packages on Datakey keys to ensure loading of protected content. • Only use Wi-Fi adapters while technician at cabinet (one per tech, not cabinet) • Closure of all unnecessary ports/services/software
ITS Software presents many additional security concerns including: • Few use logon credentials within software • NTCIP access often works without logon credentials • Web interfaces are becoming a common UI that require external connection. • Peer-to-Peer applications expand network vulnerabilities • USB stick usage for software loading and configuration transfer are commonplace.	Econolite Recommends: • Application of logon credentials within software systems. • Configuration of system reporting to cabinet door opening events without controller logon. • Ensure all NTCIP interfaces are encrypted. • Mandate and monitor dedicated USB/Datakeys for file management • Protect peer communications via port management.

Connected Vehicle based systems open many new vulnerabilities including:
• Many new app vendors / stakeholders are entering the ITS space that have little experience with the safety and security needs of traffic control systems.
  • Failsafe design of CV systems is often overlooked?
  • Desire for cloud/secondary network interfaces from traffic cabinets introduces risks.
• CV applications co-hosted on ATC hardware may introduce myriad risks to the critical control applications.
• Data hungry buzzards are seeking access to devices and system, even offering to drop their own cellular links into the system to access this
	Econolite Recommends:
	• Ensure new vendors follow existent standards and work through trusted partners.
	• Protect all CV network and backhaul points within cabinet/RSU. Avoid bridging external networks to C2F network!!! (separate VLANs wherever possible)
	• Separation of ATC hardware applications physically from CV applications via the use of a Connected Vehicle Co-Processor.
	  • Mandate NTCIP protection of ATC – CVCP (RSU) interfacing
	• Offer field data via managed EDM interfaces, not via access to field equipment

Network Topologies/Security Architecture
Contractor must work with MDOT to design and build out the full security architecture of the system. Centracs provides the following features for role and jurisdiction-based authorization:

- Jurisdiction Roles that allow the for the specification of Entities into distinct control groupings
- Application Roles that allow for the specification of permissions at the application level, such as the right to add or delete Entities or to add a new user
- User roles comprised of application and jurisdiction roles, which are then assigned to users to control access across both sets of roles.
- Granular permissions across the system's functions

Centracs provides two modes of authentication: Active Directory (AD) and native credentials. Active Directory will be the principal means for authentication in this project, and native authentication can be disabled if desired. Centracs' AD feature allows administrators to specify specific AD users, groups, or organizational units for inclusion into Centracs. IT administrators can control access and manage additions or departures from the organization using their AD toolchain. Centracs can synchronize with account changes and apply the appropriate role and permissions based on assigned groups/OUs. Centracs also provides encryption for data at rest converging confidential information. All user credentials are encrypted in the database.

Contractor must address Network Security at the following levels:

Centracs Service to Service: The Centracs Core and Device Manager services communicate with TCP and employ transport level TLS encryption. Authentication and authorization are handled using Windows Communication Foundation and Windows Server account credentials.

Device Manager to Controller: Controllers communicate with two protocols: NTCIP with UDP and SFTP for high-resolution data transfer. Econolite must further enhance the NTCIP communications to provide greater security on that front as well.

Centracs Client to Core: The Centracs Client and Core services communicate with TCP and employ transport level TLS encryption. Authentication and authorization are handled using Windows.

Centracs SPM: There is a one-way data push that only requires an outbound port be available. All traffic is encrypted, and the system requires a unique signature of the expected source in order to establish communications.

Econolite's Centracs roadmap also includes enhancements that will provide additional tracking of user changes, both to controller firmware as well as central software. This will include an extensive user activity audit of what changes were made, at what time, where they originated, and how the user was authenticated.

Externally Hosted
The Solution will be storing sensitive data. Contractor must comply with the Data Security requirements set forth in **Schedule F – Data Security Requirements** to the Contract Terms.

Contractor must comply with the following requirements:

- Must provide a GovCloud Solution that is hosted in a FedRAMP authorized facility and maintain an annual SSAE 16 SOC 2 Type 2 audit based on NIST SP 800-53 moderate controls.
- Must be encrypted in transit and at rest using FIPS certified modules with AES 128 bit or higher encryption.
- Must have FIPS/NIST compliant multi-factor authentication for privileged/administrative access or other identified access.

- Must remain compliant with The Federal Information Security Modernization Act of 2014 (FISMA) and the NIST Special Publication 800-53 (most recent version) MOD controls using minimum control values as established in the applicable SOM PSP's.

On-Premise
Contractor is responsible for establishing and maintaining a data privacy and information security program, including physical, technical, administrative, and organizational safeguards, that is designed to: (a) ensure the security and confidentiality of the State Data; (b) protect against any anticipated threats or hazards to the security or integrity of the State Data; (c) protect against unauthorized disclosure, access to, or use of the State Data; (d) ensure the proper disposal of State Data; and (e) ensure that all Contractor personnel comply with all of the foregoing. In no case will the safeguards of Contractor's data privacy and information security program be less stringent than the safeguards used by the State, and Contractor must at all times comply with all applicable State IT policies and standards, of which publicly available ones are located at http://www.michigan.gov/dtmb/0,4568,7-150-56355_56579_56755---,00.html.

11. END USER OPERATING ENVIRONMENT

The SOM hosting environment is X86 VMware, IBM Power VM and Oracle VM, with supporting enterprise storage monitoring and management.

If the Solution includes a web browser-based application, the software must run under commonly used web browsers. At a minimum the software must support Internet Explorer v9 or higher, Chrome v36 or higher, Firefox v31 or higher, and Safari v5.1 or higher both under the Windows and iOS operating systems.

If the Solution includes a stand-alone, desktop application, the software must run under the most recent Windows operating system and be backward compatible to at least Windows 7.

Solution must support remote access through secure communications connection, such as VPN.

Contractor must support the current and future State standard environments at no additional cost to the State.

12. SOFTWARE

Centracs utilizes a client-server architecture and is built with Microsoft .NET Framework, Windows® Presentation Foundation, and Windows® Communications Foundation. The "core" server provides all the central ATMS functionality (system administration, schedule functions, system alerts, user settings, traffic responsive and adaptive algorithms). A data abstraction layer on top of the Microsoft SQL Server database serves as a broker for all data requests throughout the system. Communications servers handle the real-time device messaging and network interface. All system data is entered through the user interface.

There are no .ini configuration files to edit manually, no direct interaction with the database, and no system restarts for most configuration items. The latest version of Centracs software is provided annually (or more often if patch releases are needed) at no additional cost (when the software maintenance agreement is current). Contactor maintains one version of Centracs. Features that are developed for a singular agency are developed as a modular selection so other users who do not need this support, do not experience clutter of unneeded modules or interfaces.

The Centracs user interface uses "containers" to present data elements in an organized fashion. With full multi-monitor support, the system supports additional frames that can be assigned to each monitor. Each user can save one or more preferred configurations and restore their unique preferences when logged in.

System Map Interface: The main map and intersection graphics display is an integrated part of the system and is not a stand-alone application. The system automatically updates the status of all devices on all map displays once-per-second as data is retrieved from the field devices.

Centracs incorporates an interactive Statewide map as the foundation for the main graphics display. The map can be displayed in any or all the available Centracs “containers” simultaneously or individually. Each instance of the map display is set up independently by panning and zooming such that each map region can be utilized as an individual sub-area for monitoring individual intersections or groups of intersections.

Centracs maps are rendered dynamically using geo-coded Geographic Information Systems (GIS)-based map data. The Centracs system comes preconfigured with rendered map “tiles” generated from geographically accurate HERE map data. HERE map data provides the most accurate street-level rendering capabilities for the Centracs map interface. Street curves, corners, and other geographic entities are depicted accurately and without distortion. The display supports bitmap (.BMP), JPG/JPEG, .PNG, and .GIF raster file formats, ESRI shape files, and SDE version 9.x. Centracs supports Web Map Services (WMS) to display geo-referenced map images from any WMS source, including ESRI ArcInfo Enterprise, if available and properly configured.

Zoom level ranges are configurable such that the display of dynamic and real-time status data appears or changes at various zoom levels. The four supported zoom levels of the map interface include regional, Statewide, corridor, and intersection level.

Alarms: Centracs can be configured to send alerts to users based on specific events from field devices or from components in the system. The existing events are displayed in the Alert Monitor dialog. Centracs receives “Events” from field devices and other points in the system. These “Events” can be logged, but also can generate “Alerts” or initiate other actions to occur.

An “Alert” is a notification sent to, either an online, logged-in user, or an offline recipient via an email or SMS text message. A “Trigger” defines how an event generates an Alert or Action and is user definable.

All Centracs users, whether online or offline, can be assigned to receive alerts. Offline recipients are those individuals that are not currently using the ATMS and therefore require an email or SMS message notification. In order to send emails or SMS text messages, the email server must be configured and setup using the Centracs SMTP Servers main menu setup window.

If an alert is not acknowledged or closed within a certain period, the user may “escalate” the alert or send it to an additional recipient or group of recipients. Centracs allows for this via Alert Escalations.

Traffic Control: Centracs supports five central traffic control strategies that allow the traffic operations staff to ensure the system is either running its normally scheduled TOD patterns, or dynamically commanding alternate patterns to meet non-recurrent traffic patterns, special events, or other needs. The following strategies are offered in order of descending priority:

- Manually Commanded / Overridden
- Incident Response Triggered
- Adaptive (licensed per intersection)
- Traffic Responsive
- Time-of-Day (TOD)

These methods of traffic control can be applied in any combination to individual controllers, sections of controllers, and groups of controllers. Controllers can belong to a single section at any time but can be moved from one section to another manually or by Time-of-Day. Controllers can also belong to multiple groups at any one time, offering maximum flexibility in traffic control strategies.

Reports: Centracs provides a full set of reports that provide insight to the roadway conditions as well as operational status and events within the infrastructure itself. These reports are generated using Microsoft

SQL Reporting Services. Some reports allow for specifying, filtering, and sorting parameters to customize the reports.

Centracs allows user-specific reports to be created and added to the Reports menu item without the requirement of additional third-party software or custom development work by the software provider. Microsoft SQL Reporting Services is provided as the custom report-generating tool.

Dynamic Message Sign (DMS) Management: Centracs supports Dynamic Message Signs allowing users to manage and control signs and messages from within the Centracs user interface. The DMS module has a user interface that supports operations for NTCIP compatible signs, which includes message formatting, true display on workstation, message libraries, and banned word lists.

Signal Performance Measure: The Centracs SPM module offers Signal Performance Measures (SPM) analytics, reporting tools, and even control strategies based on research from the FHWA NCHRP 3-79a program. These tools graphically combine and render detector and other data specific to traffic signal operation. Combines key signal operations data in graphical tools to visually inspect and analyze the performance of traffic timing and coordination.

Automated Signal Retiming: Contractor, using signal performance measurement and optimization, has the capability to automatically re-optimize signal timing through the central system. This capability will eliminate the need for MDOT to fund or perform manual signal re-timing.

Adaptive Signal Control: Centracs Edaptive, cloud-based adaptive solution using high resolution Performance Measures datasets, can adjust cycle length, offset, and splits to ensure the fastest response to unpredictable changes in traffic demand.

Transit Signal Priority (TSP): Basic TSP is implemented by controller software running on the ASC/3 and Cobalt controllers. TSP functions can be managed, monitored and reported via Centracs. Centracs can also provide Route-based Transit and Emergency Vehicle Priority.

Closed Circuit Television (CCTV): Centracs supports video streaming from RTSP sources directly into the Centracs client workstation or via integration into a 3rd party CCTV system. Contractor has partnered with Genetec to integrate their Security Service Video Management software into Centracs. This is offered as an optional module to Centracs.

Centracs Travel Time: Centracs supports data collected by Travel Time systems. This interface provides automated recognition of BlueTOAD devices that can display data on the Centracs system maps by changing roadway colors. Detailed current and historical travel-time reporting for before-after studies. Contractor must work with MDOT to extend the Centracs Travel Time module to support additional data sources from XML feeds (HERE, INRIX, and Uber datasets)

Centracs Local Edition: Allows uploads and downloads from a laptop to locally connected controllers in the field. Allows users to modify controller configurations offline from the central system and synchronize their changes with the main Centracs database when re-connected to the ATMS network.

Server to Server: Allows agencies to participate in cross-jurisdictional management and monitoring of neighboring agency intersections. Adjoining Centracs-managed agencies can seamlessly share data and manage arterial traffic across agency boundaries.

NTCIP Center-to-Center Interface: Exchanges data objects with other central systems using published NTCIP objects including the Traffic Management Data Dictionary (TMDD). Data can be securely exchanged between centers and displayed on each system.

Data Collection and Management System (DCMS): Provides users with real-time traffic monitoring and travel conditions at intersections, mid-blocks, or freeways via vehicle detection devices. On-street video detection devices can be turned into automated virtual count stations that gather traffic data. Expands

support for detectors and other ITS devices that are not connected to a traffic controller. Obtain data needed to optimize traffic signal timing and satisfy federal and state data reporting requirements.

Maintenance Management System: Provides real-time data entry that tracks all field activities and assets. An asset management system that provides document management, staffing management, inventory control, and more. Fully integrates with ATMS module, MMS can respond to system events by creating a service ticket and even dispatching technicians assigned to the affected area or on-call.

Incident Management System (IMS): Contractor has teamed with Waycare to provide arterial incident detection and management capabilities.

Basic Streaming Video Integration: Integration with external video streaming services including MDOT's current Parsons/Delcan video distribution management systems used for ITS applications. The Centracs Client requires network access to the streaming server. View video streams within Centracs sourced at a separate video switch or directly to the field device. Solution carries no 3rd party software licensing fees. Monitor traffic conditions from Autoscope video cameras or other sources. A Centracs workstation with multiple monitors can tile these video feeds in the TMC for a lightweight and low cost "video wall" solution.

Signal Performance Measures (SPM) Architecture: Collects and stores data sets and hosted in the cloud. Application Programming Interfaces (APIs) are available for 3rd parties to quickly and easily access the data sets. Authentication and authorization of 3rd parties and available data sets will be managed by MDOT. MDOT has sole control over who they wish to allow access and to which datasets.

Centracs Application Programming Interface (API): Two principal APIs exist for the system: Center to Center web services with SOAP interface, and a Managed Extensibility Framework (MEF) model.

Strategic and Innovative Approaches: Some of these innovations will be applied to all 280 signals in Phase 1. Others are licensed on a per-intersection basis and typically only deployed at specific locations or corridors. Contractor will deploy an "Innovation Corridor" for up to 16 intersections that will showcase these advanced innovations in Phase 1. This corridor may require that MDOT provide additional detection that is not included. These innovations can be more broadly deployed during future phases, at MDOT's prerogative.

Centracs SPM (Signal Performance Measurement and Optimization): A cloud-based solution that measures and assesses factors that impact traffic signal coordination. Provides efficient and effective tools for optimizing traffic signal timing, coordination and operations. Provides diagnostic dashboards, heat maps and analytical tools that identify problem areas and enables users to understand issues that are affecting traffic flow, traffic signal changes that need to be made, and how well those coordination changes are working. Transforms qualitative and quantitative data into actionable information. Before-and-after charts and reports allow engineers to know how timing and other changes affect traffic flow.

Centracs SPM is an analytic reporting and data management platform for performance-based management of traffic signal operations and maintenance. Maintained and updated by the Contractor. Web user interface provides access any time, any place, on any platform. Data collection is continuous and unobtrusive to the rest of the transportation and traffic signal operations.

Enables signal retiming strategy decisions based on traffic performance data. Proactively optimizes signal timing, enhancing mobility and safety. Centracs SPM is for connected and autonomous vehicle and Smart Community applications.

Contractor must deploy Centracs SPM with Optimization for all 280 of the traffic signals that will be upgraded under Phase 1 of this contract. All signals must automatically run optimized timing patterns. Optimization occurs automatically and maintains the system indefinitely.

Centracs Edaptive: Optimizes cycle, offset, and splits by using high-fidelity 1/10th-second resolution data. Makes timing changes based on data. Centracs Edaptive is web-based and offers analytical capabilities through Centracs SPM for maximum performance of the signal control system. Provides automated real-time signal adaptation using the latest adaptive algorithms. Target applications include corridors with highly variable traffic patterns, changing weather conditions, special events, high-priority corridors requiring maximum performance, and others utilizing existing detection.

Adaptive control is for those signals that do not always follow patterned time of day traffic flow. Contractor must deploy Edaptive control on the Innovation Corridor as a demonstration of the capabilities and benefits to MDOT under the Phase 1 deployment.

Centracs Priority: Contractor offers both a standalone, controller-based solution and a Route-Based Priority (RBP) system solution that uses data from the controller, Centracs and the Transit Management System software.

Controller-Based TSP (Transit Signal Priority): MDOT Cobalt controllers running Econolite's EOS firmware support the following TSP options: TOD inhibit, Queue Clearance Phase, Recover Cycle, and Preempt Recovery.

Route-Based Priority: The Solution includes Controller-based TSP. Contractor deploy a comprehensive Route Priority system for Transit and Emergency Vehicles. The system will use a combination of Transit Signal Priority and Preemption to accommodate priority service request, but new Signal Control Priority Standards are also available.

Transit Signal Priority and Preemption are two options available in the priority scheme. Signal Control Priority (SCP) uses ETA to plan out the method by which to accommodate requests. SCP allows for classification of vehicles that correspond to different control options.

Contractor must deploy one corridor (up to 16 signals) of priority operation as part of Phase 1 of this contract. Contractor must work with MDOT to identify the appropriate corridor and source of priority requests. Priority requests will be generated from CV-based sources using the J2735 Service Request Message, legacy Opticom inputs and peer-to-peer transmission of estimated time of arrival between intersections (an EOS feature), or from a centralized Automatic Vehicle Location (AVL) source.

Incident Management and Integrated Corridor Management: Incident management systems require three core capabilities be supported by infrastructure:

1. Rapid and accurate positive detection of incidents.
2. Traffic control methods that can quickly prepare for and adapt to the redirection of traffic around these incident locations.
3. Roadway user notification of incidents, including suggested alternate routes to improve the dynamic route selection for those users not being navigated by on-board systems.

Contractor has partnered with Waycare (www.waycaretech.com) to provide an integration between the Centracs ATMS system and the Waycare Event Monitoring and Notification system to provide these three capabilities in an integrated manner.

Detection of Incidents: Waycare's incident detection system monitors data sources and applies AI techniques to identify anomalous roadway activity. This system automatically detects roadway incidents without the need for human monitoring of the roadway.

Centracs-Waycare integration will improve the accuracy and speed of incident identification by relaying real-time detection and event information from traffic controllers into the Waycare deep learning algorithms. AI algorithms will discern localized anomalies from the system-wide and commonly recurrent traffic patterns. Shared data will include all detectors for all Econolite controllers within the traffic management system (stop bar, advance, pedestrian, system) and all event data as generated by the NCHRP 3-79a Signal Performance Measures data collection subsystem. Centracs will collect and supply

this local detection and controller data in one-minute intervals, to ensure the Waycare system can discern these incidents as quickly as possible.

Incident Management Traffic Control Methods: Contractor will leverage the capabilities of the Centracs system and the newest controller firmware (EOS) to ensure roadway capacities are prepared for diversionary traffic flows prior to in-vehicle navigation systems sending drivers onto alternate routes. Centracs and EOS provide continued real-time optimization of the traffic congestion levels, once these alternate timing plans have been deployed, and their capacities challenged with the diverted traffic patterns.

Solution will use a two-stage approach that begins with immediate triggering of redirected roadway capacity to alternate, predefined routes. Followed with a second stage of control that involves optimization of alternate routes based on the cycle-by-cycle growth of volumes.

Incident Event Notification: The integration of the Waycare and Centracs systems allows consistent messaging and triggering of action plans. Incidents in the Waycare system share the same naming conventions within the Centracs system. Shared configuration parameters setup in one system are automatically shared with the other to avoid redundancy or confusion.

The Waycare platform synthesizes incident and other traffic data into one layered GIS screen. Operators have a global view of current road conditions and areas requiring attention. Incidents are sourced from both 911 calls and through in-vehicle data events. Open incidents, hazards, and other warnings are visible on the map and within the reporting module. Operators can access all the relevant information, view the user log, update the incident details, and locate the most relevant cameras and update other infrastructure such as DMS.

The proposed Centracs system will include this Incident Management capability demonstrated in the Innovation Corridor.

Integrated Corridor & Active Traffic Management Interfaces: A platform that ties incident management capabilities for critical arterials that are adjacent to high volume sections of interstates throughout Michigan. With existing Phase 1 intersections, an ICM program could potentially be developed using M-125 through Monroe, adjacent to freight-heavy I-75 south of Detroit. Contractor will deploy the Waycare incident detection system as a trigger to these events, and/or develop a data interface to currently installed operations platforms (via DUAP or other interfaces) that manage the freeways.

Connected Vehicle Integration & Preparedness: Contractor is currently implementing aspects of the trajectory-based measurement and control. Contractor will equip one signal within the Innovation Corridor with trajectory-based sensors and trajectory analysis engine. Contractor will not invoke trajectory-based control over the signals but use for trajectory measurement and identification of safety conflicts for offline analysis by researchers and MDOT staff.

ATMS as a Component of EDM: Contractor has developed intersection data collection software that fuses roadway sensors and traffic controller state information within legacy standards into a CV-ready framework that includes real-time status, control interfaces, as well as future-state projections of the interactions between roadway users and infrastructure. This localized information is additionally merged within the cloud-hosted Centracs SPM system for system-wide analytical processing of local intersection datasets among the entire roadway network, preparing these datasets for integration with other Smart Community subsystems.

This architecture results in a data dictionary that can be served via two distinct Application Programing Interfaces (API's):

1. One API is offered at the intersection edge, primarily used for real-time (<100 milliseconds latency) applications such an in-vehicle systems, real time traffic control, mobile edge compute applications, and mobile devices utilized by roadway users.

2. A second API is offered at from the Econolite's Azure-hosted cloud for near-real-time (2-3 seconds latent) data interfaces as well as historical record of intersection datasets.

Upon subscription to this API, data is offered for most signals utilizing Econolite control equipment and systems. The data availability is dependent upon the type of infrastructure (especially vehicle detection) installed at each intersection as well as the active state of the Center-to-Field (C2F) communications channels. Contractor is not currently collecting and/or archiving information for all 100,000+ signals under control of Econolite software. However, Contractor will engage in this data collection, transfer, and archive upon request of 3rd parties seeking access through API services.

Contractor will deploy its API for the signals contained in the MDOT Innovation Corridor. This API will function with Centracs SPM for the 16 Innovation Corridor signals as well as other Phase 1 signals that MDOT may choose to deploy Centracs SPM.

Smart Community/CV/Integrated Corridor: Contractor will deploy a Pilot Corridor comprised of up to 16 intersections where the new research and technology discussed above can be applied. The location of this Smart Pilot Corridor to be determined by MDOT. Contractor will equip these intersections with the latest Smart Community CV technologies at no cost or installation labor to MDOT. The equipment provided will include:

- **DSRC 4.1 Standard RSU:** Econolite will furnish and install a sole vendor, or selection of vendor RSUs as desired by MDOT. This will include generation of MAP files and configuration of the system to broadcast SPAT and MAP messages.
- **Econolite's Connected Vehicle Co-Processor (CVCP):** The CVCP will support RSU and controller interfaces and securely host the CV applications that collaborating partners will deploy.
- **Centracs SPM and Edaptive:** Econolite will deploy Centracs SPM and Edaptive on this corridor. This support will allow detailed analysis of the signal timing capabilities of the firmware, the Centracs system and any Smart Community applications that are deployed.
- **Waycare Data Feed:** Waycare will deploy a trial system of their incident detection capabilities on this corridor.
- **Smart-Micro Trajectory-Based Radar Sensor:** Econolite will deploy one intersection of trajectory-based sensing to enable CV applications. These sensors will enable the CVCP detection fusion application to issue J2735 Basic Safety Messages for non-connected vehicles that are detected, so that CV applications can have a more complete framework of vehicle datasets.
- **Centracs API:** The Centracs SPM system will collect and redistribute the data collected by the signal controller and CVCP applications for publication to cloud interfaces. This will allow technology partners to develop and validate applications, as well as study datasets from the remote and secure access offered by Econolite's SPM cloud.

Contractor offers a host of Smart Community applications for deployment on this corridor, in partnership with their business partners. These applications will be identified based on discussions between MDOT and the project's Innovation Council. MDOT must approve and can condition any of the proposed applications. This corridor will be a joint test bed to validate solutions for broader MDOT deployments, a base infrastructure for joint pursuit of research grants, and ongoing public-private-partnership solutions.

Integration with Existing Michigan Centracs Systems: MDOT has option to work with Contractor to integrate the statewide system with existing Centracs deployments around the State, both in Phase 1 of the project and in future phases. This can be accomplished using the Centracs S2S module, which provides an interface that allows agencies to share data and manage arterial traffic across agency boundaries. S2S allows agencies to participate in cross-jurisdictional management and monitoring of agency intersections while maintaining full and exclusive control of their respective signals. In addition, each agency controls the data that is published and how much system control is given or shared across the S2S interface. As agencies connect via a Centracs S2S peer network, the connected Centracs servers immediately begin to publish desired data, including device status on the system maps and entity

trees. As a result of the S2S module, MDOT would have increased capabilities of coordinating signal operations and maintenance with a local agency to improve corridor performance for the motoring public.

Contractor's License Agreement for the Software is labeled as **Schedule C – License Agreement**. Contractor provided **Schedule D – Pricing** with perpetual license. Contractor's License Agreement includes full use of the Software by the State's Authorized Users, and no separate end-user license agreement is required.

For third-party products that are part of the overall Solution, Contractor must include any end-user license agreements that will be required to access and use such products.

Pricing for third-party products in connection with this Contract can be found in **Schedule D - Pricing**.

13. HARDWARE

Contractor is responsible to furnish, configure, install, integrate, and test cellular modems as defined in **Exhibit E – Cellular Modem Requirements**. As required, the contractor may also be responsible to furnish, configure, install, integrate, and test Managed Field Ethernet Switches as defined in **Exhibit F – Managed Field Ethernet Switches**

Cellular Modems: Where necessary, Contractor will use Digi Transport® WR31 (2-port) or Digi Transport® WR54 (4-port) cellular modems. Once the modems have been ordered and received, they must be tested in the C&G office to ensure they are operational and fit for deployment. Once approved, they will be programmed and configured as required, labeled and made ready for field deployment.

A performance quality control test plan must be prepared for cellular modems, so that each unit is tested (post configuration) prior to field deployment. The modems will not be ordered until the cellular site survey is completed (see **Field Installation** under **15. Integraton**).

Managed Field Ethernet Switch: Contractor will use a managed field ethernet switch (MFES) where necessary, the Dymec KY-3100EM 8-2 port industrial managed gigabit Ethernet switch, or a rackmount equivalent, the Dymec KY-3170EM4 6-4 industrial managed gigabit Ethernet switch.
The shelf-mount KY-3100EM will be used for some locations that do not have a rack or have full racks already. This must be confirmed during site visits. Like the cellular modems, the MFES must initially be tested in the C&G office and confirmed operational prior to configuration. Once approved, each MFES will be configured per the project requirements.

14. SOLUTION REQUIREMENTS

See **Schedule A - Project Scope** and the attached **Exhibit A - Table 1 Business Specification Worksheet**.

Contractor detailed any configuration changes or customization modifications that must be made to the Solution to meet the specifications set forth in **Exhibit A - Table 1 Business Specification Worksheet**.

Configuration is referred to as a change to the Solution that must be completed by the Contractor prior to Go-Live but allows an IT or non-IT end user to maintain or modify thereafter (i.e. no source code or structural data model modifications occurring).

Customization is referred to a modification to the Software's underlying source code, which must be completed as part of the initial implementation.

All configurations or customizations made during the term of the awarded contract must be forward-compatible with future releases and be fully supported by the Contractor without additional costs.

15. INTEGRATION

The Solution must be integrated with controller units (CU) installed in the field via remote communications connection provided by cellular modems. Contractor is responsible to program, configure, test and install MDOT-furnished CU's and integrate the corresponding intersection in the Software as defined in **Exhibit D – CU Requirements**.

Integration of Controller Units. Contractor must procure, install and integrate cellular modems and managed field ethernet switches for each of the 280 locations as needed for this project (See **13. Hardware**).

Contractor will use MDOT's IP-schema that identifies existing and future IP addresses for MDOT field devices. Otherwise, with input from both MDOT as well as IT staff, Contractor can develop a network communications IP schema master plan for the MDOT CSCS project, as an optional subtask.

Once the MFES has been configured with IP addresses and are ready for field deployment, they must be tested to ensure they are functioning as required. Once the cellular modems and MFES are ready for deployment, they will be packaged with the controller unit, ready for field deployment.

Field Installation: As part of the field implementation, a procedure must be developed (and approved by MDOT) with precise steps that must be followed as part of the installation process. This will ensure that each location is installed in the same approved manner.

Prior to ordering the equipment, Contactor must perform a cellular site survey for each Phase 1 intersection location to check for signal strength including upload/download speeds, latency, and received signal strength. In addition, Contractor field technicians must check the cabinet for suitability to contain the controller and communication equipment. Any deficiencies must be reported to MDOT.

After testing and quality control is complete, Contractor must take the controller, cellular modem, and MFES to the field and install them into the cabinet. It is envisioned that the cellular modem will be installed first so that communications can be established. This will be followed by installation of the MFES (if necessary) to verify that communication ports are operational, communicating with the cellular modem, and with end-to-end communications back to the Centracs communications module. This will then be followed by installation of the controller which will be brought under control of the Centracs server.

Once the intersection is live, Contractor must utilize documented procedural steps of the LDAT to ensure the intersection is operating properly including detector programming, and "walking-the-intersection," to verify the intersection phasing is per plan.

Integration Deliverables:

- Cellular Site Survey Deficiencies Report
- Controller Database Conversion, including testing and deployment of 280 MDOT-supplied controllers.
- Supply, configuration, installation, and integration of up to 280 cell modems, as needed.
- Supply, configuration, installation, and integration of up to 280 MFES, as needed.

16. MIGRATION

Contractor must review the Migration Data Sample the State has provided and explain how the Contractor will migrate the data. Data migration includes programming MDOT-furnished CU with existing intersection timing parameters to provide the required traffic signal control operation in accordance with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). MDOT will provide the existing signal timing parameters in pdf format. The Contractor may collect electronic versions of databases from in-service CU in the field at no additional cost to MDOT (see **Exhibit D – CU Requirements** for traffic signal cabinet access restrictions). The Contractor is responsible for any labor and equipment required for programming the new CU.

Migration of Controller Unit (CU) Data: Once existing controller databases are received from MDOT, and Contractor begins to take delivery of MDOT-provided controllers, the database conversion process will begin. Contractor traffic engineers and field technicians must verify each setting during the conversion process.

Beginning with the Kick-off meeting, Contractor must coordinate planning the corridor/intersection change-out sequence and schedule with MDOT to limit the required time where controllers are not communicating with either the new Centracs system or existing software. Controller database migration will lead controller change-out by approximately 3-4 weeks. The Contractor must test each controller prior to deployment in a traffic signal cabinet that is similar (identical if possible) to the cabinet it is destined for during the Controller Unit Bench Test. This testing must be done at the MDOT Signal Shop. The controllers, once tested, will be labelled and readied for field deployment.

Contractor must conduct controller migration operation at the MDOT Signal Shop in a field-like cabinet. Each controller must be tested for 24-hours, including any significant time changes such as coordination pattern changes or time-of-day phase sequence adjustments. Contractor must utilize separate staff for database conversion and dedicated testing/quality control staff to ensure the controllers are safely operating as intended before being deployed in the field.

Once verified in the Signal Shop, the controllers will be deployed in the field strategically to minimize downtime and impacts to traffic. AM and PM peak traffic periods, as well as special events, must be avoided. Contractor must provide MDOT with a weekly schedule of controllers to be field installed. This schedule must be updated based on any weather or other unforeseen circumstances.

Data Collection: MDOT will provide Contractor with hardcopy signal timing information for the 280 locations. C&G is familiar with the existing Siemens Tactics systems deployed throughout the state, previously the sole Siemens distributor in Michigan. MDOT will provide or give access to download the native electronic controller database files (the most recent timing plan information available).

Contractor Controller Programmer Manager, must conduct a meeting to understand if any unique programming/database mapping may be in use by MDOT. While the Tactics print-outs provide significant detail, they often do not contain unique database mapping configurations MDOT may employ.

Database Conversion: Contractor's Controller Programmer Manager must lead this element of the project and provide additional training to ensure that even the most obscure database elements are properly managed in the conversion process. Each database conversion must follow the same process, so the timing sheet is filled out appropriately. Minimum clearance intervals and safety parameters must also be assessed during the conversion process and recommendations will be made, as necessary, to make improvements. If any improvements are identified, they will be presented to MDOT staff, who will review and approve the recommended change as needed. Paper records must be produced and timings will be electronically input into a virtual controller and uploaded to the Centracs staging server to facilitate loading the timings into both a test controller as well as the final field deployed controller. The "test controller" is used to verify proper conversion and to complete an initial check that it is operational prior to formal quality control followed by field deployment. Database conversion process will progress with each field deployment grouping or phase.

Loading: Once the completed database is uploaded into the Staging Centracs Server and verified through the test controller, the MDOT-supplied controller will be connected, and the converted database will be downloaded onto the controller. The controller will then be labeled, removed, and staged for testing and eventual deployment.

Testing and Quality Control: Contractor must complete Controller Unit burn-in testing at the MDOT Signal Shop. This test must check for any potential errors in the database conversion process, as well as to ensure that it is operational within the MDOT cabinet. A formal checklist must be developed, and standard testing procedures and steps, so that each controller is tested in the same manner. Contractor must perform all testing, and MDOT will be invited to join and/or participate but will not be required to

perform testing. Once the controller has passed testing, it will be ready for field deployment.

17. TESTING SERVICES AND ACCEPTANCE
Contractor must review **Section 12. Pre-Delivery Testing and Section 13. Acceptance Testing - and the Schedules referenced in Section 13**, **of the Contract Terms**.

Contractor must review **Schedule H – Acceptance Testing** which includes System Acceptance and Testing requirements (i.e. Acceptance Test Plan, Confirmation Testing, Local Device Assembly Test, Final System Test, Burn-in Test).

Contractor has reviewed the State's Acceptance Testing requirements contained in Schedule H. Contractor understands that the overall system testing must follow a process consisting of:

1. Software User Acceptance Testing
2. Controller Unit Bench Testing
3. Local Device Assembly Testing
4. Final System Testing
5. 60-Day Burn-in Test

Test 1 focuses on CSCS software, and Tests 2 – 5, collectively referred to as Solution Acceptance Testing (SAT), will serve as a guide to operationally test system hardware, software and integration end-to-end for all Phase 1 intersections.

Software User Acceptance Testing: Contractor will use the following process for the Software UAT:

1. Create and document a written Software UAT Plan that includes test data and scripts. The UAT Plan will be based on Econolite's existing Standard Centracs Test Procedures modified to incorporate requirements from the State's Business Specification Worksheet as well as the requirements validation process.
2. Create and provide MDOT with Test Data/Test Scripts, where required. Data and scripts will be used in conjunction with the UAT Plan to conduct the Software UAT. Scripts will include procedures for scanning the software to ensure no malicious code is present.
3. If MDOT has Test Data that it would like included in the UAT, Contractor will incorporate it into the UAT Plan, as appropriate.
4. Train MDOT Staff on how to perform acceptance testing using the UAT Plan
5. Install, configure and deploy the software in the test environment
6. Install, configure and deploy the test hardware, including Controller Unit (CU) and MMU
7. Communicate to MDOT that the test environment is ready
8. Conduct UAT. During the UAT process, each outcome must be recorded as complied, partially complied, or failed. Each test in the UAT Plan will be conducted via one (or more) of the following methods: demonstration, test with test equipment, analysis, and/or inspection. This phase of testing ensures that the Standard Centracs Test Procedures and the specific additional functional and performance requirements from the State's Business Specification Worksheet are observed and proven to successfully function.
9. Provide MDOT with Test Results
10. Provide a defect tracking system
11. Correct Defects
12. Conduct regular status meetings
13. Assist MDOT with SUITE documentation

Contactor Solution Acceptance Testing (SAT): The Contractor SAT will serve to test the entire system from CSCS software to CUs end-to-end. The SAT Plan will serve as a guide to operationally test system hardware, software and integration at each Phase 1 intersection. The overall Contractor SAT process will proceed as follows:

1. Contractor must create a written SAT Plan. For each of the testing stages (CU Bench Testing, Local Device Assembly Testing (LDAT), Final System Test (FST), and 60-day Burn-in Test, the plan must include a detailed description of the tests to be conducted, the purpose of each test, the environment the test will be conducted in, and the passing criteria. It must also include a definition of major and minor failures for the purposes of the Burn-in Test.
2. Conduct CU Bench Testing prior to field deployment of controllers,
3. Proceed with installation, configuration, and deployment of hardware and software according to the Contract Requirements.
4. Conduct LDAT once controllers are installed in the field and ready for integration with the CSCS software.
5. Contractor must communicate to MDOT once all hardware, CU deployment, and signalized intersection implementation is complete and ready to use prior to FST.
6. Conduct Final System Test (FST) once all Phase 1 intersections are on-line with the CSCS software.
7. Conduct the Burn-in Test after successful completion of the FST.
8. Provide MDOT with Test Results
9. Provide a defect tracking system
10. Correct Defects
11. Conduct regular status meetings

The SAT must be completed at the end of each signal grouping (i.e., 5%, 25%, 50%, 75%, and 100%) to ensure that each group is complete and end-to-end communications and control are achieved. Once all 280 intersections for Phase 1 are complete, the FST will be complete.

Conduct Controller Unit (CU) Bench Test: Contractor must program MDOT-furnished CUs with existing intersection timing parameters to provide the required traffic signal control operation in accordance with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). MDOT will provide the existing signal timing parameters in pdf format and CU loaded with firmware.

Contractor must transport the programmed CU, ready for field deployment, to the MDOT Signal Shop facility for 24-hour bench testing, completed by Contractor and verified/approved by MDOT or its designee. The facility currently has capacity to bench test 10 CUs at one time. If necessary, Contractor is prepared to loan MDOT (at no cost) additional cabinets to increase the overall testing capacity.

Conduct Local Device Assembly Testing (LDAT): After each CU and hardware have been installed in controller cabinets located in the field, Contractor must conduct an LDAT to confirm the installation and verify that the intersection is operating as intended. Please See **Implementation** for more details.

Conduct Final System Test (FST): Final System Testing must be conducted once all Phase 1 signalized intersections have been brought on-line in Centracs and all modules and software customizations are operational. Final System Testing must follow the procedures detailed in the SAT Plan. A Final Test Results Report must be prepared at the conclusion of the FST.

Conduct 60-Day Burn-in Test: Upon successful completion of the FST, a 60-day Burn-In Period will commence. During the Burn-In Period, various issues may arise. Typically, many of these are of a minor or trivial nature, and while they will be addressed, do not constitute a system failure and do not warrant a restart of the Burn-In Period.

Contractor will utilize the following priority mechanism to organize and account for the types of issues that may be encountered during the Burn-In Period. The issues would be handled as follows:

Priority One

Priority One applies if the problem could:

- Prevent the accomplishment of an operational or mission essential function, OR

- Causes loss of data or data corruption, OR
- Jeopardize safety or security

If not resolved within 24-hours after the problem is first reported to Contractor, the Burn-In Period restarts from zero days after resolution. Otherwise, the Burn-In Period continues without interruption.

Priority Two

Priority Two applies if the problem could:

- Adversely affect (but not prevent) the accomplishment of an operational or mission essential function, and no workaround is available, OR
- Adversely affect technical or cost risks to the life cycle support of the System, and no workaround is available.
- Priority Two problems include aborts, but not loss of data or data corruption.

If not resolved within 72-hours after the problem is first reported to Contractor, the Burn-In Period will be suspended until resolution, after which the day count will resume. Otherwise, the Burn-In Period continues without interruption.

Priority Three

Priority Three applies if the problem could:

- Adversely affect (but not prevent) the accomplishment of an operational or mission essential function, but a workaround is available, OR
- Adversely affect technical or cost risks to the life cycle support of the system, but a workaround is available.
- Priority Three problems do not include aborts or loss of data.

If not resolved by the end of the Burn-In Period, the Burn-In Period continues until resolution.

Priority Four

Priority Four applies for any problem related to the System which does not fall within Priority One, Two or Three, and should be resolved within the next two (2) New Releases. Priority Four issues will not prevent the successful completion of the Burn-In Period.

Upon successful completion of the Burn-In Period, MDOT will grant “Acceptance” and the Warranty and Support period will begin.

- MDOT may create its own Test Data for use in the UAT and SAT Plans.
- MDOT may develop and add tests to the UAT and SAT Plans.
- MDOT will execute tests and report Test Results to Contractor in accordance with the UAT and SAT Plans.
- MDOT will participate in regular testing status meetings.
- MDOT will have access to enter defects from Test Results into the Contractor-provided issue tracking system.
- MDOT will perform regular retest of Contractor resolved defects based on a mutually agreed schedule.
- MDOT will work with Contractor to prioritize issues that arise during UAT and SAT.
- MDOT will grant Acceptance at successful completion of the 60-day Burn-in Period.

Testing Deliverables:

- Draft and Final UAT Plan, including test data and scripts
- Draft and Final SAT Plan, including test data and scripts
- Conduct Software UAT
- Conduct CU Bench Test
- Conduct LDATs

- Conduct FST
- Conduct 60-Day Burn-in Period
- Document all test results
- Defect Tracking System
- Regular Status Meetings

18. IMPLEMENTATION

Project Management: A kick-off meeting must be held at the start of the contract to formally introduce the team for each task, and to present Contractor's approach for communication as well as establish the meeting schedule as the project moves forward. Processes must be documented as part of project initiation and set the stage for the project as it moves through design, deployment and acceptance for all stages. Contractor must not begin installation or configuration of any component without written approval from MDOT and permitting agencies (as required).

Contractor must perform proactive project management throughout the course of the project and provide periodic invoices as milestones are met and provide progress reports to summarize the project status.

System Design and Implementation Plan: Contractor must develop several planning-level documents that document the overall system (architecture) and the approach to the deployment and subsequent expansion through future project phases. Each of these plans must be developed and approved by MDOT prior to deployment.

Requirements Validation: A requirements validation exercise will be completed with MDOT and IT staff. Each of the requirements will be reviewed in working sessions to illustrate how this requirement will be met. Contractor and MDOT will further fine tune the requirements as needed or required and determine the testing criteria to meet the requirements. The testing requirements must be captured in the UAT/SAT documents. Once the requirements have been reviewed and/or fine-tuned, the final requirements document must be submitted to MDOT.

At the conclusion of the validation sessions the Final Requirements Validation Document deliverable must be provided to MDOT and contain the follow sections:

- Introduction, purpose and scope
- High level system description
- Technologies utilized
- Primary use case
- Test description
  - Test setup
  - Execution procedures
  - Defect tracking and recording
  - Verification matrix
- Reference documents and appendices

Implementation Approach: Contractor must install Centracs throughout the State of Michigan at the initial 280 MDOT signalized intersections, with the capability to expand to include up to 5,000 signalized intersections (Figure 2). MDOT has identified two future phases consisting of 1,365 and 1,498 signalized intersections each. Each of these future phases can also be done in smaller groupings (e.g., 50, 100, 250, 500 signalized intersections) and Contractor is flexible working with MDOT as the future unfolds.

Contractor must provide MDOT with an orderly and timely field deployment process for this project. Table 2 indicates the sequence of operations for field operations. Each step includes a justification for its place in the sequence of operations, and a step for punch-list items and any outstanding work is included at the end. Contractor is open to change and/or modify this approach depending on the needs and desires of MDOT.

Figure 2 - Phase 1 Intersections by Region

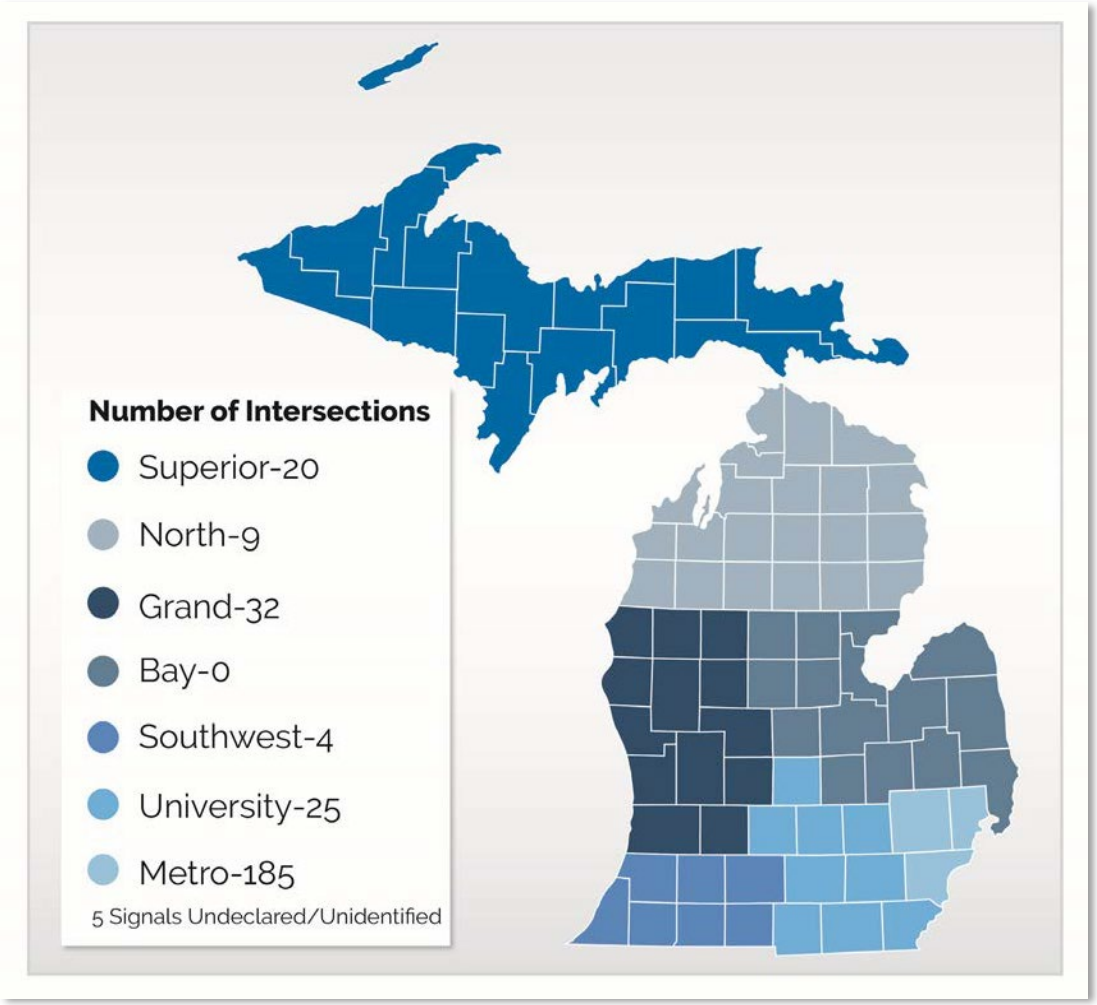


Table 2 - Proposed Field Deployment

Order	Region	Justification
1	Identified first 5% of intersections (University, Grand Regions)	Identified by MDOT
2	M1 Corridor (Metro Region)	High profile corridor
3	Superior, North Regions	Importance of access to remote and isolated signals
4	Remaining Metro Region Locations	High profile corridors with high density of signals
5	Grand, Southwest Regions	Proximity to C&G west Michigan staff
6	University Region	Remaining locations
7	Punch-list items	Outstanding locations and troubleshooting

Hardware and Software Implementation Services: Contractor must work with MDOT staff to define a methodology for deploying the State's traffic signal management system in a cooperative manner. This will include procedures for setup of the servers, configuration of workstations, etc. Contractor must first baseline the existing system and work with MDOT staff to further refine understanding of project requirements as well as relevant MDOT IT constraints.

Central System: Contractor must provide a Centracs license to include the following:

- Centracs ATMS licensed for up to 280 intersections and expandable to 5,000
- Centracs High Availability

Centracs must be installed on servers provisioned by MDOT. Prior to installation on the production server environment, Contractor must set-up and configure the Centracs ATMS with all system parameters on a staging server maintained in a separate environment. This will allow for testing and other needs as the system is rolled out.

Intersection Graphics: Contractor must develop a typical graphic representation of an intersection and submit a template to MDOT for review and approval. The template must include icons for various zoon/view levels, such as:

- Intersection status (1st level)
- Intersection status with plan (2nd level)
- Intersection status with main street green (3rd level)
- Intersection phase movement display with status (4th level)

Once MDOT approves how an intersection should look and what graphical elements are important or required, Contractor must use this template to reproduce graphics for each intersection.

Intersection Properties: Each intersection must be geo-located and intersection properties, including intersection name, main street, cross street, and IP address must be configured.

Central System - Installation: Contractor must install, configure, and integrate the Centracs ATMS on virtual servers supplied by MDOT. DTMB IT will assist Contractor with establishing a connection to the MDOT network switch for access to the field network, the Internet, and any workstations (local or remote) that require access to the Centracs system. In addition, Contractor must work with DTMB IT staff to identify, network routes to the field network, and provisions for remote access for maintenance and software updates.

Client Software: Contractor must install and configure the Centracs client software application on up to (50) MDOT-supplied workstations and/or laptops. In addition, a routine must be developed that will allow for the installation on additional workstations for the "trusted 3rd party" users. MDOT will be responsible for installation of the Centracs client on these additional workstations. There is no additional cost or licensing required to add additional workstations.

Hardware and Software Implementation Services Deliverables:

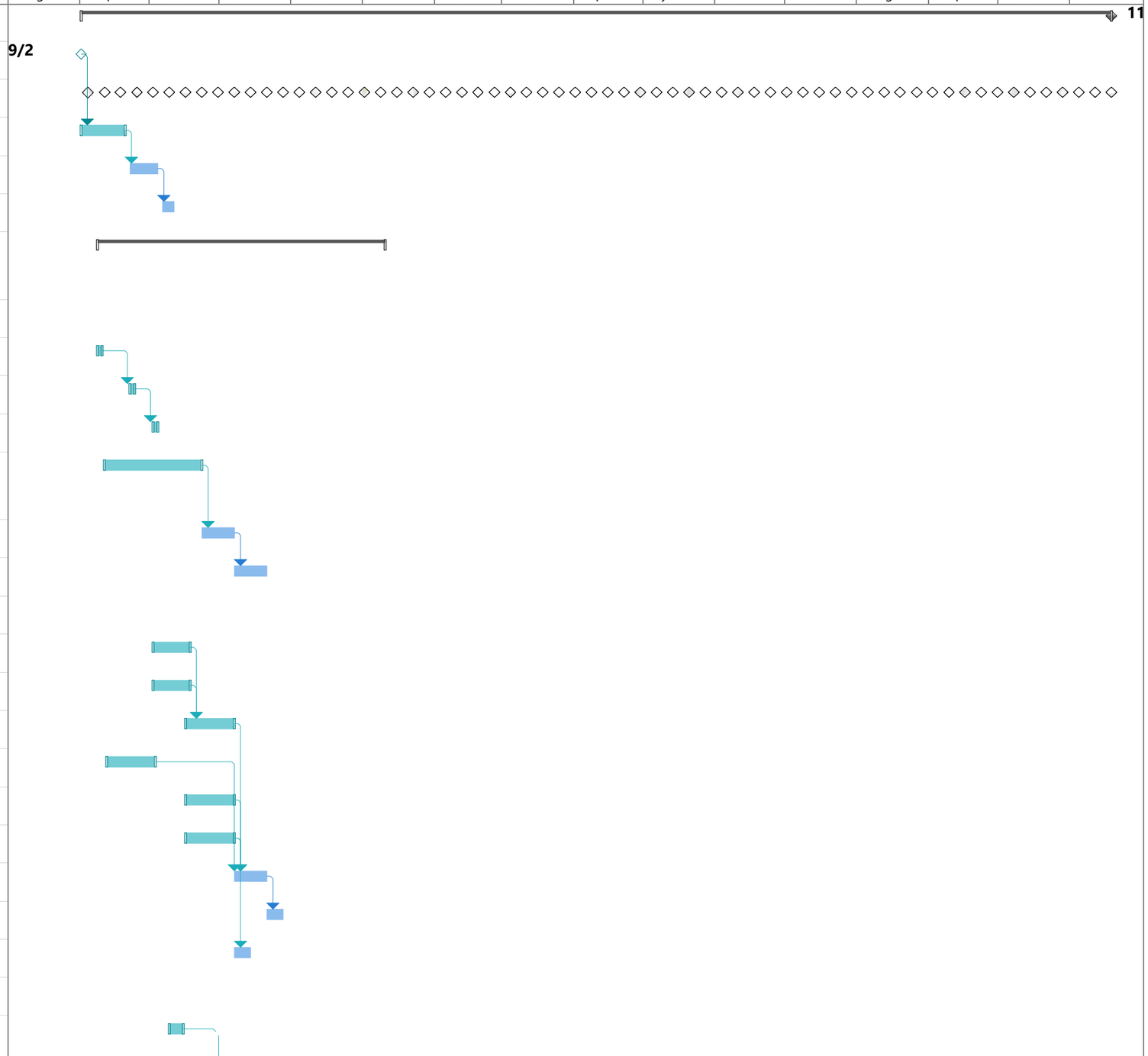
- Licensing:
  - Centracs ATMS licensed for up to 280 intersections (expandable to 5,000)
- Centracs installed, configured, and operational on MDOT-provided servers
- Centracs client software applications installed on 50 MDOT-provided workstations.
- Install routine for "trusted 3rd Party" workstations
- Intersection graphics (280 intersections)

Work Breakdown Structure (WBS): The schedule for this project is illustrated on the following pages and identifies each task and subtask, deliverables, review times and linked dependencies between tasks

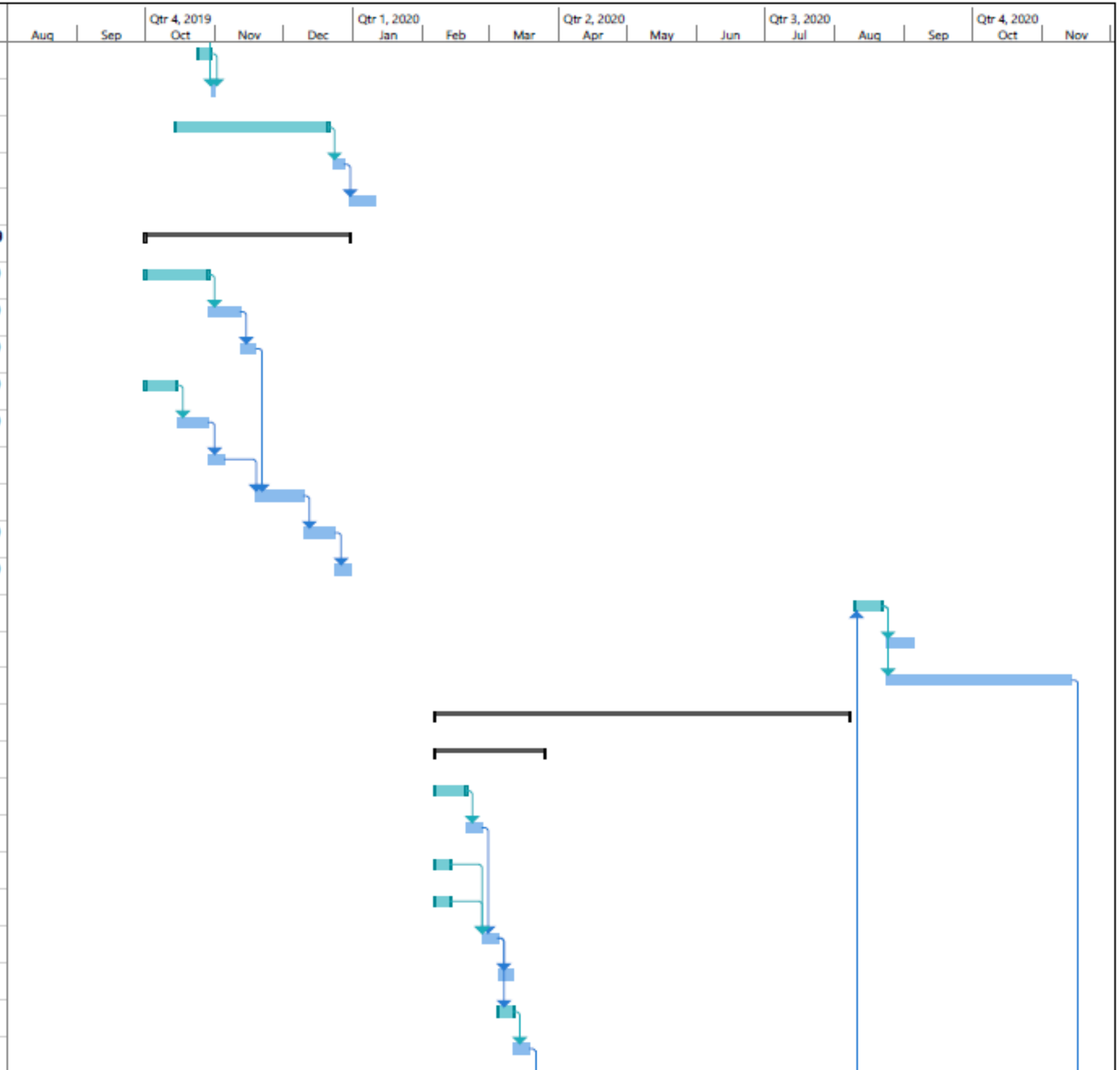
and submittals. This is a real-world schedule that includes MDOT review times, and an assumption that deployment is completed within the 450-day period requested. This schedule will be further detailed out as part of the overall Project Management Plan. If MDOT desires to deploy at a more rapid pace, Contractor has the ability and is prepared to accelerate the process through local staff.

Contractor must work with MDOT staff to update the overall project schedule and WBS to kept current and reviewed during project management meetings both internal to our team as well as meetings with MDOT staff. Contractor must maintain this schedule throughout the life of the project to assist in projecting issues that may arise to overall work efforts within each task.

ID	Task Mode	Task Name	Duration	Start	Finish
1		**Task 1: Project Management**	**318 days**	**Mon 9/2/19**	**Thu 11/19/20**
2		Project Kick-Off	0 days	Mon 9/2/19	Mon 9/2/19
3		**Weekly Progress Meetings**	**315 days**	**Thu 9/5/19**	**Thu 11/19/20**
68		Draft Project Management Plan	15 days	Mon 9/2/19	Fri 9/20/19
69		MDOT Review	10 days	Mon 9/23/19	Fri 10/4/19
70		Final Project Managment Plan	5 days	Mon 10/7/19	Fri 10/11/19
71		**Task 2: System Design and Implementation**	**90 days**	**Mon 9/9/19**	**Fri 1/10/20**
72		**Requirements Validation (RV)**	**20 days**	**Mon 9/9/19**	**Fri 10/4/19**
73		RV Session 1	2 days	Mon 9/9/19	Tue 9/10/19
74		RV Session 2	2 days	Mon 9/23/19	Tue 9/24/19
75		RV Session 3	2 days	Thu 10/3/19	Fri 10/4/19
76		System Architecture/Design Document	30 days	Thu 9/12/19	Wed 10/23/19
77		MDOT Review	10 days	Thu 10/24/19	Wed 11/6/19
78		Final System Architecture	10 days	Thu 11/7/19	Wed 11/20/19
79		**Implementation Plan Document**	**55 days**	**Mon 9/16/19**	**Fri 11/29/19**
80		Software Development Plan	12 days	Thu 10/3/19	Fri 10/18/19
81		Interface Control Plan	12 days	Thu 10/3/19	Fri 10/18/19
82		Systems Integration Plan	15 days	Thu 10/17/19	Wed 11/6/19
83		Equipment Integration Plan	15 days	Fri 9/13/19	Thu 10/3/19
84		Risk Management Plan	15 days	Thu 10/17/19	Wed 11/6/19
85		Transition In/Out Plan	15 days	Thu 10/17/19	Wed 11/6/19
86		MDOT Review	10 days	Thu 11/7/19	Wed 11/20/19
87		Final Implementation Plan	5 days	Thu 11/21/19	Wed 11/27/19
88		SOM EASA Documentation	5 days	Thu 11/7/19	Wed 11/13/19
89		**Environment Provisioning**	**16 days**	**Thu 10/10/1**	**Thu 10/31/19**
90		Staging	4 days	Thu 10/10/19	Tue 10/15/19

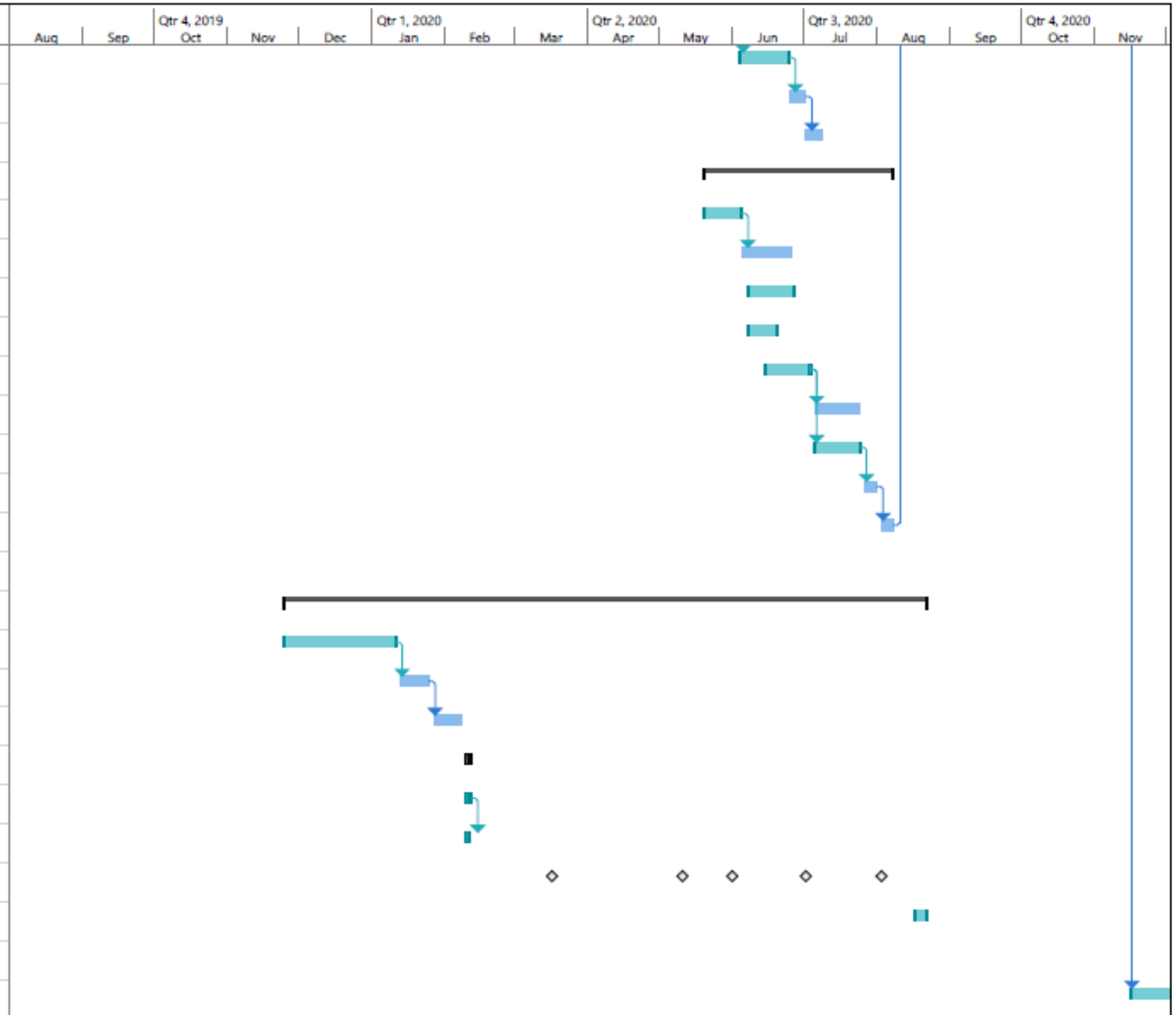


ID	Task Mode	Task Name	Duration	Start	Finish
91		Production	4 days	Thu 10/24/19	Tue 10/29/19
92		Validate Staging/Production Sites	2 days	Wed 10/30/1	Thu 10/31/19
93		Software Customization	50 days	Mon 10/14/1	Fri 12/20/19
94		UAT Testing	5 days	Mon 12/23/1	Fri 12/27/19
95		UAT Test Result	10 days	Mon 12/30/1	Fri 1/10/20
96		**Task 3: Testing**	**65 days**	**Tue 10/1/19**	**Mon 12/30/19**
97		Draft UAT Plan	20 days	Tue 10/1/19	Mon 10/28/19
98		MDOT Review	10 days	Tue 10/29/19	Mon 11/11/19
99		Final UAT Plan	5 days	Tue 11/12/19	Mon 11/18/19
100		Draft LDAT Plan	10 days	Tue 10/1/19	Mon 10/14/19
101		MDOT Review	10 days	Tue 10/15/19	Mon 10/28/19
102		Final LDAT Plan	5 days	Tue 10/29/19	Mon 11/4/19
103		Draft SAT Plan	15 days	Tue 11/19/19	Mon 12/9/19
104		MDOT Review	10 days	Tue 12/10/19	Mon 12/23/19
105		Final SAT Plan	5 days	Tue 12/24/19	Mon 12/30/19
106		Final Solution Testing (FST)	10 days	Mon 8/10/20	Fri 8/21/20
107		FST Results Report	10 days	Mon 8/24/20	Fri 9/4/20
108		60-Day System Burn-in	60 days	Mon 8/24/20	Fri 11/13/20
109		**Task 4: Field Integration**	**132 days**	**Thu 2/6/20**	**Fri 8/7/20**
110		**5% Deployment**	**35 days**	**Thu 2/6/20**	**Wed 3/25/20**
111		Database Conversion	10 days	Thu 2/6/20	Wed 2/19/20
112		Controller Setup	5 days	Thu 2/20/20	Wed 2/26/20
113		Cell Modem Setup	5 days	Thu 2/6/20	Wed 2/12/20
114		MFES Setup	5 days	Thu 2/6/20	Wed 2/12/20
115		LDAT Testing	5 days	Thu 2/27/20	Wed 3/4/20
116		Deploy Field equipment	5 days	Thu 3/5/20	Wed 3/11/20
117		Centracs Connection	5 days	Thu 3/5/20	Wed 3/11/20
118		SAT Testing	5 days	Thu 3/12/20	Wed 3/18/20



ID	Task Mode	Task Name	Duration	Start	Finish
119		Test Results Report	5 days	Thu 3/19/20	Wed 3/25/20
120		**25% Deployment**	**57 days**	**Thu 2/27/20**	**Fri 5/15/20**
121		Database Conversion	10 days	Thu 2/27/20	Wed 3/11/20
122		Controller Setup	15 days	Thu 3/12/20	Wed 4/1/20
123		Cell Modem Setup	15 days	Tue 3/10/20	Mon 3/30/20
124		MFES Setup	10 days	Tue 3/10/20	Mon 3/23/20
125		LDAT Testing	15 days	Mon 3/23/20	Fri 4/10/20
126		Deploy Field equipment	15 days	Mon 4/13/20	Fri 5/1/20
127		Centracs Connection	15 days	Mon 4/13/20	Fri 5/1/20
128		SAT Testing	5 days	Mon 5/4/20	Fri 5/8/20
129		Test Results Report	5 days	Mon 5/11/20	Fri 5/15/20
130		**50% Deployment**	**58 days**	**Tue 3/17/20**	**Thu 6/4/20**
131		Database Conversion	10 days	Tue 3/17/20	Mon 3/30/20
132		Controller Setup	15 days	Tue 3/31/20	Mon 4/20/20
133		Cell Modem Setup	15 days	Thu 4/2/20	Wed 4/22/20
134		MFES Setup	10 days	Thu 4/2/20	Wed 4/15/20
135		LDAT Testing	15 days	Mon 4/13/20	Fri 5/1/20
136		Deploy Field equipment	15 days	Mon 5/4/20	Fri 5/22/20
137		Centracs Connection	15 days	Fri 5/1/20	Thu 5/21/20
138		SAT Testing	5 days	Fri 5/22/20	Thu 5/28/20
139		Test Results Report	5 days	Fri 5/29/20	Thu 6/4/20
140		**75% Deployment**	**77 days**	**Thu 4/23/20**	**Fri 8/7/20**
141		Database Conversion	10 days	Thu 4/23/20	Wed 5/6/20
142		Controller Setup	15 days	Thu 5/7/20	Wed 5/27/20
143		Cell Modem Setup	15 days	Wed 5/6/20	Tue 5/26/20
144		MFES Setup	10 days	Wed 5/6/20	Tue 5/19/20
145		LDAT Testing	15 days	Wed 5/13/20	Tue 6/2/20
146		Deploy Field equipment	15 days	Wed 6/3/20	Tue 6/23/20

ID	Task Mode	Task Name	Duration	Start	Finish
147		Centracs Connection	15 days	Thu 6/4/20	Wed 6/24/20
148		SAT Testing	5 days	Thu 6/25/20	Wed 7/1/20
149		Test Results Report	5 days	Thu 7/2/20	Wed 7/8/20
150		**100% Deployment**	**58 days**	**Wed 5/20/20**	**Fri 8/7/20**
151		Database Conversion	12 days	Wed 5/20/20	Thu 6/4/20
152		Controller Setup	15 days	Fri 6/5/20	Thu 6/25/20
153		Cell Modem Setup	15 days	Mon 6/8/20	Fri 6/26/20
154		MFES Setup	10 days	Mon 6/8/20	Fri 6/19/20
155		LDAT Testing	15 days	Mon 6/15/20	Fri 7/3/20
156		Deploy Field equipment	15 days	Mon 7/6/20	Fri 7/24/20
157		Centracs Connection	15 days	Mon 7/6/20	Fri 7/24/20
158		SAT Testing	5 days	Mon 7/27/20	Fri 7/31/20
159		Test Results Report	5 days	Mon 8/3/20	Fri 8/7/20
160					
161		**Task 5: Training & Support**	**195 days**	**Mon 11/25/1**	**Fri 8/21/20**
162		Draft Training Plan/Materials	35 days	Mon 11/25/1	Fri 1/10/20
163		MDOT Review	10 days	Mon 1/13/20	Fri 1/24/20
164		Final Training Plan/Materials	10 days	Mon 1/27/20	Fri 2/7/20
165		**Initial Implementation Training**	**2 days**	**Mon 2/10/20**	**Tue 2/11/20**
166		Administrator Training	2 days	Mon 2/10/20	Tue 2/11/20
167		Operator Training	1 day	Mon 2/10/20	Mon 2/10/20
168		**Go-Live Support Training**	**99 days**	**Tue 3/17/20**	**Mon 8/3/20**
174		Self Suffciency Training	5 days	Mon 8/17/20	Fri 8/21/20
175		On-Going Training (throughout term			
176		Warranty	90 days	Mon 11/16/2	Fri 3/19/21
177		Support	261 days	Sat 3/20/21	Fri 3/18/22



Software Development Plan: How Centracs will be configured within the MDOT environment as well as the areas of customization that will be required, and how the customization will occur.

When customization is required, they must be rolled out through a series of software releases. New versions and feature rollouts will require MDOT to review, test, and approve for subsequent deployment. Contractor's internal process for customization follows an agile approach, whereby MDOT will be able to view pre-release versions that will allow the agency to see progress as well as features of the module as they become available.

Preceding all releases, Contractor's software quality assurance (SQA) requires comprehensive testing of modifications as well as regression testing in order to ensure correct system operation. In addition, Contractor's SQA performs testing specific to MDOT's system specifications and architecture, database configuration, and device types. Once released, the following procedure can be updated to deploy to pre-production and eventually to production:

1. Notification of release schedule with expected changes.
2. Release notes to be provided for review.
3. MDOT must approve moving forward with the new release for staging in the pre-production environment.
4. The system must be reviewed in the pre-production environment. The duration must be discussed with the MDOT and will take into consideration the extensiveness of the modifications and associated risks.
5. Upon MDOT approval of the release, Contractor must work with MDOT to schedule the production upgrade.
6. Contractor must work with MDOT to perform the upgrade of the production system.
7. A rollback procedure must be available should the production upgrade fail.

Interface Control Plan: The Contractor must prepare an Interface Control Plan. After identifying the major system components and optional modules selected by MDOT, the Team will describe the overall system operation and interfaces in use, with a focus on the roles the interfaces provide. The plan must include 3rd party vendors and other existing hardware and software providers that the Centracs system will interface and integrate with.

The plan must provide the individual physical, functional and content characteristics of external interfaces to the system, including the responsibilities of the organizations on both sides of the interface.

The Interface Control Plan deliverable must include the following major sections

- Introduction
  - Purpose
  - Scope
- Overall System Interface Operation
  - High level system overview and how it meets Agency requirements
  - Block diagram showing major system components and interfaces
  - Example usage of interfaces across major system components
- Interface Details - interface by interface list providing for each the following info
  - Physical
  - Functional
  - Content
  - Owning Organization(s)
    - Identity and Contact info
    - Responsibilities and demarcation points

- Warranties, Service Level Agreements, and Contacts

Systems Integration Plan: Contractor must coordinate with SOM Information Technology (IT) personnel to understand their requirements on provided systems and the services their facilities offer. This coordination must also provide SOM IT with an understanding of the user needs that Contractor's systems are intended to satisfy. Gaps identified on either side must be documented and mitigation planning undertaken.

The Systems Integration Plan document deliverable must include the following sections:

1. High Level System Description:
   - Describes the primary use case of the system
2. MDOT Requirements:
   - Summary of Contractor's understanding of the facility expectations on equipment
   - Summary of Contractor's understanding of the SOM facility services (e.g., power, cooling, network, monitoring, etc.)
3. Identified Gaps:
   - Description of gaps and mitigation
4. Equipment to be Integrated:
   - Detailed equipment specifications
     - Make, model, and high-level configuration (e.g., CPU cores, total RAM, total available storage, network interfaces)
     - Component manufacturer part numbers, as necessary to reorder
     - Warranty and manufacture service information
   - Description of each server's
     - Primary purpose
     - Services provided
     - Network connectivity
     - Expected bandwidth needs
   - Utilization of MDOT services, examples could include:
     - Internet access
     - Firewall rules, as necessary
     - VPN or similar remote access for remote support and/or updates
     - Network storage for backups
     - Offsite storage for backups
     - Monitoring/alerting services
     - Active Directory authentication
     - Antivirus and system updates
5. Support Information
   - Contact information at Econolite and C&G
   - Contact information at MDOT facilities
   - Typical support scenarios and procedures (example: reboot a server)
   - Conformance to change management policies
   - Procedures for system changes
6. Installation Schedule
7. Post Installation Testing Procedures

- Confirm server operation
- Confirm remote access functional
- Confirm access to SOM services
- Execute typical support scenarios

Training Plan: At a high-level the Training Plan identifies the lesson plan for each course, detailing the literature, standard operating procedures, manuals, and test materials that will be used. It also includes information on training locations and other logistics. Please see **19. Training Services**.

Risk Management Plan: The Risk Management Plan must identify, analyze and evaluate potential project risks, as well as monitor them throughout the process. The Plan is a proactive approach to managing risks that may potentially enter the project process. The Risk Management Plan must cover five main areas:

1. Risk identification
2. Analyze the risk
3. Evaluation of risks and ranking (risk register)
4. Risk mitigation approach and process
5. Monitor and review the risks at regular intervals.

Equipment Integration Plan (EIP): Contractor must prepare an Equipment Integration Plan that includes the following major sections:

- Introduction
  - Purpose
  - Scope
- Agency Procedures
  - Identification of Agency procedures and integration requirements with focus on appropriate controlling sections
- Equipment in Use
  - Make, model, and configuration(s) for each device type
  - Typical programming and setup for each
- Site and TOC Configurations
  - List of equipment
  - Integration
    - Elevation diagram of equipment mounting
    - Interconnect diagram (in Visio or similar)
      - Equipment model
      - Cable types
    - Step-by-Step Integration procedures
  - Revision tracking
    - Revised diagrams based on field changes
- Overall System
  - Network Diagram
  - IP Configuration details
    - System Diagram
    - Tabulated format (Excel)

<u>System Design and Implementation Plan Deliverables:</u>

- Requirements Validation
- Software Development Plan
- Interface Control Plan

- Systems Integration Plan
- Risk Management Plan
- Transition In/Out Plan
- Equipment Integration Plan

Software Customization: As detailed in the Business Requirements, Contractor must provide software customization to meet the State's requirements. These customizations are detailed in the Requirements Validation and Software Development Plans. Contractor will introduce the customized software components through a series of software releases. Contractor understands that new versions and feature rollouts will require a process to allow MDOT to review, test, and approve for subsequent deployment. Contractor's internal process for customization follows an agile approach, whereby MDOT will be able to view pre-release versions that will allow you to see progress as well as features of the module as they become available.

Preceding all releases, Contractor software quality assurance (SQA) requires comprehensive testing of modifications as well as regression testing in order to ensure correct system operation. In addition, Contractor SQA performs testing specific to the State's business requirements, database configuration, and device types. Once released, the following procedure will be updated to deploy to pre-production and eventually to production:

1. Notification of release schedule with expected changes.
2. Release notes to be provided for review.
3. MDOT must approve moving forward with the new release for staging in the pre-production environment.
4. The system must be reviewed in the pre-production environment. The duration must be discussed with MDOT and will take into consideration the extensiveness of the modifications and associated risks.
5. Upon MDOT approval of the release, Contractor must work with MDOT to schedule the production upgrade.
6. Contractor must work with MDOT to perform the upgrade of the production system.
7. A rollback procedure must be available should the production upgrade fail.

Software Customization Deliverables:

- Software Customization Release Notes
- Software Customization – Pre-production
- Pre-production Environment Review
- Software Customization - Production

Once the project planning stage is complete, the requirements are finalized, and the system configuration documents are approved, Contractor must supply, integrate and configure Centracs ATMS software that meets the project requirements

A description of the software/hardware implementation services to be provided include:

a. Installation, integration, and configuration of all CSCS software and modules, supporting operating systems, databases, 3rd party software, and any other software as needed for a full and complete Solution
b. Set-up and configuration of maps, user access, databases, alarms/alerts, logs, standard reports, dashboards, schedules, etc.

19. TRAINING SERVICES

The Contractor must provide administration and end-user training for implementation, go-live support, and transition to customer self-sufficiency. The Contractor must provide a training plan for go-live support and

transition to self-support, including options and details such as the number of dedicated personnel, staff location, hours available and duration of go-live support.

Training: Contractor must provide all training necessary for MDOT to successfully operate and manage its new CSCS. Training must be provided by Contractor product specialists and must focus on the practical application of the system software. During the initial system implementation, Contractor must focus on providing tailored training at three specific project milestones:

1. Initial Implementation
2. Go-Live Support
3. Customer Self-Sufficiency

Following System Acceptance, on-going annual training must also be provided. All system training must be detailed in a Training Plan that identifies the lesson plan for each course, detailing the literature, standard operating procedures, manuals, and test materials that will be used. Contractor must submit the Training Plan to MDOT for review and approval 30-days prior to the scheduled start of any training.

Contractor must provide details on, and examples of, clearly written instructions and documentation to enable State administrators and end-users to successfully operate the Solution without needing to bring in additional Contractor support.

Initial Implementation Training: Contractor must provide MDOT with initial high-level Initial Implementation Training, so MDOT is able to begin effectively using the new CSCS as the first new CUs are installed and Local Device Acceptance Testing is performed.

For the Initial Implementation Training, the Contractor must conduct 8-hours of user training “Basic Training” and 16-hours of administrator training “Advanced Training”. Each of these trainings must include all training materials supplied for up to forty (40) people. The trainings will be conducted either at an MDOT facility or C&G’s Learning Center at the C&G office in Farmington Hills, Michigan. The facility is capable of hosting training for 40 individuals if needed.

These trainings will include both classroom-style instruction on system functionality and use as well as “hands-on” training and must be suitable for both traffic systems engineers and traffic signal technician staff. Contractor must adjust the curriculum according to MDOT’s needs.

The trainings will be divided into Basic and Advanced sessions. Basic training will address each of the following topics:

- System Overview
- System Set-Up, Configuration, and Calibration
- Graphics Set-Up
- Basic Operations
- Advanced Operations
- Reports and Alarms Generation
- System Maintenance
- Troubleshooting

Advanced training will focus on system administration as follows. This content can be adjusted to MDOT’s needs:

- **Introduction and Overview** - System Hardware, System Software, Centracs capabilities and features, and the Traffic Management System Workspace. How to log-on to Windows for both remote connections and local workstations, launching the Client application, logging on to Centracs, accessing system graphics, and an explanation of the workspace components.
- **Windows Security** - General overview of the Windows security system, creating

and removing user accounts. Each attendee will have the opportunity to add or remove a user account to/from the system.

- **Windows Event Logs** - System and Application Event Logs within Windows. Specific items within the logs will be discussed and their relationship to system performance will be reviewed.
- **Database Backups** - How the system backs-up the SQL Databases and the required operator actions.
- **Software Installation Procedures** - Procedures used to install the Centracs ATMS software on a target computer. General setup requirements for each "type" of computer will be reviewed.
- **The Centracs Server Suite** - Function of each component of the server software suite and the Administration menu items associated with the Client application. Adding and deleting users to/from the Centracs system and assigning user privileges.

Go-Live Support Training: Go-Live Support Training must be provided on approximately a monthly basis as the groups of intersections are brought on-line. This level of training will be more in-depth than Initial Implementation Training and will be structured so that each training session reviews the material covered in the previous training and then introduces new topics. Training will focus on advanced user features and functionality as well as detailed system administration. Each Go-Live Support Training will consist of an 8-hour day of training, for up to twenty (20) users, conducted at the MDOT Signals Unit Shop in Lansing, Michigan.

Customer Self-Sufficiency Training: Customer Self-Sufficiency Training must focus on ensuring MDOT is able to configure, operate and provide day-to-day system maintenance functions with minimal outside support on an on-going/sustaining basis. Training will be conducted at Final System Test over a 16-hour period. The training is for up to 20 users and will be conducted at an MDOT facility.

On-Going Training: Contractor must continue to provide annual Basic and Advanced training courses so long as the system is under an active Support and Maintenance Agreement. Each year Contractor must provide one (1) Basic Training and one (1) Advanced Training. Basic Trainings will be 8-hours in duration, while Advanced Trainings will include 16-hours of instruction. In each case, up to 40 users will be able to participate in the training. All training materials must be provided by the Contractor and the training will occur either at an MDOT facility or C&G's Learning Center.

In addition to formal, on-site training, Contractor must provide at no cost to MDOT, on-demand training via the Econolite Learning Center (http://learn.econolite.com/). C&G is happy to provide short training sessions at no cost to MDOT.

Training Deliverables:

- Draft Training Plan
- Final Training Plan
- Training Documentation and Manuals (Electronic)
- Three (3) 8-hour training sessions (Operations, Administration, Follow-Up)
- Initial Implementation Basic Training, 8-hours
- Initial Implementation Advanced Training, 16-hours
- Go-Live Support Training, 8-hours, once per month for the initial 12 months of the contract.
- Customer Self-Sufficiency Training, 16-hours
- Basic On-Going Training, 8-hours, once per year
- Advanced On-Going Training, 16-hours, once per year
- Access to additional training via the Econolite Learning Center

20. HOSTING

System requirements

Externally Hosted
Contractor must review the State's standard **Service Level Agreement (SLA) attached as Schedule E** to the Contract Terms.

Contractor must maintain and operate a backup and disaster recovery plan to achieve a Recovery Point Objective (RPO) of 2 hours, and a Recovery Time Objective (RTO) of 2 hours. Contractor must include a copy of its Disaster Recovery Plan as **Schedule G**, which will be treated by the State as confidential information.

On-Premise
The State will be hosting the Software in its own environment, please refer to **Section 11, End User Operating Environment**, of this Project Scope document.

Network Architecture: Components can be scaled to run in various IT frameworks and field networks including a separation between the ATMS's local area network and the center-to-field networks. Centracs supports segregation of separate VLANs for any fiber, copper, or dedicated wireless interconnect. Solution supports APN connection of those controllers that will communicate via cellular connectivity. High-availability and redundancy are part of the overall network architecture. The components of this system will be varied to meet MDOT's needs.

Contractor will leverage existing interconnect in MDOT's network and convert legacy architectures into cellular-based interconnect. Centracs supports serial communications, in addition to IP. Any legacy communications links will be converted to cellular IP at head-end (on-street-master) locations. Existing serial interconnect between legacy master and local controllers can be utilized within Centracs. An IP-serial terminal server would be placed at the head end, and all controllers downstream would need to be updated to support NTCIP-serial communications.

Detailed System Architecture and Design Plan
Contractor must submit a detailed System Architecture and Design Plan covering the following items, for review and approval.

1. Detailed design plans of the network components, including physical and logical cores, physical and logical servers, physical and logical access, physical and logical field devices, VLANs, VPN users, computer room floor and rack designs
2. Detailed descriptions of:
    a) All servers such as application servers, database servers, communication servers, directory servers, clock servers, test servers, backup servers, Internet Information Services (IIS) servers, and others;
    b) Typical workstations configurations including monitors and printers;
    c) UPS, switches, power switches, routers, firewalls; and
    d) Field devices including but not limited to CU and any other field devices that will be managed or monitored by the system, such as CCTV, WiFi/Bluetooth sniffers, detectors, MMU, TSP, UPS/battery back-up, and others.

The following tables depict the recommended server hardware for the initial 280 intersection deployment. Contractor must work with MDOT to determine any additonal hardware requirements and/or preferences, particularly with respect to future system expansion. Contractor has reviewed the State's End User Operating Environment parameters and solution is fully-compatible with the State's standard environment and must remain so for the duration of the contract.

Table 2 - Database Server Requirements

Item	Description	Quantity
Processor:	Intel Xeon Gold 5118 2.3G, 12C/24T, 10.4GT/s, 16.5M Cache	2
Memory:	128GB Memory	1
Hard Drive:	480GB SSD	6
Hard Drive Controller:	PERC H730P Raid Controller for RAID 5	1
Operating System:	Microsoft Windows Server 2016 Standard	1
Database Software:	Microsoft SQL Server 2016 Standard	1

Table 3 - Core Server Requirements

Item	Description	Quantity
Processor:	Intel Xeon Gold 5122 3.6G, 4C/8T, 10.4GT/s, 16.5M Cache	2
Memory:	64GB Memory	1
Hard Drive:	600GB SAS	2
Hard Drive Controller:	PERC H330 Raid Controller for RAID 1	1
Operating System:	Microsoft Windows Server 2016 Standard	1

Table 4 - Communications Server Requirements

Item	Description	Quantity
Processor:	Intel Xeon Gold 5122 3.6G, 4C/8T, 10.4GT/s, 16.5M Cache	2
Memory:	16GB Memory	1
Hard Drive:	600GB SAS	2
Hard Drive Controller:	PERC H330 Raid Controller for RAID 1	1
Operating System:	Microsoft Windows Server 2016 Standard	1

System Architecture & Design Plan: The Centracs system architecture utilizes IT-hosted servers and services, cloud-hosted subcomponents, as well as both rich and thin client interfaces. Under Scope of Work, Contractor must expand on the information contained in this section with specific, detailed information on the overall system architecture, with special emphasis on network, security, system hardware, software, tools, peripherals, software license, and the logical distribution of system components and processes across the architecture. This section provides an overview of the Centracs architecture.

The Centracs system architecture will build on MDOT's current ATMS/IT architectures with the production system hosted on-premises at MDOT and is comprised of three main servers:

- Centracs Database server VM
- Centracs Core server VM
- Centracs Communications server VM

Centracs supports the concurrent use of multiple workstations (Rich Clients) over local and wide-area

network connections. The number of workstations that can connect is only limited by the capacity of the network and the system servers, which can be increased if necessary. The basic architecture would be a Core server talking to multiple workstations running the Centracs Client. Device Managers run on their own virtual machine hosted by the Communications server VM, and they communicate with the field devices and the Core server.

In order to accomplish the desired level of scalability and availability, Contractor will leverage a combination of application-level failover, and virtual machine failover capabilities across each service:

- **SQL Server Database:** There are three databases in the Centracs system. These will be configured with high-availability capabilities using Microsoft's SQL Server Availability Groups.
- **SQL Server Reporting Services:** Centracs makes use of SSRS for its reporting capability. Contractor plans to leverage SSRS services. In addition to availability, this provides component isolation to ensure the reporting features does not adversely affect system operations.
- **Active Directory Services:** Centracs integration with Active Directory Services allows users to leverage their domain credentials in Centracs. Contractor will use MDOT's Federation Services as they are today.
- **Centracs Core Service:** The Centracs Core service is responsible for a number of critical system operations. The Core service will be configured to scale out across several virtual machines, the number of which will increase as the deployment and migration progresses. In order to ensure service availability, the Core service will be configured for failover. Should a single node drop out, the remaining nodes will take over the distribution of work. The SQL Database will be used as witness instance for these services (note that the SQL Server is highly available as well).
- **Centracs Device Manager Service:** The Device Manager service is responsible for field and controller communications. As such, this service is mission critical and needs to be highly available. The Device Manger will be configured in cluster mode. Cluster mode allows the service to load balance across n-number of nodes. In the event a node fails, the work of the failed node will be automatically distributed across the other nodes. The Core services act as a witness across the Device Manger services. The addition of virtual machines will occur as needed as node utilization increases with the migration effort.
- **Centracs Core-Client Network Load Balancer:** In order to ensure high-availability Centracs Client access, a Load Balancer will be configured. Client communications will be directed at the Load Balancer such that there is a single point of connection by which the Client will be concerned. The Load Balancer will then direct Client traffic to the appropriate Core node. In the event a Core node fails, the remaining Core instances will be responsible for updating the Load Balancer to omit the failed Core node.

Centracs High-Availability: Centracs supports horizontal scalability across services, such as the Device Manager. Horizontal scalability and failover for all essential Centracs services is provided by the Centracs High Availability module.

This module provides MDOT with application level failover capabilities for their Centracs Core and Device Manager services.

In the event of a problem or shutdown of the primary Centracs services, a secondary instance will take over. This provides significant reduction in down times and loss of data. While the secondary node can be physically located with the primary instance, due to the mission critical nature of the system, Contractor recommends it be located remotely offsite for additional redundancy. Offsite location of the secondary node requires sufficient network bandwidth and access to the field network.

3-part deployment of the High-Availability Module

- Licensing for a two-node failover cluster
- Deployment and setup services
- Training and procedure review

As an initial step, a review and assessment of the MDOT VM servers and network will be needed to ensure compatibility. This assessment must consider the following areas:

- Server needs and placement
- Networking and bandwidth requirements
- Security and account requirements
- Database requirements

Anticipated deployment includes a total of three servers, which could be virtualized, and are co-located at same physical location and on the same network. Centracs High-Availability makes use of existing high-availability features of Windows and SQL Server. Windows Clustering is used to manage the overall system. Specifically, SQL Server, when configured, will function as part of the Windows Cluster Roles, use the cluster witness, and handle the failover and fallback rules. SQL Server can be configured using Standard or Enterprise Edition with Basic Availability Groups or Availability Groups respectively. Existing SQL Server licensing is expected to cover these capabilities without requiring additional expense, however, Standard edition is limited to single Basic Availability Groups.

Centracs itself leverages the high-available properties of SQL Server as the basis for a Witness. Effectively, when the expected Centracs services do not register with SQL Server within an allotted timeframe, the secondary server is triggered to take over.

Centracs Workstation Clients continue to communicate with the service backend through a load balancer. To accomplish this, Windows Network Load Balancer is used. This provides a single point of connection for Clients, such that the Clients do not need to know which system (i.e. primary or secondary) is active. Contractor must provide services for the deployment and setup of the servers, database, Windows Clustering, Network Load Balancer, Availability Groups and Centracs services. This must include testing various failure conditions and acceptance testing. Assistance from the DTMB's IT department will be required in order to ensure sufficient account permissions for the set up.

Due to the added servers and services, there is additional complexity related to administering the Centracs environment, such as how to recover from a failover. Contractor must provide training for key personnel to ensure understanding of new procedures. Training must include items such as managing backups, failing back to the primary server, and associated system management and are included in the Administrator training session.

See **Schedule J - Hardware** for a complete set of minimum Contractor hardware requirements.

21. SUPPORT AND OPERATIONS

Contractor must review **Schedule B – Maintenance and Support** for CSCS support, maintenance, and troubleshooting requirements.

Externally Hosted

Contractor must review the State's standard Service Level Agreement (SLA) attached as **Schedule E – Service Level Agreement** to the Contract Terms.

On-Premise

Contractor must review the State's Maintenance and Support schedule attached as **Schedule B – Maintenance and Support** to the Contract Terms.

Support-Hours

Contractor must provide Support Hours as 24 hours a day, seven days a week.

Contractor must commence providing maintenance and operations support services 90 days after the date the Centracs Software has entered full production mode and ending on the date the Contract expires. Contractor's maintenance and support services cover all defects and bugs in the central system software and entitles MDOT to free software updates.

Contractor provides unlimited remote technical support via phone and Internet and Contractor's Farmington Hills-based local support team is available to answer questions, problem solve, and help MDOT with its Centracs system.

Contractor must provide MDOT with a dedicated Contractor Service Manager (Frank Carrier) that will serve as MDOT's primary point of contact for support and operations matters throughout the duration of the contract.

MDOT will provide the first line of support for the CSCS, but if unable to resolve a problem, will issue a Support Request via e-mail or telephone that is classified per the State's Service Level Table as Critical, High, Medium, or Low – See **Schedule B – Maintenance and Support**. Each support request classification has an associated response time and resolution time requirement. Contractor must provide a monthly electronic summary of problems reported along with their actual acknowledgement times and resolution times.

The four levels of response are:

- **Level 1, Technician** – This initial level of support will be provided by Contractor's local Michigan-based support personnel. This level handles questions about the operation, application, and functionality of Contractor's software. If issues cannot be resolved at this level, they are escalated to Level 2.
- **Level 2, Engineering Support** – Contractor will provide a dedicated software support team based in the Colorado Springs technology center. Issues not resolved at this level are escalated to Level 3.
- **Level 3, Quality Assurance** –Problems not resolved at Level 2, QA gets involved to test the issue, replicate the issue, and gather additional information surrounding the problem. Issues that are found to result from a defect in software are escalated to Level 4.
- **Level 4, Development** – Level 4 issues are those that require development activity to resolve. Software deficiencies are prioritized and scheduled based on the software product release cycle. Then standard processes are followed for notification and distribution of the resolution, based the severity and impact of the issue.

To facilitate access by these individuals, Contractor will utilize a VPN connection to remotely access the system and assist in diagnostics and troubleshooting. This will reduce MDOT staff time for troubleshooting. Software updates may also be loaded remotely through this connection with MDOT and SOM IT approval. Contractor must work with MDOT's IT group to establish access which is compatible with the State's IT policy.

Regular support is available during normal business hours, 8am to 5pm Central Time. For emergencies, Contractor has a toll-free 24x7 maintenance hotline that can log trouble tickets and generate appropriate responses after hours.

Contractor must provide 5-years of maintenance and operations support, plus an additional 5 1-year options. During this 10-year period, Contractor must provide the following support services:

- **Technical Support** – Assist MDOT staff with routine questions about the use, configuration, management, and troubleshooting of Centracs.
- **On-Site Support** – In the event that telephone or on-line support is unable to resolve and issue, Contractor must provide on-site support to resolve the problem.
- **Software Upgrades** – Contractor must provide all released upgrades to MDOT. Software upgrades include those to address errors, defects, security flaws, etc. and those that provide enhancements, new features, new functions, etc. Centracs must retain all system, user configuration, and preferences when applying software upgrades. If requested by MDOT,

Contractor must provide technical support to install software upgrades.

- **Technical Knowledge Base** - Access to a technical knowledge base including user groups, user newsletters, on-line training, and advanced documentation.

Support & Operations Deliverables

- Operations and Maintenance Support – 10-Years
- Software Upgrades – as released versions of Centracs become available (annually at a minimum)
- Dedicated Contractor Service Manager (Frank Carrier)

22. DOCUMENTATION

Contractor must provide all user manuals, operating manuals, technical manuals and any other instructions, specifications, documents or materials, in any form or media, that describe the functionality, installation, testing, operation, use, maintenance, support, technical or other components, features or requirements of the Software and Hardware.

Contractor must develop and submit for State approval complete, accurate, and timely Solution documentation to support all users, and must update any discrepancies, or errors through the life of the contract.

The Contractor's user documentation must provide detailed information about all Software features and functionality, enabling the State to resolve common questions and issues prior to initiating formal support requests.

The documentation package must address all hardware and software provided under this contract, as well as any other instructions, specifications, documents or materials, that describe the functionality, installation, testing, operation, use, maintenance, support, technical and/or other components, features or requirements of the software and hardware. Contractor must submit all documentation for review and approval by MDOT. Following approval, all documentation must be provided to MDOT in electronic format.

Documentation Deliverables:

- Software & hardware submittals (electronic)
- User/operator manuals (electronic)
- Software programming manuals & procedures (electronic)

23. TRANSITION SERVICES

Upon termination or expiration of the agreement, Contractor must, for a period of time specified by the State (not to exceed 90 calendar days), provide all reasonable transition assistance requested by the State, to allow for the expired or terminated portion of the agreement to continue without interruption or adverse effect, and to facilitate the orderly transfer of the services to the State or its designees. Such transition assistance may include but is not limited to: (a) continuing to perform the services at the established rates; (b) taking all reasonable and necessary measures to transition performance of the work, including all applicable services to the State or the State's designee; (c) taking all necessary and appropriate steps, or such other action as the State may direct, to preserve, maintain, protect, or return (in a format specified by the State) to the State all data stored in the Solution; and (d) preparing an accurate accounting from which the State and Contractor may reconcile all outstanding accounts.

Transition In/Out Plan: MDOT currently utilizes a series of Tactics and closed loop systems throughout the state. As part of this project, once the controllers are changed out, and communications is established (through cellular modems and managed field ethernet switches) the intersection must be brought on-line under Centracs and removed from Tactics or the closed loop system.

Contractor must prepare a Transition In/Out Plan that includes the following sections:

- **Executive Summary:** The executive summary must describe the transition plan at a high-level and what the plan should accomplish.
- **Transition Approach:** Discusses the overall approach to the transition. Some items that must be considered are staffing requirements for both Econolite, and C&G, as well as MDOT, transition schedule, and assumptions (i.e., MDOT staff (or designee's) will be available onsite to participate in the transition and receive knowledge transfer, etc.).
- **Transition Team Organization:** This section of the Transition In/Out Plan must provide an organizational chart showing all resources and their roles in the transition. Key team members will be from both Contractor and MDOT.
- **Work Execution During Transition:** Discusses the level of work that must be performed during the transition period and the impact of the transition on that work (i.e., system maintenance, support services, etc.).
- **Subcontracts:** This section documents all the existing contracts and if/how they will be transitioned (subcontract agreements, software/hardware maintenance contracts, etc.).
- **Property Transition:** This property may include hardware such as laptops/PCs, software bundles or add-ons, portable electronic devices (PEDs), and security badges. This section must detail any Contractor-owned equipment that will remain with Contractor and identify options where this equipment may be available for purchase by MDOT for their use.
- **Intellectual Property:** This section must describe how intellectual property will be handled as part of the transfer process. Intellectual property may include documentation, supplier and subcontractor information, service agreements, or original designs or plans.
- **User Accounts and Passwords:** This section must discuss how any accounts will be transitioned, who they will be transitioned to (i.e., system administrator accounts). It will provide a table of all user accounts to be transitioned/disabled.
- **Knowledge Transfer:** This section must discuss how knowledge will be transferred from Contractor staff to MDOT (or MDOT designee) staff.
- **Schedule:** This section of the transition plan must contain a GANTT chart schedule of the transition. The complexity of the transition will dictate the level of detail required in the schedule.
- **Handover and Acceptance:** The Transition In/Out Plan will reference Software User Acceptance Testing and Solution Acceptance Test Plans for procedures on system handover and acceptance.

24. PRODUCTS AND SERVICES

Contractor must describe additional Solution functionality, products or services that the State specifications do not address but are necessary to implement and support this Solution.

25. CONTRACTOR KEY PERSONNEL

Contractor must identify all Contractor resources and responsibilities required for the successful implementation and ongoing support of the Solution.

Contractor Contract Administrator. Contractor must identify the individual appointed by it to (a) administer the terms of this Contract, and (b) approve and execute any Change Notices under this Contract.

Contractor: Econolite
Name: Eric Raamot **Address:** 5755 Mark Dabling Boulevard, Suite 300, Colorado Springs, CO 80919 **Phone:** 714-392-9794

Email: eraamot@econolite.com

Contractor Project Manager. Contractor must identify the Contractor Project Manager who will serve as the primary contact with regard to services who will have the authority to act on behalf of the Contractor in matters pertaining to the implementation services.

Contractor: Econolite
Name: Jon Ringler, P.E. **Address:** 5910 Shiloh Road East, Suite 114, Alpharetta, GA 30005 **Phone:** 678-641-9236 **Email:** jringler@econolite.com

Contractor Service Manager. Contractor to provide name of individual to serve as primary contact with respect to the Services, who will have the authority to act on behalf of Contractor in matters pertaining to the receipt and processing of Support Requests and the Support Services.

Contractor: Carrier & Gable
Name: Frank Carrier **Address:** 24110 Research Drive, Farmington Hills, MI 48335 **Phone:** 248-477-8700 **Email:** frankcarrier@carriergable.com

Contractor Central Signal System Integrator. Contractor to provide name of individual to serve as primary contact with respect to central signal system integration Services, who will have the authority to act on behalf of Contractor in matters pertaining to the integration of the central signal system.

Contractor: Econolite
Name: Nick Ullman **Address:** 1250 N. Tustin Avenue, Anaheim, CA 92807 **Phone:** 949-584-3851 **Email:** nullman@econolite.com

Contractor Controller Programmer. Contractor to provide name of individual to serve as primary contact with respect to signal controller Services, who will have the authority to act on behalf of Contractor in matters pertaining to programming signal controllers.

Contractor: Carrier & Gable
Name: Mike Schasser **Address:** 24110 Research Drive, Farmington Hills, MI 48335 **Phone:** 248-477-8700 **Email:** mikeschasser@carriergable.com

26. CONTRACTOR PERSONNEL REQUIREMENTS

Contractor must present certifications evidencing satisfactory Michigan State Police Background checks ICHAT and drug tests for all staff identified for assignment to this project.

In addition, proposed Contractor personnel will be required to complete and submit an RI-8 Fingerprint Card for the National Crime Information Center (NCIC) Finger Prints, if required by project.

Contractor will pay for all costs associated with ensuring their staff meets all requirements.

27. STATE RESOURCES/RESPONSIBILITIES

The State will provide the following resources as part of the implementation and ongoing support of the Solution.

State Contract Administrator. The State Contract Administrator is the individual appointed by the State to (a) administer the terms of this Contract, and (b) approve and execute any Change Notices under this Contract. The State Contract Administrator is Christopher Martin.

State Project Manager. The State Project Manager will serve as the primary contact with regard to implementation Services who will have the authority to act on behalf of the State in approving Deliverables, and day to day activities. The State Project Manager is Jim Normandin

Agency Business Owner. The Agency Business Owner, the Michigan Department of Transportation (MDOT), will serve as the primary contact for the business area with regard to business advisement who will have the authority to act on behalf of the State in matters pertaining to the business Specifications. The Agency Business Owner is Colin Castle.

State Technical Lead. The State Technical Lead will serve as the primary contact with regard to implementation technical advisement. The State Technical Lead is Nathan Bouvy.

28. MEETINGS

The resulting awarded Contractor must attend the following meetings at no additional cost to the State.

At start of the engagement, the Contractor Project Manager must facilitate a project kick off meeting with the support from the State's Project Manager and the identified State resources to review the approach to accomplishing the project, schedule tasks and identify related timing, and identify any risks or issues related to the planned approach. From project kick-off until final acceptance and go-live, Contractor Project Manager must facilitate weekly meetings (or more if determined necessary by the parties) to provide updates on implementation progress. Following go-live, Contractor must facilitate monthly meetings (or more or less if determined necessary by the parties) to ensure ongoing support success.

Weekly Progress Meetings: Contractor must hold weekly project meetings via teleconference to keep MDOT informed of project progress and upcoming activities. These meetings will be structured as "status only" and are intended to last not more than thirty minutes. This time frame ensures regular stakeholder attendance and insists that more in-depth discussion to be taken offline. The agenda for these meetings will guide the discussion and function as a Status Report. These meetings will be limited to the following discussion points:

- Estimates of progress
- Work performed during the prior period
- Work anticipated for the current/following period
- Any deviations from the project plan along with their current issues, status, and how they are to be remedied.

For each weekly progress meeting, Contractor must provide the meeting agenda and notes. The notes will include a "rolling" Action Item list that identifies and summarizes the Action Item (what needs to be done), Responsible Parties (who needs to do it), Resolution Dates (when will it get done), and End Result (how was it accomplished).

Additional weekly scheduled discussions between Contactor and MDOT project managers will be held to work through any schedule or task needs and to keep each informed of any changes or modifications that may be needed.

Communication: Contractor will develop an external site (i.e., SharePoint, Dropbox, etc.) which will be accessible by the project management, QA/QC staff, task leaders as well as the MDOT management and staff. This will allow for seamless sharing of project progress, data, and documentation.

Internal: Contractor must hold an internal kick-off meeting with project management staff and task leaders in which a preliminary schedule will be set for project delivery. Contractor must hold weekly internal project coordination meetings during the installation/configuration and testing phases. Contractor is responsible for keeping the entire Team aware of any changes that may occur during the preparation of the contract deliverables. Written and/or telephone correspondence, as well as meetings and/or conferences, will occur on a frequent basis during the design process and will focus on planning for upcoming activities and priorities.

External: Contractor must host weekly formal meetings to keep MDOT informed of project and upcoming activities. Task leaders and other key personnel will participate in the weekly progress meetings as needed. The Team must provide a detailed project plan and schedule for the upcoming four-week period.

These meetings will be scheduled for sixty (60) minutes and will discuss administrative items impacting the project, including reviewing progress reports, open action items, upcoming activities and written correspondence exchanged since the last meeting. During these progress meetings, the Team will discuss technical aspects of the project and review comments on documents submitted for approval. The agenda for these meetings will guide the discussion and function as a Progress Report. and will include the following discussion points:

a. Work performed in the prior week
b. Work anticipated in the ensuing week
c. Provide a project plan and schedule for the upcoming (four) 4-week period
d. Outstanding issues in scope
e. Comments on submittals
f. Other issues such as coordination with local agencies (if required), permitting, etc.

Meetings must be documented using meeting notes to identify decisions or direction given by MDOT personnel. All critical information must be shared with those responsible for preparing the deliverables. Contractor must prepare and submit all meeting notes within 48 hours of the meetings.

Deliverables:

- Kick-Off Meeting
- Project Management Plan
- Weekly Progress Meetings

29. PROJECT REPORTS

Once the Project Kick-Off meeting has occurred, the Contractor Project Manager must monitor project implementation progress and report on a weekly basis to the State's Project Manager the following:

- Progress to complete milestones, comparing forecasted completion dates to planned and actual completion dates
- Accomplishments during the reporting period
- Tasks planned for the next reporting period
- Identify any existing issues which are impacting the project and the steps being taken to address those issues
- Identify any new risks and describe progress in mitigating high impact/high probability risks previously identified

30. MILESTONES AND DELIVERABLES

The State's proposed milestone schedule and associated deliverables are set forth below, or as approved by the State.

Milestone Event	Associated Milestone Deliverable(s)	Schedule
Project Planning	Project Kickoff	Contract Execution + 10 days
Requirements and Design Validation	Validation sessions, Final Requirement Validation Document, Final System Architecture and Design Document, Final Implementation Plan Document. Complete SOM EASA.	Execution + 90 days
Provision environments	Validate Test and Production environments	Execution + 90 days
Installation and Configuration of Software	Final Solution and Testing Document, completion of SOM System Security Plan and Risk Assessment in GRC Tool;	Execution + 180 days
Testing and Acceptance of Software	Final Software UAT Results Report; Final Training Documentation	Execution +210 days
Installation, Configuration, Testing, and Acceptance of Solution (5%)	Solution Acceptance Test Plan Results for 5% of Phase 1 Intersections,	Execution+240 days
Installation, Configuration, Testing, and Acceptance of Solution (25%)	Solution Acceptance Test Plan Results for 25% of Phase 1 Intersections	Execution+270 days
Installation, Configuration, Testing and Acceptance, of Solution (50%)	Solution Acceptance Test Plan Results for 50% of Phase 1 Intersections	Execution+300 days
Testing and Acceptance of Solution (75%)	Solution Acceptance Test Plan Results for 75% of Phase 1 Intersections	Execution+330 days
Testing and Acceptance of Solution (100%)	Solution Acceptance Test Plan Results for 100% of Phase 1 Intersections	Execution+360 days
Solution Burn-in Period	Successful completion of 60-day burn-in for 100% of Phase 1 Intersections	Execution+450 days
Post Production Warranty	Maintenance and Support (free of charge)	Production + 90 days
Production Support Services	Ongoing after Final Acceptance.	Begin at end of Warranty Period Ongoing

Contractor must provide a final Work Breakdown Structure (WBS) that corresponds with the milestone dates set forth above (or with Contractor's alternatively proposed schedule). The WBS must be detailed enough to identify all State and Contractor responsibilities. Invoices must be submitted in accordance with the contracted milestone payments.

The Contractor Project Manager will be responsible for maintaining an MS Project schedule (or approved alternative) identifying tasks, durations, forecasted dates and resources – both Contractor and State - required to meet the timeframes as agreed to by both parties.

During the project start-up phase, the master schedule and budget baseline define tasks to a common level using a standard work breakdown structure or WBS. As tasks advance through the delivery lifecycle, the master schedule must be updated to reflect the additional scope and schedule details.

The Project master schedule progress and budget performance must be updated on a regular basis throughout the life of the project tasks and coordinated as necessary.

- Project Schedule Review: As part of their monitoring and control processes, the Management Team will review all activities included in the master schedule monthly.
- Budget Performance Review: The Project budget represents the estimate-at-completion (EAC) for the overall Project. This will be determined using the costs-to-date (CTD) and estimate-to complete (ETC). The CTD will be the sum of all expenditures. The ETC is the projected remaining expenditures for the Project built up from detailed estimates for those tasks currently in delivery and at a higher summary level for future tasks.

All changes to scope, schedule or cost must be addressed through a formal change request process with the State and the Contractor to ensure understanding, agreement and approval of authorized parties to the change and clearly identify the impact to the overall project.

Invoices must be submitted in accordance with the contracted milestone payments.

SUITE Documentation
In managing its obligation to meet the above milestones and deliverables, the Contractor is required to utilize the applicable State Unified Information Technology Environment (SUITE) methodologies, or an equivalent methodology proposed by the Contractor.

SUITE's primary goal is the delivery of on-time, on-budget, quality systems that meet customer expectations. SUITE is based on industry best practices, including those identified in the Project Management Institute's PMBoK and the Capability Maturity Model Integration for Development. It was designed and implemented to standardize methodologies, processes, procedures, training, and tools for project management and systems development lifecycle management. It offers guidance for efficient, effective improvement across multiple process disciplines in the organization, improvements to best practices incorporated from earlier models, and a common, integrated vision of improvement for all project and system related elements.

While applying the SUITE framework through its methodologies is required, SUITE was not designed to add layers of complexity to project execution. There should be no additional costs from the Contractor, since it is expected that they are already following industry best practices which are at least similar to those that form SUITE's foundation.

SUITE's companion templates are used to document project progress or deliverables. In some cases, Contractors may have in place their own set of templates for similar use. Because SUITE can be tailored to fit specific projects, project teams and State project managers may decide to use the Contractor's provided templates, as long as they demonstrate fulfillment of the SUITE methodologies.

The Econolite process for project delivery is very similar to the State Unified Information Technology Environment (SUITE) for Project Management. Contractor will follow these processes from project development through project closeout and every step in between to deliver a successful project. Contractor's project execution processes comply with the Project Management Body of Knowledge (PMBOK).

Contractor will create an Innovation Council which will contain leaders from Econolite, C&G, Verizon, and other resources from technology-based firms. The Innovation Council will meet with MDOT on a quarterly basis to report on the tactical project activities, and discuss the future integration of data interfaces, innovative applications and address any topics that MDOT seeks input on regarding the advancement of this system toward the smart community and CV architectures.

During the performance of work as outlined in the high-level Implementation Plan, Contractor will further detail its project management activities through a Project Management Plan (PMP). The PMP is a formal, approved document used to manage project execution. The PMP will document the actions necessary to define, prepare, integrate and coordinate the various planning activities and how the Project will be executed, monitored and controlled, and closed. The PMP will be part of the Project Plan deliverable

Contractor must provide monthly progress reports that include any necessary schedule updates, activities accomplished during the reporting period, percentage of work complete, anticipated work over the next month, and any other technical or scheduling issues. Contractor must hold weekly project coordination meetings during the installation, configuration, and acceptance phases. These meetings will provide the status of all activities and will focus on planning for upcoming activities and priorities. A written agenda, meeting notes and action items will be provided for each meeting. Contractor's extensive experience on ATMS projects and knowledge of MDOT's standards and procedures, Contractor expects to operate as an extension of staff and jointly deploy the CSCS for the State of Michigan.

Contractor's QA/QC Approach: Contractor's Quality Assurance (QA) and Quality Control (QC) has three main components: quality planning, quality assurance, and quality control.

The Contractor will be responsible for the professional quality, technical accuracy and coordination of all design, development, implementation, field integration and other services under this contract, notwithstanding any reviews or inspections by or on behalf of MDOT.

All project activities and deliverables will be checked for conformance with project requirements and applicable standards to ensure that a quality product is delivered to MDOT. Contractor's QA/QC process assumes that at least two qualified individuals agree on the correctness of each work product before it is released as a deliverable. This requires specific activities be performed for QC reviews and QA verification on every deliverable as noted:

- Contractor Project Manager is responsible for QC for the project and will lead the preparation of a Design Quality Management Plan (DQMP) that will include a QC Plan.
- The DQMP and the QC Plan will identify the Lead Technical Professionals (LTPs) and the Quality Control Reviewers (QCRs), as well as the QC reviews identified as specific tasks within the project schedule.
- Contractor Project Manager will ensure appropriate communication is completed with the proper members of the Team prior to commencement of work activities, usually through a project kick-off meeting.
- During deliverable production, the QCRs must be independent of the members of the team. The LTPs are responsible for the quality of their individual deliverables.
- At the end of each sub-task, the LTP compiles the documents to be used for the QC reviews and submits them to the Contractor Project Manager who distributes them to the QCR associated with the work.
- The QCR performs the review in accordance with the QC procedures outlined in the DQMP and provides the document back to the Contractor Project Manager.
- The QC and QA documentation developed will be properly recorded in the files to show that project requirements were met.

Contractor must submit the Project's Design Quality Management Plans within thirty (30) calendar days of the written Notice to Proceed (NTP).

A signed Statement with each submittal that the documents have undergone a QC review will be submitted. All members of the Contractor's Team will be held to the same quality standard and will be adhering to the approved DQMPs.

31. PRICING

Contractor provided in **Schedule D – Pricing,** a detailed description of all costs associated with implementing, maintaining and supporting the Solution, including all requested services set forth in the Contract. Contractor provided tiered pricing discounts based on volume.

If Contractor reduces its prices for any of the software or services during the term of this Contract, the State shall have the immediate benefit of such lower prices for new purchases. Contractor shall send notice to the State's Contract Administrator with the reduced prices within fifteen (15) Business Days of the reduction taking effect.

Support and maintenance costs are dependent on the number of signalized intersections licensed, Contractor has provided a tiered pricing structure consistent with submitted licensing structure.

Travel and Expenses

The State does not pay for overtime or travel expenses.

32. ADDITONAL INFORMATION

The State reserves the right to purchase any additional services or products from the Contractor during the duration of the Contract.

STATE OF MICHIGAN

Contract No. 190000001522
Central Signal Control System (CSCS)

EXHIBIT A – Table 1
BUSINESS SPECIFICATION WORKSHEET

A	B	C					D
Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
MANDATORY MINIMUM							
1.0	The Solution must be compatible with controllers using the NTCIP 1202 v02 Center-to-Field (C2F) communications protocol and have the scalability to meet future NTCIP standards as they are approved (e.g., NTCIP 1202 v03 is currently under development).	✓					The backbone of Centracs is NTCIP which includes support of numerous NTCIP protocols including 1202.
PREFERED REQUIREMENT	**SYSTEM ARCHITECTURE**						
2.0	The Solution must be integrated with all the features of the following controllers/firmwares: Siemens m60 NEMA ATC loaded with Siemen's SEPAC controller firmware version 5 over Linux using NTCIP communications and Econolite Cobalt NEMA ATC loaded with Econolite's EOS controller firmware version 03.01.28 over NTCIP communications. Integration must include all the base features available through NTCIP or other open protocols/data object definitions (e.g., NTCIP 1202 mandatory objects) as well as all vendor-specific features available through vendor- specific Management Information Bases (MIBs). All functionality that is available locally at the controller must also be available remotely through the Solution. Controller hardware must be equipped with its native firmware as listed in the MDOT NEMA Type ATC Special Provision or as approved by the Engineer.	✓					NTCIP supports SEPAC version 5 with NTCIP, including Siemens proprietary objects. There is also support in Centracs for native Controller Database Editor capabilities of the Eagle Controller.
3.0	The Solution must include the ability to store user-created signal timing plans that command the signal controllers to change the pattern or plan, based on the day of the week and time of the day.	✓					The Centracs includes a scheduler that provides the means to schedule pattern changes in controllers based on day of the week and time of the day.

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
4.0	The Solution must maintain only one active set of the operational parameters in the Solution central database. The active set must be shared via the central database rather than copied by the workstations. The Solution must ensure database consistency and integrity among multiple users.	✓					The signal database editor stores a local copy of each controller's configuration settings. The Signal Database editor can store multiple copies of each controllers' settings for analysis or implementation later. There is one copy that is designated as the main copy and that one is used to ensure database consistency between field and central
5.0	The Solution must provide a Graphical User Interface (GUI) with a commercially licensed GIS based map to control and monitor the traffic signal system in real time.	✓					Centracs' maps offer a real-time display of the overall state of each Signal, Link, and CCTV device. Dynamic icons superimposed onto true GIS-based maps indicate the type, status, and location of each active field device.
6.0	The GUI must have the ability for a user to create timing plans for groups of intersections and to schedule those timing for recurring or one-time operation.	✓					Centracs gives users the ability to create timing plans and copy them to multiple controllers. Users can then use the scheduler to run the same plan for a group of intersections.
7.0	The GUI must display real-time status of individual signal controller attributes such as signal timing, phasing, detector inputs, preemption, etc.	✓					The signal status display shows the real time status of an individual signal with displays for signal timing, phasing, detector inputs, preemptions, overlaps, alarms, comm. status, etc.
8.0	The Solution must operate in a distributed mode, fully making use of the intelligence in the local intersection controllers. The intelligent local controllers must be programmed with timing plans, time-of-day/day-of-week (TOD/DOW) schedules, traffic adaptive/responsive operations, and all other parameters required to operate the local intersection. Operational changes originating from the Solution must be implemented on local controller	✓					Centracs follows a fully distributed architecture. Local controllers are programmed with timing plans, time-of-day/day-of-week (TOD/DOW) schedules, traffic adaptive/responsive operations, and all other parameters required

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
	databases such that local controllers are always capable of operating fully independent of the Solution.						to operate the local intersection. Operational changes originating from Centracs are implemented in a way that allows the local controller to always operate independently. If communications are lost between field and central, signals will revert to local TOD operations.
9.0	The Solution must provide the ability to automatically download clock updates to field clocks integrated in each controller. If the time/date in the field clock has drifted beyond a user-defined amount, the Solution must automatically download the true time, as identified through an external Network Time Protocol (NTP) server, to the field clock. The Solution must report the clock drift to the user.	✓					Centracs includes functionality to automatically download clock updates to the field. A time drift check can also be enabled to automatically correct the time when it has drifted past a certain user defined threshold.
10.0	The Solution must provide the ability to set a reference point where all coordinated signal cycles sync up.	✓					Centracs provides the ability to set up a reference point where all coordinated signal cycles can sync up.
11.0	The Solution must be capable of operating in the Eastern and Central Time zones.	✓					Centracs supports multiple time zone through its distributed Controller Communications, namely, the ability to run the Centracs Device Manager service in any number of time zones to support the specific time zone of each controller for time synchronization operations.
12.0	The Solution must provide role-based access controls and allow the authorized system administrator(s) to define and assign different user access levels which enable and/or restrict the features, functions and/or data available to users.	✓					Access to data and functions in Centracs is strictly controlled. Centracs offers multiple levels of security that an administrator can use to permit or prevent access to specific data and functions on a user-by-user basis.

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
							The basic user password dynamic is used to login but Centracs also offers active directory support to streamline security with Windows. Level of password strength can be defined by an administrator and audit trails of user activity can be seen in the System Activity report. We are also providing enhanced security measures as part of our recent system expansion contract with Miami-Dade County.
13.0	The Solution must be compatible with National Transportation Communications for Intelligent Transportation System Protocol (NTCIP) 1201, NTCIP 1202, NTCIP 1211, Traffic Management Data Dictionary (TMDD), and underlying base standards.	✓					Econolite Centracs supports the use of the NTCIP protocol for all communications with field controllers. This also includes robust NTCIP 1211 for vehicle priority applications.
14.0	The Solution must provide a completely automated installation from storage media. From the operating system command line, no more than two typed commands should be required to fully install all software. Once the software is installed, configuration screens must allow the system administrator to set distinct operating features of the system through the graphical user interface (GUI).	✓					Centracs provides for a completely automated installation process. Centracs clients will automatically upgrade to the same version as the core server.
15.0	The Solution architecture must provide the capacity to concurrently network (i.e., communicate with) up to 35,000 IP addressable connected intersection devices used to support the operation of the signalized intersections that support the overall operations of the arterial system.	✓					The system architecture is able to fulfill this requirement and has full support of IP class A, B, and C, cellular VPN's, VLANS, etc.

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
15.0	The Solution architecture must provide the capacity to concurrently network (i.e., communicate with) up to 35,000 IP addressable connected intersection devices used to support the operation of the signalized intersections that support the overall operations of the arterial system.	✓					The system architecture is able to fulfill this requirement and has full support of IP class A, B, and C, cellular VPN's, VLANS, etc.
16.0	The Solution must allow changes to user-defined configurations and updates to individual and group intersection data without restarting/rebooting the Solution.	✓					Centracs allows changes to user defined configurations and updates to intersection data without having to restart the application. This includes such common operations as: adding a new intersection to the system, updating the map, changing a device IP address, changes to dynamic objects, device communication channels, and many more.
17.0	The Solution must save all data and end all processes upon shutdown.	✓					The user interface enables users to save and retain configuration and data across any number of "preference sets". Centracs stores open dialog information, dialog positions, and other user preference data on shutdown to these preference sets. All processes are closed upon shutdown.
18.0	In the event of Solution failure and without user intervention, upon restart, the Solution must return to normal operation according to system configuration prior to failure and current time of day. All system failures must be logged and sent to the Solution manufacturer as needed for analysis and product refinement.	✓					System services and operations feature robust recovery capabilities and integration with Windows features, such as automated notification of services and service restarts.

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Business Specification Number	**Business Specification**	**Current Capabilit**	**Requires Configuratio**	**Requires Customizatio**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
							Econolite prides itself on its Proactive support abilities. The proposed support agreement in includes proactive monitoring and logging whereby not only failure but trends in key areas are tracked. For example, support can monitor and project when a hard drive will fill up and proactively address it before it becomes an issue. As well, all failure logs and diagnostics are captured and are monitored by Econolite support.,
19.0	If the Solution detects a fatal error within one or more of its processes, it must inform end-user operators in real-time via email and by audible and visual alert and log a message to the Solution's system log.	✓					An alert can be sent upon detection of a fatal error within the system processes. Both a visual notification along with an optional audible notification can be associated with it.
20.0	The ability of the system components (e.g., central server, signal controllers, field communications equipment, other connected field equipment, user workstations, etc.) to interact with each other shall not be governed by a structured start-up order. That is, if a component fails to operate or is powered down, the remainder of the system will operate without interruption and not have to be shut down and restarted to re-establish a working system. The unaffected components will simply wait for the missing component to be returned to the system. When returned, all components will automatically revert to normal operations. This requirement includes but is not limited to the following scenarios: (1) Failure of a signal controller or other connected intersection equipment installed in the field (2) Failure of a user workstation, remote laptop, or mobile device (3) Failure of field communications equipment (e.g., network switch, cellular modem/router, radios) (4) Failure of one or more of the servers for the Solution central software and/or database (5) Failure during system maintenance, software upgrade or other hardware, software or infrastructure related issue	✓					Centracs is designed in a way where any one component failure will not affect the overall performance of the system. If a server failure were to occur, controllers in the field would revert to local TOD operation. The Centracs system could be installed on a backup serverready to be operational in event of a fail. The backup server would be able to restore the data from archived Centracs backups or there would be a backup of the SQL Server that could be restored. In any event, once the data is restored, the backup Centracs would be able to return to normal

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
21.0	The Solution must include a software/hardware watchdog timer (WDT) process to control time critical tasks.	✓					Centracs includes automated health monitoring that far surpasses watchdog style monitoring, which are passive in nature. Specifically, Centracs constantly monitors all critical health vectors, such as database operations, device manager communications, and Core server availability. Upon a failure of any of these subsystems, Centracs will immediately failover and bring online secondary services to avoid any service interruption.
22.0	The Solution must have the scalability to integrate with connected vehicle applications, DSRC or 5G cellular communications equipment, signal priority systems, network management system, wrong way driving systems, and other emerging technologies.	✓					Econolite has prepared forsupport of connected vehicles (CV) with particular focus on the advancements that can be made to signalized control when vehicle speeds and trajectories are known. Econolite has redeveloped many elements within the traffic control phase timing and sequencing modules to support real time changes to phase sequencing/timing/and phase next updates to accommodate these future CV applications. Econolite has also developed the Connected Vehicle Co-Processor (CVCP) which allows hosting of connected vehicle applications, such as the FHWA V2I Hub, an essential component in any connected vehicle architecture. Moreover, the CVCP enables powerful edge compute capabilities for full CV readiness now and into the future.

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
23.0	The Solution must not require changes to the existing domain structure other than the addition of computer and users accounts that might be incidental to the installation and maintenance.	✓					The Centracs software supports integration with Microsoft Active Directory for account access and user management including domain elements such as groups and organization units. This allows for ease of IT oversight through IT toolchains such as Active Directory.
24.0	The Solution must provide all the necessary utility operations for backing up, restoring, and repairing the databases to an external storage device.	✓					Centracs has an archive and restore function to backup database tables and restore the data in the event of a server failure. SQL Server itself has backup and restore features which would provide further redundancy in safeguarding the data.
PREFERED REQUIREMENT	**GUI – GENERAL REQUIREMENTS**						
25.0	The GUI must provide full-color displays for all maps, graphs, displays, commands, and imagery.	✓					Centracs monitoring screens represent data graphically and make it easy for users to quickly keep tabs on what is occurring in the system. Unlike the user interfaces of many traditional traffic management systems, which separate operator control and text reporting functions from graphic display functions, the Centracs user interface integrates these operations. This lets you easily move between contexts in an intuitive point-and-click manner.

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
26.0	The GUI must be able to simultaneously display multiple windows, including multiple map views and multiple text displays, and have intuitive tools for window sizing and arranging, including but not limited to dockable panes that are easy to layer and maneuver.	✓					With the versatile layout of Centracs, users can make their own arrangement of windows. When the application is launched for the first time, the main window shows a set of empty panes. Each of these panes is a container for a window. To quickly and easily make a customized view, users can open the windows that are used most, and drag them into these containers. When the user exits the application, the container layout is stored in the database, and is retrieved the next time they log in.
27.0	The GUI must be simple, provide clear messaging, and be easy to use while providing a fast and efficient way to control and monitor traffic signals in real time.	✓					The Centracs' GUI provides users with a clear and intuitive process to monitor and control traffic signals in real time. The signal status display allows control and monitoring of an individual intersection while the section status screens and the manual command and scheduler functions allow users to control a large grouping of signals quickly and efficiently.
28.0	The GUI must allow the user to display aerial imagery or map-based background that remain crisp and readable at any zooming level in the system map.	✓					Centracs features a powerful map engine, utilizing online mapping sources including Bing, OpenStreetMaps, and any Web Mapping Services (WMS) Server such as ESRI ArcGIS.
29.0	The GUI display must remain crisp and readable on all workstation monitors and video walls.	✓					Centracs' GUI display is clear and readable on all workstation monitors and video walls with the additional ability to select between a light and dark theme.

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
30.0	The GUI map must display the state of Michigan in a single view (i.e. map can zoom out to show the entire state).	✓					The GUI is able to display the entire state of Michigan in a single view. Full zooming and panning functionality are standard and allows for full zoom ranges from intersection level up to regional or state level.
31.0	The GUI must display the real-time status of every signalized intersection within the viewable area shown on the map.	✓					The GUI is able to display the real-time status of every signalized intersection within the viewable area. Each zoom level on the main map can be configured to have an icon representation of the intersection status and links between devices.
PREFERED REQUIREMENT	**SIGNAL OPERATIONS**						
32.0	The Solution must collect operations data (e.g., available outputs from each device) of user-selected connected intersection devices and other field devices in real time (e.g. updated once per second) or near real time (e.g. as often as the device will communicate).	✓					Centracs collects operations data for connected intersection devices in real time or as often as the device communicates with Centracs.
33.0	The Solution must provide users the ability to enable or disable signal operations data collection on an individual intersection basis.	✓					Centracs includes the ability to enable or disable signal operations data collection on an individual signal basis.
34.0	The Solution must include the following control modes, which are implemented by time of day schedule, and user-selectable from the Graphical User Interface (GUI): (1) Manual Control, (2) Time-of-Day/Day-of-Week, (3) Flash Control, (4) Free Control, (5) Event Scheduling Control.	✓					Centracs allows the user to set signals to Manual Control, TOD/DOW, Flash Control, Free Control, Event Scheduling Control on a user configured schedule.

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
35.0	The Solution must accommodate the control and monitoring of the on/off status of all of the inputs and outputs to be implemented by the local controller. This monitoring and control must be available both from the remote workstations and portable computers connected directly to controllers. The Solution must provide the ability for a user to turn any input on or off while being monitored from a remote workstation or portable computer connected directly to controllers.	✓					Centracs provides a full spectrum of status monitoring capabilities. Controller monitoring is available in the map, entity tree, device status and other locations. Specifically, controllers, including various input/output status on this Signal Status display, as well as full virtual front panel access though the Remote Front Panel feature.
36.0	The Solution must provide users the ability to import signal operations data (e.g., volume, timing, phasing, intersection layout) and export signal operations data to traffic modeling software platforms (e.g. Synchro, VISSIM, etc.).	✓					Several export/import options exist for such application as Synchro and VISSIM. Multiple versions of Synchro UTDF format are available. Additionally, controller databases can be exported and added to VISSIM. Econolite has ongoing integration with PTV supporting directly cunning “virtual controllers”.
37.0	The Solution must provide users the ability to interface with Synchro software package to perform timing plan generation, based on detector information received from the field or operator input data. It must be capable of uploading the new timing plan to the Solution central database to be implemented on the field controller system timing plan databases (i.e., cycle length, split and offset). As a minimum, the following existing signal timing data must be transferred to Synchro, including: (1) intersection node number (2) intersection control area (3) phase (number and direction) (4) phase minimum green (5) vehicle clearance (6) pedestrian clearance (7) maximum phase duration The Solution must provide users the ability to transfer the same data from Synchro to the Solution		✓				Support of the items indicated can be provided by a combination of out-of-the-box functionality and updating UTDF fields with associated metadata.

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38.0	The Solution must allow for field changes via physical, local equipment to timings, phasing, software/firmware updates, equipment upgrades and other field-related tasks and detect, log, and store the changes in real-time in the Solution database.	✓					Centracs allows fields changes and provided the proper alerts are set up, logs the changes in real-time in the central database.
PREFERED REQUIREMENT	**SECURITY**						
39.0	The Solution operating systems, middleware, applications, and interfaces must be scanned for vulnerabilities every 30 days and scanning reports must be provided to State of Michigan data owner as required by State of Michigan security standards.	✓					We understand that DTMB will perform these scans. Econolite will remediate any issues identified by the scan and provide reports, as applicable.
40.0	The Solution must cooperate with the State of Michigan to allow monthly vulnerability scans against all public-facing interfaces with access to State of Michigan data.	✓					Econolite will cooperate with State scans.
PREFERED REQUIREMENT	**EXTERNAL INTERFACE**						
~~41.0~~	~~The Solution must facilitate a general-purpose field computing platform for transportation applications that meet Advanced Traffic Controller (ATC) family of standards: open architecture, modular, multi-tasking, multi- application, can grow with technology. Please describe the approach to meeting this requirement.~~						Requirement deleted per the State's Bidder Q&A response.
PREFERED REQUIREMENT	**DATABASE**						
42.0	The Solution must not limit the size of the databases or database record fields other than that imposed by the hardware storage capacity. The Solution will coordinate with the Owner to determine the amount of storage space needed at time of procurement.	✓					Centracs does not limit the size of the database or the database record fields. The only limit is the hardware storage capacity.
43.0	The Solution must automatically record all signal operations data in the database every 60 seconds, at a minimum, and be administrator configurable to larger intervals. Signal operations data include but is not limited to phase splits, green time, detection device data, preemption dwell time, communication status, cabinet equipment status, advanced traffic control parameters, coordination plans, special functions, incident management plan, and cycle returns.	✓					Centracs can be setup to log all signal operations data for an intersection or a group of intersections.

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44.0	The Solution must include an active database that stores, at a minimum, 90 days of signal operations data as well as system events such as alerts and user activity.	✓					Centracs stores signal operations data as well as system event, alert, and user activity data. The amount of data is only limited by the hardware storage capacity.
45.0	The Solution must provide the ability to include an archive consisting of select data elements such as signal operations, system events, alerts, and user activity not in the active database (e.g. greater than 90 days old).	✓					Centracs provides the user with the ability to archive off signal operations, system events, alerts, and user activity data older than a user selectable date. They can restore this archive at any time to regain access to the data.
46.0	The Solution must provide the ability to query signal operations data in the archive database.	✓					Centracs provides the ability to query signal operations data once the archived database is restored.
47.0	The Solution must provide the ability to query archived data from external sources.	✓					Centracs provides the ability to query data from external sources provided it is able to be restored to a compatible database and is in a format that Centracs recognizes.
48.0	The Solution must provide the ability to perform database backups and exports by schedule and by system administrator request.	✓					Centracs gives the user the ability to perform database backups and exports by schedule or manual command.
PREFERED REQUIREMENT	**COMMUNICATION**						
49.0	The Solution must be compatible with wired and wireless communications.	✓					Centracs is compatible with wired and wireless communications. Network latency will affect system performance.

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50.0	The Solution must provide the ability to communicate via Simple Network Management Protocol Version 3 (SNMPv3) and be backward compatible with SNMP v1 and v2.).	✓					Centracs is compatible with SNMP v1 and v2. The next version of NTCIP 1218 will call for the use of SNMPv3 for controller-RSU communication, and it is expected to be released in 2020. In addition, there is a separate effort to adopt SNMPv3 in the ISO 20684 standard. Once it is officially released in NTCIP 1218, Econolite plans to incorporate this into the controller software and then into Centracs. This would be at no cost to MDOT.
PREFERED REQUIREMENT	**INTERSECTION CONTROL GROUP DISPLAY**						
51.0	The Solution must have the ability for a user to dynamically select signalized intersections from the GUI to be grouped for: (1) Coordination (e.g. coordination timing patterns – time of day or traffic adaptive), (2) Monitoring the performance of intersections (e.g., observation, data collection and analysis, dispatching maintenance), (3) Control (e.g. modification of timing parameters/functions on intersection firmware) purposes.	✓					Groups in the Entity Tree. In the Centracs software, users can assign field devices to groups. One device can appear in multiple groups. Users can administer and manage multiple field devices by group.
52.0	The Solution must allow intersections to be selected from a list. The Solution must allow the list of intersections to be sorted by a given attribute (e.g., ID number, network segment, communications channel, county, roadway, etc.). The Solution must allow the list to be printed and exported in CSV, Excel, and PDF formats.	✓					In Centracs, the entity tree is the list and it can be sorted and filtered. The list of entities is also found in a report which can be printed or exported.
53.0	The GUI must have the ability for a user to display the real-time status of all devices in a control group.	✓					Centracs includes the device status list that shows the real-time status of all devices in a control group.

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54.0	The Solution must allow a user to select a predetermined group of signalized intersections for monitoring.	✓					Centracs allows the user to select a predetermined group of signals for monitoring.
55.0	The GUI must allow users to monitor the current green status of each intersection in an intersection group, with the option to show yellow, red, flashing yellow arrow, and flashing red arrow signal indications.	✓					In Centracs, users can use the signal status display to monitor current green, yellow, red, FYA, and flashing red arrow indications.
56.0	The GUI must allow user to monitor intersection preemption dwell time, clearance time, and, if time of day, time necessary to re-synchronize corridor cycle times affected by the preemption event.	✓					Centracs gives users the ability to monitor intersection preemption details.
57.0	The GUI must allow users to move, delete, or add intersections in real time from one control group to another control group by time-of-day / day-of-week schedule and other criteria using drag and drop or other functionalities.	✓					In Centracs, users can setup action sets to move, delete, or add intersections to a control group on a scheduled basis
58.0	The Solution must allow users to dynamically assign intersections and detectors to any control group.	✓					Centracs allows users to dynamically assign intersections and detectors to a control group.
59.0	The Solution must allow each control group to include any number of intersections between 1 and the total number of intersections in the system.	✓					Control groups in Centracs can be from 1 to the total number of controllers in the system.
60.0	The Solution must allow control groups to be modified (i.e., assign, remove, reassign intersections) either by user command or time of day command.	✓					Control groups can be altered via manual command.
PREFERED REQUIREMENT	**CONTROLLER FUNCTIONALITY DISPLAY**						
61.0	The Solution must allow all controller functions to be accessible and editable by means of menus. All menu items must be labeled in American English. Likewise, all elements in data tables and displays must also be clearly labeled in English according to function, phase, timing plan number, etc. Editable attributes must include hardware description, firmware revision, serial number, location of assets and others.	✓					Centracs is menu based and complies with all the requirements listed.

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PREFERED REQUIREMENT	**STATUS DISPLAY**						
62.0	The GUI must be able to display the operational status of each intersection by individual intersection, control group, or entire system.	✓					Centracs is able to display the operational status of each intersection, control group, or entire system using the signal status display, the section status display, and the entity tree respectively.
63.0	The GUI must have a state-wide map display that shows the status of every signalized intersection within the display area (on-line or faulty – flash, all out, communication failure, pre-empt, coordination status, etc.).	✓					Centracs is able to display a state-wide map that shows the status of every signalized intersection within the display area. The icons will be a point with a color corresponding to a status. Tooltips are also available when hovering over the icons with the mouse. These contain additional status detail.
64.0	The GUI must display the intersection mode of control.	✓					The signal status display shows the intersection mode of control.
65.0	The GUI must be able to display the status of all vehicle detection at each intersection and mid-block if applicable.	✓					Centracs is able to display all vehicle detection at an intersection along with system detection not assigned to an intersection.
66.0	The GUI must display IP-addressable devices on the system map and within the intersection status display. The GUI must display, at a minimum, a hyperlink to that device's monitoring and control interface.	✓					Hyperlinks can be added to the main map for IP-addressable devices. Device monitoring and control can be accessed via the hyperlink.
67.0	The GUI must display the operational status of all connected intersection devices and other field devices in list-based views and on the system map.	✓					The device status dialog in Centracs will display operational status of all connected intersection devices and other field devices in a list-based view.

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PREFERED REQUIREMENT	**INTERSECTION DISPLAY**						
68.0	The GUI must display intersection status in a separate window (e.g. pop up) or within the existing window when an intersection is selected on the main map display.	✓					The Centracs Intersection Status Display shows the active status of a user selected controller. Signal ID, firmware version, address, IP are displayed along with other status information such as alarms, coordination status, preempt status, and communications status.
69.0	The GUI must display real time (i.e. updated once per second) detection device data in the intersection status display.	✓					Detection device data is shown in the intersection status display.
70.0	The GUI must display controller type, firmware version, signal identification number and IP address of field controller.	✓					The signal status display shows the controller type, firmware version, signal ID, and the IP address of the controller.
71.0	The GUI must display type, asset number, online status, and IP address of all IP-addressable network connected traffic signal and ITS equipment.	✓					Type, asset number, online status, IP address are all displayed in Centracs.
72.0	The GUI must display system inputs (e.g. detector) and outputs (e.g. signal indication) on the intersection graphic.	✓					The signal status display shows the system inputs and outputs.
73.0	The GUI must provide the ability to view operational and equipment status by individual intersections, groups, or entire system.	✓					Operational and equipment status can by shown by individual intersection, groups, or the entire system using the signal status display, section status display, device status display or the entity tree itself.
74.0	The GUI must display the status of the signals at an intersection or multiple intersections using a graphical display that shows the approximate layout of the intersection with colored signal heads.	✓					The section status and the device status dialogs are used to show status of signals at an intersection or multiple intersections using a graphical display.

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75.0	The GUI must be able to display multiple intersection displays simultaneously as separate displays or tiled windows.	✓					Multiple signal status displays can be opened at the same time in Centracs.
76.0	The GUI must have intersection status displays that are updated in real-time (i.e. updated once per second). The intersection status displays must include a minimum of 16 phases and 8 overlaps for one or more intersections, including split monitoring.	✓					The Centracs Signal Status user interface includes real-time status for controllers, including support for more than 16 phases and 8 overlap as well as the ability to monitor splits such as programmed and actual times, and termination conditions.
77.0	The GUI must display signal indication (green, yellow, red, flashing yellow arrow, flashing red arrow, and overlaps) at the approach and movement levels in real time.	✓					The signal status display shows the signal indication at the approach and the movement levels in real time.
78.0	The GUI must provide a user-friendly and efficient method of setting up new intersections and graphics.	✓					Centracs' intersection display and map icon setups are intuitive and easy. The robust online help that is provided with Centracs will guide the user in setting these up in a quick and efficient manner.
79.0	The GUI must include a library of tools (drawings, intersection configurations, icons, symbols) to use when constructing or editing intersections.	✓					The map editor in Centracs includes many tools (icons, map layers, images) for constructing or editing intersections.
80.0	The GUI must provide a method to assign system inputs (e.g., detector) and outputs (e.g., active phase) to different graphical icons on the intersection drawing display during initial intersection setup or modification.	✓					The map editor gives the user the ability to assign inputs and outputs to different graphical icons on the intersection display.
81.0	The GUI must have the ability to display geometrically correct intersection diagrams, allowing icons representing individual phases and movements to be editable in size and 360-degree orientation at an intersection level.	✓					Centracs has the ability to display geometrically correct intersection diagrams.

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PREFERED REQUIREMENT	**MONITORING AND CONTROL DISPLAY**						
82.0	The GUI must provide a toolset to enable efficient monitoring and control operations by the user based on role-based user access level.	✓					Centracs provides permissions for various monitoring and control operations that can be setup based on user role and jurisdiction.
83.0	The GUI must include a method to simultaneously monitor and control multiple devices and alerts (e.g., pop-up windows and display multiple objects).	✓					Centracs is able to display multiple dialogs simultaneously to monitor and control devices.
84.0	The GUI must incorporate menu icons and controls.	✓					Centracs incorporates menu icons and controls.
85.0	The GUI must incorporate dialog boxes that display information and request user to input information.	✓					Centracs' GUI incorporates dialog boxes.
86.0	The GUI must incorporate push button and other active commands.	✓					The signal status display has push button commands for several actions, such as: setting calls, get time, set time, launch the database editor, etc.
87.0	The GUI must incorporate the use of object characteristics such as colors, highlighting, and flashing to alert users of status changes.	✓					The Centracs' GUI incorporates the use of colors, highlighting, and flashing to alert users of status changes.
88.0	Upon inputting changes to the Solution, the GUI must prompt the user by a pop-up window to confirm that the changes will be saved.	✓					The GUI will prompt the user to confirm changes that have not been saved.
89.0	The GUI must provide the ability to remotely place calls on multiple detection devices or phases from the intersection status display, if supported by controller firmware.	✓					The signal intersection display gives users the ability to place calls on multiple detection devices or phases.
90.0	The GUI must allow users to print system maps, intersection status displays, interface views, and other intersection or intersection group data.			✓			Printing of system maps, intersection status displays, and interface views can all be accomplished using the Windows Snipping Tool or doing a CtrlALT

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							Print Screen command and pasting into a document. We believe we meet this requirement. However, should MDOT wish to have a more native print screen option this can be added to Centracs at an additional cost. The cost for this requirement is contained in the Pricing exhibit.
91.0	The GUI must produce and print graphics files (e.g. .jpg, .png, and others) associated with specific devices for the purpose of documenting unusual phasing assignments, etc.	✓					Files are allowed to be attached to entities in Centracs. The files can be launched from the signal status display or the entity properties screen.
PREFERED REQUIREMENT	**EXTERNAL DATA DISPLAY**						
92.0	The GUI must allow the user to display additional layers, including but not limited to the following formats: satellite imagery, GIS Shapefile, DWG, DGN, and other vector-based formats.	✓					Can connect to WMS sources like ArcServer for DWG, DGN, etc.
93.0	The GUI must display the MDOT roadway network data on the system map.	✓					Assume they have a layer with this stuff.
PREFERED REQUIREMENT	**REAL-TIME DATA DISPLAY**						
94.0	The Solution must allow users to define the frequency with which communication occurs with specific connected intersection devices and other field devices. A minimum frequency of once per second must be provided as an option.	✓					Frequency with which communication occurs is a user specified value in Centracs. Once per second for primary polls and once per minute for secondary polls are the default.
95.0	The GUI must be refreshed as frequently as the feedback data are being returned from field equipment.	✓					The GUI refreshes at the same frequency as when feedback data is received.
96.0	The GUI must display a message if feedback data are not received from the field because of communication failure.	✓					The GUI displays a message if feedback data is not received from the field.

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97.0	All static displays must be designed and developed in such a way as to ensure instantaneous redraw of the graphic display.	✓					The static displays found in the system are designed and developed to ensure instantaneous redraw.
98.0	The GUI must have a visual indication of whether signal operations data is being collected from an intersection.	✓					Status icons and the entity tree give visual indication of when signal operations data is being collected from the intersection.
PREFERED REQUIREMENT	**ALERTS**						
99.0	Alerts must be configurable to be displayed in real time, audibly and visually on the GUI.	✓					Alerts are configured to be displayed in real time.
100.0	Any modifications made to the data maintained in the Solution (e.g. addition of intersections, detection devices, and other modifications) must be applied across the entire Solution (e.g. to the GUI, maps, intersection status display, and other areas). The Solution must allow system administrator to configure alerts to review and approve such modifications prior to implementation.	✓					Review and approval workflows for modifications apply to some aspects of the system such as the signal editor but not all system modifications have an approval review process. Most modifications can be controlled by the user roles system found in Centracs. Some configuration, such as controller databases, include approval workflow options with notifications.
101.0	The Solution must provide users the ability to create and configure alerts based on user-defined thresholds for any operation the Solution monitors.	✓					Users can create and configure alerts based on defined thresholds for all applicable operations monitored by the solution.
102.0	The Solution must provide the ability to assign any alert to any user access level group in a many-to-many relationship (i.e., one alert to multiple users or multiple user to one alert).	✓					Centracs can assign any alert to a user access level group in a many to many relationship.
103.0	The Solution must provide users the ability to search and filter active alerts.	✓					The Centracs system has a status bar on the upper righthand corner that shows the number of alerts separated categories enabling search/filtering.

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104.0	The Solution must provide users the ability to define which alerts can be sent by time-of-day, day-of-week, and on a predefined schedule.	✓					Centracs users have the ability to set which events generate an alert. The alert can be configured to appear for different recipients and also be sent to offline personnel. The time of day and day of week are taken into consideration for which users are notified with an alert.
105.0	The Solution must send alerts to users by text (SMS).	✓					Centracs alerts can be sent to users via SMS.
106.0	The Solution must send alerts to users by email.	✓					Centracs alerts can best to users via email.
107.0	The Solution must display alerts by type on the system map.	✓					The Centracs system has a status bar on the upper righthand corner that shows the number of alerts separated into the three categories in the system. Also, signal alarms will be shown in the signal status display.
108.0	The Solution must provide users the capability to list alerts by location and frequency.	✓					Centracs is able to list alerts by Location, Criticality, Acknowledge State, Time of Creation. Users can see the number of alerts by their type (Informational, Warning, Critical) in the Centracs Status bar.
109.0	The Solution must provide users the ability to enable or disable alerts.	✓					Users can enable or disable the triggers that would generate an alert.
110.0	The Solution must provide an alert if no data is received from an intersection or group of intersections within a user-defined period of time.	✓					There are six different types of communication events that Centracs can trigger off of to generate an alert. The user can also define the period of time in which these events must occur before an alert is triggered.

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111.0	The Solution must monitor communications to each field device. In the event of a communication failure, the Solution must flag devices as failing to communicate. The Solution must continue to attempt to communicate with the device according to user-definable communications timeout criteria.	✓					Centracs is able to monitor communications to field devices and show comm. status in the main map, entity tree, and the signal status display. Centracs will continue to communicate with a device unless set to an offline state.
112.0	The Solution must create an alert during a field communication failure exceeding a user-defined timeframe threshold. The Solution must be configurable to not produce duplicative alerts for each successive failure as the Solution works to re-establish a connection.	✓					Centracs can be configured to create an alert when a communication failure is detected. The system is configurable to not produce duplicate alerts for the same event.
113.0	The Solution must clear the alert when communication is restored to the device after a communications failure.	✓					Centracs supports a full Alert workflow, including “Closed” which clears the alert such as when communications are reestablished.
114.0	The Solution must display the ID of the connected intersection device(s) associated with an alert.	✓					The device ID is displayed in the alert information.
115.0	The Solution must display the ID of the detection device associated with an alert.	✓					The ID of the detection device would be displayed if it is associated with an alert.
116.0	The Solution must create an alert when the door of any traffic signal controller cabinet door is left open, if the cabinet is equipped with the hardware for this functionality.	✓					A cabinet door open event exists in Centracs to provide this functionality.
117.0	The Solution must display NTCIP diagnostic messages associated with vehicle detector alerts.	✓					Centracs can display NTCIP diagnostic messages associated with vehicle detector alerts.
118.0	The Solution must display NTCIP diagnostic messages associated with pedestrian detector alerts.	✓					Centracs can display NTCIP diagnostic messages associated with pedestrian detector alerts.

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119.0	The Solution must display NTCIP diagnostic messages associated with offlineITS or CV equipment.			✓			Centracs currently displays NTCIP diagnostics for several ITS devices such as CCTV and DMS. For CV RSUs the ability to poll for NTCIP status will be added to Centracs. The cost for this requirement is contained in the Pricing exhibit.
120.0	The Solution must display NTCIP diagnostic messages associated with unit alerts status 1.	✓					Centracs provides events for Alarms 1-10 in the controller. Alerts can be triggered off any active alarm input.
121.0	The Solution must display NTCIP diagnostic messages associated with unit alerts status 2.	✓					Centracs provides events for Alarms 1-10 in the controller. Alerts can be triggered off any active alarm input.
122.0	The Solution must log all alerts. The Solution must provide a historic list of alerts by device ID.	✓					Centracs logs all generated alerts. The alerts log report in Centracs provides a list of all alerts that have been triggered with a user specified time range along with associated actions taken on the alert.
PREFERED REQUIREMENT	**NAVIGATION TOOLS**						
123.0	The GUI must include intuitive and comprehensive navigation tools.	✓					Centracs is both intuitive to use and has a robust set of navigation tools to access various parts of the application. There is a menu bar at the top of main dialog for navigation or right clicking on any entity will give access to a context sensitive navigation menu.
124.0	The GUI must allow the user to intuitively select objects on the screen by point-and-click manipulation with the mouse, thereby minimizing typing and the need to memorize lengthy commands.	✓					Centracs allows the user to select objects on the screen with point and click manipulation.
125.0	The GUI must provide pan and zoom capabilities in the system map.	✓					Centracs provides pan and zoom capabilities with the main map.

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PREFERED REQUIREMENT	**SIGNAL OPERATIONS FUNCTIONALITY AT INDIVIDUAL INTERSECTIONS, CONTROL GROUPS, AND SYSTEM-WIDE**						
126.0	The Solution must communicate (i.e., request/receive feedback and push new parameters) to traffic signal controllers and other connected devices at signalized intersections on an individual, group, or system-wide basis.	✓					Centracs communicates with traffic signals and other connect devices at an intersection on an individual, group, or system-wide basis.
127.0	The Solution must allow users to simultaneously implement operational changes within an intersection group while locking out other users from simultaneously modifying the same intersection.	✓					Centracs allows users to simultaneously work on intersections while locking down the data from being changed by other users at the same time. Locks can be removed if the user has the proper privileges.
128.0	The Solution must allow users to disable (i.e., temporarily move to an offline state in Solution software) any component (e.g., controller, MMU, detector, or other connected field device) through the user interface. The Solution must not control or communicate with the disabled/offline component. Please note "disabled" refers to an offline state in the Solution software. This requirement does not refer to disabling the local operation of the field device.	✓					Centracs allows users to place entities in an offline state stopping all communications to the device while letting it continue with local operations.
129.0	The Solution must allow users to manually override the current and/or future timing plans for the system, control group, or individual controller.	✓					Centracs manual commands have default higher priority so when run they override whatever current operation that the controller is running. The priority of various actions and commands in the system can be user defined and manual commands can be run against a controller, a group, or the whole system.
PREFERED REQUIREMENT	**CONTROLLER DATABASE REVISIONS AND TRANSFERS**						
130.0	The Solution must give upload/download operations precedence over real-time monitoring.	✓					Centracs has a setting that lets users toggle which action takes precedence over the other.

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131.0	The Solution must require confirmation from the user prior to uploading and downloading data from controllers. All regularly scheduled upload/download operations must be determined in consultation with the Owner and must occur during off-peak or overnight hours.	✓					Upload and download operations are commands in the system and they can be scheduled by a user with the right permissions. Manual upload/download actions require user confirmation before starting.
132.0	In the event of a communications failure during a database write process for the signal controller(s), the Solution must alert the user and not leave a partially written database block.	✓					The write process with a controller is transacted and any errors during the download are communicated back to the user. No partially written blocks of data are allowed in the signal controller.
133.0	The Solution must provide the ability to compare data in the Solution with field controllers. The Solution must alert the user of the specific differences between the Solution and field controllers in a format that is clear to the user. The Solution must provide the user options for resolving data conflicts, including: (1) Download from the Solution to the controller Upload from the controller to the Solution	✓					Centracs gives users the ability to compare the controller settings saved in the Centracs database with the settings currently loaded in the Signal Editor. Differences are highlighted and all pages with differences are marked. The signal editor can also generate a list of differences that a user can look at.
134.0	The Solution must provide users the ability to archive controller databases.	✓					Centracs provides the ability to archive controller databases.
135.0	The Solution must provide user the ability to restore previous versions of timing plans from a controller database archive.	✓					Centracs stores prior versions of controller databases saved to Central. Users can restore these previous controller database versions with ease.
136.0	The Solution must provide users the ability to conduct uploads/downloads (i.e., from central to local and/or from local to central) of signal operations data (i.e., signal timing database, controller outputs, detector outputs) by schedule.	✓					Centracs allows users to schedule downloads and upload and compare actions that will provide a report of all segments that are different between the field controller and central.

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137.0	The Solution must provide users the ability to conduct uploads/downloads (i.e., from central to local and/or from local to central) of signal operations data (i.e., signal timing database, controller outputs, detector outputs) to specific intersections and/or groups of intersections.	✓					Centracs allows users to upload and download to specific intersections or groups of intersections.
138.0	The Solution must include a text input field for users to add notes at the time files are uploaded.	✓					Centracs includes a notes field that allows users to add notes at the time the signal database is saved to the central db.
PREFERED REQUIREMENT	**OPERATIONAL CHANGES**						
139.0	The Solution must allow users the ability to create timing plans individual intersections, control groups, and system wide.	✓					The system allows users to create timing plans for an individual intersection. Groups, and system wide.
140.0	The Solution must provide timing plan diagnostics that check timing plans for the following: (1) Split times that violate minimum phase lengths (minimum green + yellow + all red) (2)Split times that violate pedestrian times (walk + flashing don't walk + yellow + all red) (3)Split times that do not add up to cycle length (4)Split times that cause barriers to not be aligned (5)Conflicting phases When timing plan diagnostic errors occur, the Solution must display information enough for timely correction by the user. Users with appropriate permission must be able to override timing plan diagnostic errors	✓					Econolite controllers include a consistency check tool that is implemented in Centracs to identify timing plan errors when the plans are saved to the database and informs the user of the error and reasons for the error with a popup message box. Data will not be allowed to be saved unless the error is corrected. This is functionality for Econolite controllers only. For non-Econolite controllers we are limited to NTCIP MIB standards and release from manufacturer.
141.0	The Solution must allow users the ability to enter notes into the system for each device. Notes entry must be prompted at the time of operational changes and must be available at all other times.	✓					Centracs supports adding notes for an entity that are saved off for viewing at a later time.
142.0	The Solution must provide users the ability to duplicate timing plans from one intersection to another through copy and paste functions.	✓					Centracs provides a copy and paste function for the signal database editor. A controller template can also be created that has default data. Any new controller created in the system can be configured to be based off a template.

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143.0	The Solution must provide users the ability to import and export intersection and signal timing data from storage media (e.g., USB, Datakey).	✓					Centracs provides the ability to import and export intersection timing data from storage media for Econolite controllers only.
144.0	The Solution must provide users the ability to manually enter intersection and signal timing data.	✓					Users can manually enter in signal timing data.
145.0	The Solution must provide users the ability to upload and assign files to individual intersections. Files must be associated with a primary key (e.g., signal ID).	✓					Files can be attached with an entity in Centracs. Users can bring up these files through the entity properties screen.
146.0	The Solution central database must be capable of storing a minimum of 50 plans per intersection and up to the maximum number of plans supported within the local controller.	✓					The Centracs system is only limited by the number of plans supported in a local controller.
PREFERED REQUIREMENT	**SIGNAL OPERATIONS SCHEDULING**						
147.0	The Solution must include a calendar schedule to determine, prepare, and schedule alternate phasing and timing plans for specific dates and times of year (e.g., holidays and special events).	✓					The Centracs scheduler allows the user to configure operations that need to be repeated on a fixed schedule—such as time broadcasts, controller log uploads, report generation, and recipient enablement. With the scheduler, it is only necessary to define these recurring commands once. You can assign simple scheduling conditions (for example, the 1st of each month at 9:00am) or complex scheduling conditions (for example, the 17th of February, each hour on the hour from 9:00am until 9:00pm for 30 minutes at a time, if and only if this day falls on a Monday or Friday and is not a holiday). After the command has been saved and enabled, Centracs automatically runs the command as scheduled, with no operator involvement.

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148.0	The Solution must provide one-minute resolution for time-of-day/day-of-week schedules.	✓					Centracs provides one-minute resolution for TOD/DOW schedules.
149.0	The Solution must be configured such that scheduled events support an individual device, a specific control group, or the entire system.	✓					The Scheduler supports individual, specific group, or system wide scheduling of actions.
150.0	The Solution must provide the capability of scheduling both permanent (i.e., recurring) and temporary (i.e., one-time) commands in the event scheduler. Permanent commands must be performed every time the specified time parameter occurs. Temporary commands must be performed once and then be deleted from the scheduler database.	✓					The Centracs scheduler supports both recurring events and one-time events.
151.0	The number of events scheduled in the Solution must be limited only by the database capacity. Each event must be configurable to implement a plan or execute a function. The Solution manufacturer must provide estimated storage needs.	✓					The number of events that can be scheduled is only limited by the database capacity.
152.0	The Solution must be configured such that the temporary schedule has precedence over the permanent schedule.	✓					Manual commands(temporary) and Scheduler commands(permanent) can have their priority configured so one can take priority over the other, or vice versa.
153.0	The Solution must be configured such that timing plans downloaded to field controllers for temporary use (e.g., via temporary event/command) do not overwrite any of the timing plans that are stored locally on the field controllers and used by the local controller's TOD/DOW schedule.	✓					Commanding a field controller to a system selected timing plan will not overwrite the local controller timing plans.
154.0	The Solution must have the ability to enable or disable daylight savings functions and correctly adjust for leap years.	✓					The operating system where the application resides automatically handles daylight savings and leap year adjustments. The local controller also has clock and time settings that can be accessed via the database editor.
155.0	The Solution must provide users the ability to manually override the timing plan currently in operation via the Solution client software on an intersection, control group, or system-wide basis via the Solution event scheduler.	✓					Centracs allows users to manually override the timing plan currently in operation via the scheduler for an intersection, group, or system wide.

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PREFERED REQUIREMENT	**MANUAL CONTROL**						
156.0	If, during a manual override, a controller does not receive a valid timing plan from the Solution within a user-defined time frame, it must revert to its local TOD/DOW schedule.	✓					Backup timer in Econolite controllers provides this functionality.
157.0	The Solution must be configurable to prohibit users of Solution client software from manually overriding timing plans.	✓					User permissions can be set to prevent certain users from manually overriding timing plans.
158.0	The Solution must allow for manual selection of timing plans to have a higher priority than all other modes of plan selection.	✓					Manual commands, in the system, by default have the highest priority to be executed.
159.0	When the manual override is terminated, the Solution must command the controllers to normally scheduled operation.	✓					When a manual command is terminated, Centracs will command the controller to go back to its regularly scheduled operation
160.0	The Solution must log all information related to the change to manual mode, including but not limited to start time, end time, timing plan in operation at start, timing plan executed after manual mode end, time to synchronize with time of day or adaptive/responsive operations. The Solution must provide audible and visual alerts via the Solution GUI when the managed corridor timings are back in full synchronization.	✓					Centracs logs all information related to manual commands and scheduled commands. Alerts can be used to provide visual and audio notification when managed corridor timings are back in synch.
PREFERED REQUIREMENT	**FLASH CONTROL**						
161.0	The Solution must be configured to alert the user of Solution client software prior to completing a Solution client software operation to command individual and/or groups of intersection into flash operation.				✓		Prior to the user executing a Flash command, Econolite will add a user notification confirming the requested operation. The cost for this requirement will be included at no cost to MDOT and the functionality will be available by UAT.
162.0	The Solution must be configured to alert the user when individual and/or groups of intersections are removed from flash operation via Solution client Software, prior to completing the command.				✓		Prior to the user ending a Flash command, Econolite will add a user notification confirming the requested operation. The cost for this requirement will be included at no cost to MDOT and the functionality will be available by UAT.

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163.0	The Solution must provide a method to prevent flash operation from being implemented system wide.	✓					A global setting in Centracs can be turned on to prevent the system from being commanded to flash.
164.0	The Solution must allow the system administrator to adjust users' permission to initiate and/or remove flash control.	✓					User access to the scheduler and manual commands can be restricted through User Roles.
165.0	The Solution must provide users the ability to place intersections into free control on an individual basis. In free control, the controller must operate the signalized intersection without coordination, responding only to detector inputs and the controller's programmed timing and phasing pattern.	✓					Centracs has a Set Pattern Free command that will place intersections in Free on an individual basis.
166.0	The Solution must provide users the ability to place intersections into free control on a group basis.	✓					Centracs has a Set Pattern Free command that will place a group of intersections into Free.
167.0	The Solution must provide a method to prevent free control from being implemented system wide.	✓					User access to the scheduler and manual commands can be restricted through User Roles.
PREFERED REQUIREMENT	**SIGNAL PRIORITY / PREEMPTION**						
168.0	The Solution must support signal control preemption (e.g., emergency vehicle, rail, bridge tunnel, etc.) operation provided by the traffic signal controller. The Solution must recognize the occurrence of locally initiated preemption by an emergency vehicle and thereby not erroneously diagnose a coordination failure because the local controller has been preempted.	✓					Centracs supports signal control preemption and will not misdiagnose a preemption as a coordination failure.
169.0	The Solution must support signal priority (e.g., transit, freight) operation provided by the traffic signal controller.	✓					Centracs supports transit signal priority provided by Econolite controllers.
PREFERED REQUIREMENT	**DETECTION DEVICES**						
170.0	The Solution must support both system and local detectors.	✓					Centracs supports both local and system detectors.
171.0	The Solution must be capable of using both system and local detectors for traffic counting and computation of measures of effectiveness (MOEs).	✓					Any detector connected to the controller will be logged.

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172.0	The Solution must interface with third party software that provides connected vehicle features and comply with SAE J2735 or later standard.	✓					Centracs will interface with Econolite Controllers that provide connected vehicle features and comply with the SAE J2735 standard.
173.0	The Solution must support, manage, and display on the system map all detectors associated with a controller, a minimum of 64 detection devices per intersection.	✓					Centracs supports, manages and displays on the system map a minimum of sixty-four detectors.
174.0	The Solution must be configurable to allow local detection devices to be assigned as system detection devices for the purposes of data collection.	✓					Centracs allows local detectors to be assigned as system detectors.
175.0	The Solution must collect, and store traffic volume data collected by detection devices.	✓					Centracs collects, stores, and displays traffic volume collected by detectors.
176.0	The Solution must collect, and store occupancy data collected by the detection devices.	✓					Centracs collects, stores, and displays occupancy data collected by detectors.
177.0	The Solution must collect, and store speed data collected by detection devices.	✓					Centracs collects, stores, and displays speed data collected by detectors.
178.0	The Solution must continuously monitor detector feedback from the field for proper operation. The Solution must collect and store data on failed detection devices including location, time of failure, and cause of failure.	✓					Centracs collects, stores, and displays information on failed detection devices.
179.0	The Solution must provide the ability to store the most recent 90-day detector data for each intersection. Please indicate the time periods (e.g., 1 min, 5 min, 15 min, 1 hr.) that detector data can binned for storage.	✓					Centracs provides the ability to store the most recent 90-day detector data. The bin period is user configurable.
180.0	The Solution must be configured to provide the following automated response when detector failures occur for a user-defined timeframe threshold: (1) Report to the system log (2) Alert user (3) Display on the system map (4) Initiate max or min recall (user definable)	✓					Centracs is able to provide the automated response for reporting detector failures on the system log, alerting the user, and displaying in on the system map. Initiating max or min recall due to the detector fault can be configured in the controller using a detector diagnostics plan.

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181.0	The Solution must provide users the ability to disable and re-enable detection devices on a temporary (e.g., TOD) or as-needed basis.	✓					The functionality to disable and reenable detectors on a TOD basis is found in Econolite signal controllers, not Centracs.
182.0	The Solution must provide users the ability to enable or disable the detector data collection function.	✓					Detector data collection can be enabled or disabled in Centracs.
183.0	The Solution must have user-selectable filters that define the thresholds that a detector must exceed to be considered failed. The filter values must be definable at a detector level and selectable on a TOD basis. A minimum of three (3) TOD settings must be available. The following failure types must be provided at a minimum: (1) Maximum Presence – If an active detector exhibits continuous detection for a program entered period (0-255 minutes in one-minute increments). (2) No Activity – If an active detector does not exhibit an actuation during a program period (0-8 hours, in one-minute increments). (3) Erratic Output – If an active detector exhibits excessive actuation (program entered maximum counts per minute 0-255 in increments of one minute) (4) . Failed Communication – If communication to an active detector is unavailable for a user-defined period.	✓					The detector diagnostic plan in Econolite controllers lets users define the thresholds that a detector must exceed to be considered faulted. The detector diagnostic plans can be edited by the user in the signal database editor.
PREFERED REQUIREMENT	**TOD / DOW**						
184.0	The Solution must provide, at a minimum, the same TOD/DOW scheduling functions that are available in the MDOT controllers at the signalized intersections.	✓					Centracs provides for TOD/DOW scheduling of functions and also allows users to edit and save the local TOD schedule found in the controllers.
185.0	The Solution must be configured such that the intersection reverts to its local TOD/DOW schedule if communication is lost between the intersection and the central software for a user-defined timeframe.	✓					The backup timer parameter found in Econolite controllers provides this functionality.

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186.0	The Solution must be configured such that TOD/DOW plans are downloadable to the local traffic signal controller from the Solution on a user-defined schedule, configurable from once per minute to once per week. In this mode, each controller must automatically select and implement traffic signal timing plans in accordance with the defined schedule, locally stored, on a TOD/DOW basis.	✓					Centracs gives users the ability to schedule controller database downloads. Controllers will run the timing plans in accordance with the defined schedule, locally stored, on a TOD/DOW basis.
PREFERED REQUIREMENT	**TIME SYNC AND CONTROLLER LOCATION**						
187.0	The Solution must provide users the ability to perform a manual command to sync time between the Solution and field controllers on an individual, group, or system-wide basis.	✓					Centracs allows the user to perform a manual time synch through manual commands or to schedule a Set Time action to one controller, a group of controllers, or the system as a whole.
188.0	The Solution's must collect and display local controller clock time for comparison to measure clock drift. Local controller time must be collected on a user-definable time period, between once per second and once per day.	✓					Centracs allows users to collect, display local controller time and also to measure clock drift and set the time if the clock drift passes a user defined threshold.
189.0	The Solution must provide for automatic clock updates that range in frequency on a user-configurable basis, ranging from once per day to once per hour.	✓					Centracs can schedule automatic clock updates.
190.0	The Solution must provide the ability to synchronize with an external NTP server.	✓					This is functionality is supported by the operating system.
191.0	The Solution must provide the ability to assign which controllers receive universal time updates and which controllers run on local time.	✓					The Set Time command can be configured to only update certain controllers and leave other controllers on local time.
192.0	Unless the feature has been disabled by the operator, the Solution must transmit a clock update in conjunction with the command for implementation of a different timing plan.	✓					Centracs provides Action sets that can be setup to perform a set time command in conjunction with implementing a different timing plan.
PREFERED REQUIREMENT	**OPERATIONS MONITORING**						
193.0	The Solution must monitor field controllers and other connected field equipment on a real-time basis, configurable from once per second to once per day.	✓					Centracs monitors field equipment on a real-time basis at a user defined cadence between one second and one day.

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194.0	The Solution must monitor devices such that the Solution has the ability to identify failed individual components when user-defined error thresholds are exceeded.	✓					Centracs can be configured to send an alert as soon as individual devices exceed user defined thresholds.
195.0	The Solution must compare real-time phase returns to the scheduled signal timing parameters on the Solution database and alert the user to differences that exceed user-defined thresholds. This functionality must be user schedulable. The error conditions that must be detected include, but are not limited to, the following: (1) Controller is not using the proper signal timing plan; (2) Controller time clock is out of synchronization; (3) Controller is not sequencing; (4) Controller does not leave the current phase a minimum of once in a user-specified number of minutes; (5) Phase sequence in improper; (6) Phase interval is out of compliance; (7) Phase time is out of compliance		✓				A combination of Centracs events and I/O logic processor can be used to create these alarms.
196.0	The Solution must provide users the ability to access and display split monitoring information, including but not limited to: (1) Real-time split (2) Programmed split (3) Historical splits	✓					Centracs includes the Split Monitor function to help users analyze phase utilization for standard dual-ring controllers. The Split Monitor diagram compares the actual splits for an intersection to the programmed splits. Split Monitor logging is a scheduled function that could run for as long as the user needed barring any hardware limitations.
197.0	The Solution must monitor clock drift at user-definable thresholds per intersection and intersection group.	✓					The Time Drift Check command in Centracs includes the ability to set the threshold that must be exceeded before the Time Drift check changes the local controller clock.
198.0	The Solution must provide a method to monitor communications between the central signal system and each signalized intersection and other field devices.	✓					Centracs monitors communications between it and each signalized intersection. Communication information is shown in the signal status display, entity tree, main map, and in reports.

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199.0	The Solution must monitor for flash condition including but not limited to conflict flash and manual flash.	✓					Centracs can be configured to monitor for flash conditions.
200.0	The Solution must monitor pedestrian actuations.	✓					Centracs monitors pedestrian actuations if they are set up correctly in the controller.
201.0	The Solution must monitor for conflicting data in the signal controller and signal operations database.	✓					The Centracs system has an upload and compare command that allows the system to upload CRC values from the local controller to compare against the central database CRC values. Any conflicts are flagged and shown to users via a report.
202.0	The Solution must monitor for local manual control.	✓					The Signal Status display has a section that shows the actual controller mode and the actual pattern reported by the controller.
203.0	The Solution must monitor and display in real time (e.g. updated once per second) communications status (e.g., valid response, no response, short packet, check sum error). If the communications infrastructure does not support real time monitoring, the Solution must monitor and display communications status at least once every 30 seconds.	✓					Centracs monitors communications between it and each signalized intersection. Communication information is shown in the signal status display, entity tree, main map, and in reports.
204.0	The Solution must monitor for controller failure (e.g., conflict, watchdog, multiple outputs, low voltage). Please indicate the controller failures that can be identified by the Solution.	✓					Centracs alerts can be setup to notify users of controller failures. Here are some examples of controller failures that can be alerted off for the following: 24 VDC Communication to Monitor Fail Conflict, Detector Fault Local Low Battery Main Street Green Response Fault Stop Time

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PREFERED REQUIREMENT	**REPORTS**						
205.0	The Solution must provide all reports in human-readable form American English with no binary, hexadecimal, or octal output. In other words, there must be no list of "trouble codes" to memorize.	✓					Centracs provides reports in a readable form in American English with no binary, hexadecimal, or octal output.
206.0	The Solution must provide a reporting feature to export the current signal timing and detector configuration data (i.e., signal timing permit) to PDF and Excel formats. The report must include all relevant fields to manually setup another traffic signal controller in the event of an equipment failure.	✓					The signal database editor found in Centracs provides a way to export signal and detector configuration data in PDF, Excel, HTML formats.
207.0	The Solution must provide users the ability to create canned and ad hoc reports from the active signal operations database and from the archive through reporting tools. Reports must include but are not limited to: (1) Detailed Intersection Failure Status (intersection location, reason for failure, and time of failure) (2) Detailed Detector Failure Status (detector location, reason for failure, and time of failure) (3) Detailed Communication Failure Status (IP address, associated intersections, reason for failure, and time of failure)	✓					Centracs provides users the ability to create and view reports on intersection failures, detector faults, and communications failures.
208.0	The Solution must provide users the ability to create canned and ad hoc reports by, but not limited to: (1) Geographic area (2) Intersection attributes (3) User-defined attributes	✓					In Centracs, users can filter reports by Geographic Area, Intersection Attributes, and other user defined attributes.
209.0	The Solution must provide users the ability to create canned and ad hoc reports for, but not limited to: (1) A single intersection (2) An intersection groups (3) A group of intersection groups (4) The entire system	✓					In Centracs, users can filter reports by intersection, groups, system wide.
210.0	The Solution must provide users the ability to generate/create all reports with the permanent and temporary schedulers and selectively output reports to any combination of output devise such as printer, ASCII text file, email, and monitor.	✓					In Centracs, users can use manual commands or scheduler commands to generate and send an email to a recipient.

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211.0	The Solution must display canned and ad hoc report results in table and/or list format the can be configured by the user and are easy to read. Please describe the approach to formats in an easy-to-read format.	✓					Centracs reports typically come in a tabular form. They are easy to read and configure. The reports are typically laid out with the user selectable parameters on top. Next comes the report toolbar which gives users the option to export the report in a variety of formats, zoom level configuration, search, and page navigation. The report body will be below the toolbar and come in a tabular or chart form. All charts are accompanied by a data table of values.
212.0	The Solution must provide users the ability to export report results into a text file (e.g., .txt, .doc, and .docx formats).	✓					Centracs reports can be exported out in a variety of text formats including PDF or Word.
213.0	The Solution must provide users the ability to export report results and any other data from the database in Excel format.	✓					Centracs reports can be exported out into CSV or MS Excel format for viewing.
214.0	The Solution must provide users the ability to print any report screens to any network printer or a file at any time during the process by simply clicking a button on the report screen. If sending to the printer, the text must be formatted, as necessary, to produce a useable and legible printout for use by the traffic engineers and maintenance technicians in the field.	✓					Centracs allows users to print any report to any network printer or export to a file with the click of a button.
215.0	The Solution must maintain in the system log all functions executed by the system, users, and administrators. System log must be automatically recorded on Solution's database server(s).	✓					In Centracs, user activity is logged and can be viewed via the System Activity Report. The data logged includes: Timestamp, User Id, Entity Type, Entity Name, Activity, and the Details of the activity.
216.0	The Solution's system log must include location, event, failure, reason, date, and time of the system, user, and administrator executed actions and/or event.	✓					In Centracs, user activity is logged and can be viewed via the System Activity Report. The data logged includes: Timestamp, User Id, Entity Type, Entity Name, Activity, and the Details of the activity.

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PREFERED REQUIREMENT	**SYSTEM LOG**						
217.0	The Solution's system log must be searchable and filterable by any attributes contained within the log.	✓					The System Activity report is both searchable and filterable by attributes found in the log.
218.0	The Solution's system log must differentiate between user-executed functions and system-executed functions.	✓					The System Activity report will differentiate between user-executed and system-executed functions.
219.0	The Solution's system log must include manually entered operational commands including but not limited to change to free, flash, and the manual implementation of a timing plan.	✓					Centracs logs all the operational commands manually entered into the system. The information can be seen using the System Events report.
220.0	The Solution's system log must include records of changes signal operations database records (e.g., signal timing,) including but not limited to what operational change was made, the user that made the change, the date and time of the change, and notes added to and associated with the change.	✓					The database editor in Centracs keeps previous versions of the controller database. Operational changes, user info, timestamps are all stored in the system. A global setting determines whether a note is required whenever a signal database is saved.
221.0	The Solution's system log must include records, updated in real time (e.g. once per second), of communications status (e.g., valid response, no response, short packet, check sum error).	✓					The detailed communications dialog found in Centracs provides users with real-time communication status information.
222.0	The Solution's system log must include records of flash condition activity including but not limited to conflict flash and manual flash.	✓					The system will log records of flash including
223.0	The Solution's system log must include records of pedestrian actuation activity.	✓					Centracs logs records of pedestrian actuation activity.
224.0	The Solution's system log must include records of traffic responsive and adaptive control activity, if those modules are implemented.	✓					Centracs logs when Traffic Responsive or Adaptive control are implemented.

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225.0	The Solution's system log must include records of intersection manual control activity.	✓					The System Activity report found in Centracs can provide a record of intersection manual control activity.
226.0	The Solution's system log must include the number of successful communication attempts and the number of communication failures with connected intersection devices and other field devices.	✓					The communications statistics report found in Centracs provides this data.
227.0	The Solution's system log must include records of all user login attempts, successful and failed. The Solution's system log must include, at a minimum, the time, date, and username for each login attempt and logout.	✓					The user login report in Centracs provides data on login attempts, time, date, and username. Failed attempts are not logged.
228.0	The Solution's system log must include the following system events: (1) Internal system errors; (2) System hardware failures; (3) System network errors; (4) Software fatal errors.	✓					The Centracs system log includes internal system errors, hardware failure information, system communications errors, and software fatal errors.
229.0	The Solution must provide users the ability to export log files for review and analysis.	✓					Centracs allows users to export report data for review and analysis.
230.0	Data exported from the Solution must be in an industry standard format that provides for interoperability and portability.	✓					The data exported from Centracs reports are in a standard format that provides interoperability and portability, such as PDF, Excel CSV, and Text
231.0	The Solution's system log must contain all open cabinet alerts including location, time of alert, reason for alert (if recorded by user), length of alert, and resolution (if recorded by user).	✓					The alerts report and the signal events report would provide open cabinet event information. The alerts report will need the open cabinet event to be logged so it will trigger an alert every time the cabinet door open status appears.

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PREFERED REQUIREMENT	**USER ACCESS CONTROLS**						
232.0	The Solution must provide for a minimum of four pre-configured user access levels as follows: (1) System Administrator (full access and ability to maintain privilege level masks), (2) Power User (full access with the exception of low-level OS and system administration functions), (3) General User (reading, monitoring, and data gathering only), and (4) Limited User (reading only, and only access to some limited areas defined by the system administrator).	✓					Centracs provides two pre-configured user roles for Administrators and Technicians. New roles can be created to match the four levels that MDOT is asking for.
233.0	The Solution must support individual user identification and authentication and role-based access controls.	✓					In the Centracs software, access to data and functions is strictly controlled. Centracs offers multiple levels of security that can be used to permit or prevent access to specific data and functions on a user-by-user basis. It is recommended that the Administrator design and configure the overall security setup in advance, before people start to use Centracs for the first time.
234.0	In compliance with DTMB published standards, the Solution must automatically log off users after a system administrator defined and modifiable period of inactivity (e.g., if a user has no activity on the central signal system for 15 minutes, they will be automatically logged off).	✓					Centracs has a user configurable parameter that determines how long the client can be inactive before automatically logging them off.
235.0	Passwords must be encrypted using DTMB-approved methods and not stored as plain text.	✓					Passwords are encrypted in the database and not stored as plain text.
236.0	The Solution must grey out or not show any features that a user is not authorized to access. The Solution must display a message indicating that the feature is not available for that user.	✓					Centracs does not show any feature that a user is not authorized to access. Users can see from the license tab in system settings which modules they are licensed for.

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237.0	The Solution must provide a role that can be assigned to a user that allows the user to see who is logged in at any point in time.	✓					Centracs allows all logged in users to see all current logged in users.
OPTIONAL	**GUI**						
238.0	The GUI should have the ability to cache the system map on local computers and devices.	✓					Centracs caches the map on local workstations.
239.0	The GUI should allow each user to save display preferences. The GUI should automatically load a user's display preferences after logging into the Solution from any supported device (e.g., workstation, laptop, mobile device).	✓					By default, when a user logs out of Centracs, their current display settings are automatically saved to the database, so that the next time they log in, the containers and windows are re-opened exactly as they were left — even if the user logs in on a different workstation. Optionally, this behavior can be changed, as described below. Users can also save specific display settings to a "preference set" to be used later or by another user. Permanently saving the display preferences in a named preference set allows users to: • Change their view temporarily but go back to the current view afterwards • Save different views for different tasks during the day • Save different views for different jurisdictions that the user manages • Save different views for different workstations • Share the view with another user

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240.0	The GUI should have the ability to add new tools and commands without crowding or compromising the display on a workstation or mobile device.	✓					With the versatile layout of Centracs, users can make their own arrangement of windows. When the application is launched for the first time, the main window shows a set of empty panes. Each of these panes is a container for a window. To quickly and easily make a customized view, users can open the windows that are used most, and drag them into these containers. When the user exits the application, the container layout is stored in the database, and is retrieved the next time they log in.
241.0	The GUI should allow users to view owner traffic monitoring software containing live traffic congestion, travel times, lane closures, crashes, CCTV feeds, express lane status and live traffic related transportation news and updates.	✓					Centracs allows the use of hyperlinks to view websites with live traffic congestion information, express lane status, live traffic news, etc. Centracs also includes CCTV features that allow users to view live video streams of intersections.
242.0	The GUI should provide users the ability to view, stream, and pan/tilt/zoom (PTZ) CCTV feeds of available intersections.	✓					The advance CCTV feature in Centracs allows users to monitor and control IP-based digital video pan-tilt-zoom (PTZ) surveillance cameras utilizing the ONVIF protocol.

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243.0	The GUI should seamlessly interface with selected and approved MDOT traffic and network management software.			✓			Centracs has the ability to interface with 3rd party tools and software. Should an API be available for the 3rd party software with applicable functionality, integrated alerts could be provided in Centracs. If the software has a web interface, it can be integrated with a URL entity in Centracs. The cost for this requirement included in the Pricing Exhibit.
244.0	The GUI should be configured so that users can select which agency, localities (e.g. other authorized users), or MDOT regions intersections to view.	✓					Users can select which intersections to view. Simply clicking on a CCTV entity will bring up the video feed.
OPTIONAL	**SIGNAL OPERATIONS**						
245.0	The Solution should include the following control modes, which are implemented by time of day schedule, and user-selectable from the Graphical User Interface (GUI): (1) Traffic Adaptive Control (2) Traffic Responsive Control (3) Signal Priority Operation	✓					In Centracs, Traffic Adaptive control and Traffic Responsive control can be scheduled to run on a group of intersections.

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246.0	The Solution should provide users the ability to create real-time Time Space Diagrams (TSD) from captured and processed data.	✓					The Centracs software includes Time Space Analysis. Time Space Analysis (TSA) is a visual tool that illustrates coordination relationships between consecutive intersections. It creates a diagram with data from two or more controllers to give you a graphical representation of their timing splits. The TSA tool is used to analyze progression and coordination along a specified route. The analysis shows progression color bands from multiple intersections that are in coordinated operation, which you can use to verify the level of optimization (based on various parameters). In order to generate the display, TSA uses phase data transition information stored in the Centracs database for the selected controllers.
247.0	The Solution should provide users the ability to create historical TSDs from captured and processed data.	✓					The Time Space Analysis in Centracs includes the ability to use historical data to create the diagrams.
248.0	The Solution should provide users the ability to make offset adjustments to the TSD, using click and drag methods, which can be saved directly from the TSD display to the Solution database and downloaded to the controller for implementation.	✓					Offset adjustments resulting from manipulating the TSA diagram can be saved directly to the Central DB and then downloaded to the controller for implementation. The TSA tool will show projected effect on the corridor in the display whenever the offset is changed.

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249.0	The Solution should allow external adaptive signal control systems to access detectors and signal controllers to facilitate adaptive signal timing operation.	✓					Centracs allows external systems to access detector and signal controller data through a C2C interface or directly from the controller so long as the external system does not delete, move or change polling configuration.
250.0	The Solution should be configured to accommodate adaptive software timing plans and models. The Solution software should mesh seamlessly with traffic adaptive and/or traffic responsive software in order to facilitate a best practices utilization of progression and control technology on an individual, group, or system wide basis.	✓					The adaptive module found in Centracs, allows users to configure the system to automatically respond to changing traffic conditions by adjusting offsets and splits on the signal controllers. The Traffic Responsive Algorithm, in Centracs offers real-time traffic flow assessment and pattern selection for a corridor.
OPTIONAL REQUIREMENT	**SYSTEM ARCHITECTURE**						
251.0	The Solution should provide users the ability to view, configure, receive status reports from, and/or perform other functions on non-controller IP-addressable connected intersection devices. Please indicate the Solution's ability to interact with non-controller IP-addressable connected intersection devices (e.g., Uninterruptible Power Supply (UPS), Conflict Monitor Unit (CMU), Malfunction Management Unit (MMU), Bluetooth radios, Wi-Fi radios, Dedicated Short-Range Communication (DSRC) equipment, communications equipment, Dynamic Message Signs (DMS), Remote Power Management (RPM), Closed Circuit Television (CCTV)).	✓					ATMS related field devices with a web interface can be accessed via the URL entity in Centracs.
252.0	The Solution should use manufacturer MIBs and/or APIs to interface with IP-addressable, connected intersection devices.	✓					Centracs uses manufacturer MIBs or APIs to interface with supported devices.
253.0	The Solution should provide users the ability to successfully implement all new software components (e.g., controller firmware, connected signal hardware component, central software, central hardware such as server) without disruption to the rest of the system.	✓					Centracs provides for implementation of new software components without disruption to the rest of the system.

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OPTIONAL REQUIREMENT	**EXTERNAL INTERFACE**						
254.0	The Solution should have the ability to centralize documentation and interface with MDOT's asset management software. Please describe capabilities and experience interfacing with third-party asset management software.	✓					Centracs provides the ability to attach documentation or other files associated with devices. The Field's feature allows per-type customization of associated files. As an example, Econolite has integrated Solar Winds for network asset management.
255.0	The Solution should provide an NTCIP Center-to-Center (C2C) interface for the exchange of connected intersection device and other field device status and other command/control data to other potential third-party systems/centers (e.g., other signal control systems, Intelligent Networks ATMS).	✓					Center-to-center (C2C) interfaces have been developed in Centracs to support the export/import of data to/from regional transportation management databases or systems including user selected route-based pre-emption using data received from third party fire rescue dispatch systems.
256.0	For the C2C interface, the Solution should indicate what status data should be published and what commands it should be allowed to receive.	✓					The Centracs NTCIP 2306 C2C interface supports data discovery with standard SOAP WSDL XML. This enables a 3rd party or application to automatically determine the interface schema and all associated data elements.
257.0	The C2C interface should be transparent to the users of the Solution.	✓					The C2C interface is transparent to the users as the status and command elements are fully integrated
258.0	The Solution should provide the ability to integrate with Geographic Information Systems (GIS), including ESRI ArcGIS at a minimum.	✓					The Centracs map tools allow the Centracs Administrator to easily configure map sources from the agency or any number of publicly available Web Map Service (WMS) sources.

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259.0	The Solution should provide users the ability to view intersections operated by other agencies and/or localities.	✓					Centracs can provide a C2C interface to integrate with other agencies or localities. Centracs also has a Server-to-Server (S2S) module to share signal status and commands between two or more Centracs systems. In Centracs S2S, the system allows the local agency to share intersections with an external agency.
260.0	The Solution should contain interface drivers and system engines to allow access to existing and future MDOT traffic operations applications (e.g., administration, maintenance, information dissemination, traffic, intelligent video and analytics, data fusion and prediction, decision support, data warehousing, CV applications, design and improvement as well as center to center information systems interfaces, CCTV system drivers, and additional traffic management system drivers).	✓					The Centracs platform is well suited for integration of applications and data sources and we have accomplished numerous center-to-center and system-to-system interfaces on prior projects. These include NTCIP 2306 with TMDD enabling standards-based interoperability with other standards compliant systems. Should non-compliant or proprietary interfaces be needed, this would be a customization. the cost could only be determined once requirements are developed.
261.0	The Solution should allow user to view system network management system (NMS) software.	✓					ATMS related field devices (including networked switches) with a web interface can be accessed via the URL entity in Centracs.
262.0	The Solution should interface with Claris video sharing service to share and receive video streams.	✓					Centracs is able to connect to many video streams, such as RTSP.

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263.0	The Solution should provide a connection to an MDOT data portal to share traffic signal timings and detector outputs (i.e., volume, occupancy, speed).		✓				Integration with MDOT's data portal and sharing timings and detector is possible. Centracs also supports a C2C interface with these data sets should the portal support standards like NTCIP 2306 Center-to-Center communications. There will be some hours associated with configuring the report for export
OPTIONAL REQUIREMENTS	**DATABASE**						
264.0	The Solution should provide the ability for the Owner to implement a fully managed traffic adaptive or traffic responsive system.	✓					There is full support for Traffic Responsive and Adaptive in Centracs.
OPTIONAL REQUIREMENTS	**COMMUNICATION**						
265.0	The Solution should support the existing communications protocols and additional emerging communications protocols/controller types.	✓					Centracs supports NTCIP 1202 standard objects, definitions, and protocols. Econolite Centracs supports the use of the NTCIP protocol for all communications with field controllers.
OPTIONAL REQUIREMENTS	**CONTROL GROUPS**						
266.0	The GUI should allow users to create intersection groups based upon any intersection attributes stored in the database.	✓					Centracs allows users to create intersection groups without any restrictions.
267.0	The GUI should allow users to assign groups of intersections (i.e., rather than just one intersection at a time) to a control group.	✓					Users can put Sections or other Groups in Groups.

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OPTIONAL REQUIREMENTS	**STATUS DISPLAY**						
268.0	The GUI should display the current phase status of the intersection to the user when the cursor is placed over the associated icon on the map display.	✓					Centracs tooltips include drill down information. At mouse-over the user is able to see jurisdiction, controller software type, pattern number, flash/free, time drift, and communication quality. Phase status is available directly on the map.
269.0	The GUI should allow a minimum of 15 intersection status display windows to be opened simultaneously.	✓					There is no limit to the number of intersection displays that can be open at the same time, other than the screen size and system resources, which will permit the system to exceed 15 windows.
270.0	The GUI should display signal operations historical performance measures on the system map.	✓					Centracs performance measures are accessible from the map interface through Centracs SPM.
OPTIONAL REQUIREMENTS	**INTERSECTION DISPLAY**						
271.0	The GUI should have the capability to view all field controllers on the intersection display.	✓					The Device Status display in Centracs allows the user to view all field controllers.
OPTIONAL REQUIREMENTS	**DASHBOARD**						
272.0	The GUI should provide a dashboard to display user-definable data fields from individual intersections, groups, or entire system based on role-based user access levels.			✓			Centracs contains many metrics and performance measures. This is a feature Econolite is happy to work with MDOT to identify which metrics to include in a dashboard and what controls should be user configurable. The cost is contained within the Pricing exhibit.

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273.0	The GUI should allow users to define the data fields included in the dashboard view.			✓			Based on the Dashboard in 272.0, Econolite will work with MDOT to make the dashboard user configurable. The cost is contained within the Pricing exhibit.
274.0	The GUI should allow users to view system attributes and data (e.g. operational status, communications status, signal phase, operational mode, live traffic, detector status, counts, split monitoring, alarms and alerts, external data, manual vs. police control) using an on-screen layer menu that users can configure to indicate which data to display.	✓					The Centracs GUI allows the user to view these elements through both map and container window layout.
OPTIONAL REQUIREMENTS	**INTERSECTION SETUP**						
275.0	The GUI should provide the ability to import, export, and copy/paste entire intersection drawings.	✓					The Centracs map editor allows users to import, export, and copy/paste intersection drawings.
276.0	The GUI should provide the ability to copy and paste data tables from one device to another to alleviate repetitive data entry.	✓					The Centracs signal database editor provides users with the ability to copy and paste data tables from one signal to another.
277.0	The GUI should support import and export of customized graphical icons to the library.		✓				Centracs has the ability for maps and icons to be updated and changed dynamically, However, a GUI for full import and export would have to be added. This work is possible or Econolite can work with MDOT directly to identify and add any additional icons.
278.0	The GUI should be configured so that users can export image files (e.g., .jpg, .png, and others) of the intersection configurations to a data portal.			✓			At present, Centracs is not integrated with MDOT's data portal. Econolite can provide integration and subsequent ability to export images that have been uploaded to entities as metadata fields in the entity properties. The cost has been included in the Pricing exhibit.

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OPTIONAL REQUIREMENTS	**EXTERNAL DATA DISPLAY**						
279.0	The GUI should display the Michigan GIS Open Data on the system map.	✓					The Centracs map tools allow the Centracs Administrator to easily configure map sources from the agency or any number of publicly available Web Map Service (WMS) sources.
280.0	The GUI should have the ability to view and filter intersections operated by one or more agencies, localities (e.g. other authorized users), or MDOT regions.	✓					The Centracs system gives the ability to view and filter intersections operated by external agencies if the proper S2S connection is made.
281.0	The GUI system map should provide the ability to display other layers including, but not limited to traffic congestion, weather, etc.	✓					The Centracs map tools allow the Centracs Administrator to easily configure map sources from the agency or any number of publicly available Web Map Service (WMS) sources.
282.0	The GUI should display data and alerts from third party sources including but not limited to Waze, HERE, Google Maps, or INRIX.			✓			These data sources offer a wide range of data. We haveintegrated with 3rd party sources such as BlueTOAD and Navteq. We have also integrated with HERE and use their maps as our standard “area map” within Centracs. Econolite welcomes the opportunity to identify and integrate data elements and alerts that MDOT requires. The cost has been included in the Pricing exhibit.

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OPTIONAL REQUIREMENTS	**NAVIGATION TOOLS**						
283.0	The GUI should display an individual intersection approach in a single system map view (i.e. GUI must be able to zoom in to show an individual approach for an intersection).	✓					The Centracs software provides an intersection status display that shows real-time state of movements, including signal colors or overlap status, active coordination pattern, active preemption status, pedestrian indications, communication status, alarms, cycle counter, etc..
284.0	The GUI should be configured such that the system map provides for more detailed signal operations data to be displayed as the user zooms in (e.g. amount of information increases as user zooms in). The threshold for data display and zooms levels should be user configurable.	✓					Each zoom level on the main map can be configured to have an icon representation of the intersection status and links between devices.
285.0	The GUI should provide multiple tools for zooming on the system map (e.g. predefined zoom levels, clicking on the map, and using the mouse wheel).	✓					Centracs provides users with the ability to zoom the system map in several ways. Standard mouse wheel scrolling will zoom in, clicking on an intersection will bring up the intersection status screen. There are also preset map locations with their own user defined zoom levels.
286.0	The GUI should have pre-defined zoom system map levels (e.g., state, region, county) to be selected from pull-down menus.	✓					To view pre-defined zoom levels in Centracs, users can save each map view as a “preset map” which they can easily call up at any time.
OPTIONAL REQUIREMENTS	**BASIC FUNCTIONALITY AT INDIVIDUAL INTERSECTIONS, CONTROL GROUPS, AND SYSTEM-WIDE**						
287.0	The Solution should have the ability to interface/communicate with the Malfunction Management Unit (MMU) on an individual, control group, or system-wide basis.	✓					Centracs supports interfacing with EDI MMU units on an individual, group, or system-wide basis.

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288.0	The Solution should have the ability to interface with an environmental sensor or contact closure that informs the user that the traffic signal cabinet door(s) are open. A visual and audible alarm should alert the user via the GUI.	✓					Centracs is able to alert off the cabinet door open event from the local controller and notify users of this event.
OPTIONAL REQUIREMENTS	**CONTROLLER DATABASE REVISIONS AND TRANSFERS**						
289.0	The Solution should provide users the ability to upload and download part of the controller database (as opposed to the entire database).	✓					Centracs gives the users the ability to upload and download portions of the controller database.
OPTIONAL REQUIREMENTS	**SCHEDULE**						
290.0	The Solution should be configured so that users can implement event-based management scenarios (e.g. activate a specific detour, evacuation plans, weather, etc.).	✓					Manual commands and schedule entries usually contain one action, but they can also run compound actions, known in Centracs as “action sets”. An action set is a series of user-configurable actions that can all be kicked off at the same time (or sequentially) by one command. Centracs alerts can also be configured to run an action once an event is triggered so it can kick-off a specific set of actions every time.
OPTIONAL REQUIREMENTS	**SIGNAL PRIORITY / PREEMPTION**						
291.0	The Solution should differentiate signal priority logic from preemption functions.	✓					Centracs uses different workflows and operations to handle Signal Priority logic and Preemption functions.
292.0	The Solution should support the mandatory functionality and data objects defined in the most recent version of NTCIP 1211 (currently v02, published in September 2014).	✓					Centracs supports the mandatory functionality and objects in NTCIP 1211 v2.

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OPTIONAL REQUIREMENTS	**DETECTION DEVICES**						
293.0	The Solution should interface with third party software that provides vehicle detection data such as speed, volume, classification, and turning movements.	✓					Econolite provides standards based NTCIP 2306 3rd party interfaces that meet this need and are provided by the device directly to the controller. In addition, if the device is IP-based, Econolite can interface to the device through a URL to access the information. Econolite is also able to integrate with 3rd party API's as needed
294.0	The Solution should interface with third party software that provides pedestrian and bicycle detection.	✓					Econolite provides standards based NTCIP 2306 3rd party interfaces that meet this need and are provided by the device directly to the controller. In addition, if the device is IP-based, Econolite can interface to the device through a URL to access the information. Econolite is also able to integrate with 3rd party API's as needed
295.0	The Solution should interface with third party software that provides preemption and priority detection and/or control.	✓					Econolite provides standards based NTCIP 2306 3rd party interfaces that meet this need and are provided by the device directly to the controller. In addition, if the device is IP-based, Econolite can interface to the device through a URL to access the information. Econolite is also able to integrate with 3rd party API's as needed

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Business Specification Number	**Business Specification**	**Current**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
296.0	The Solution should be configured such that data collected from detection devices is stored in memory on a five-minute basis with the ability to be recalled in five-minute increments. Each five-minute increment should be date/time tagged. If bad data or no data is received from the detectors during any or all of the five-minute time frames, the data must be tagged as questionable or not available in the database. The Solution should be able to recognize and report local controller detector failure causing recall. The Solution should have the ability to dynamically link both upstream and downstream controllers and adjust timings based on a histogram of recent data or real-time corridor algorithm which helps compensate for failed detection.	✓					Five-minute detector binning is available as a native Centracs feature as well as controllers through NTCIP 1202. Centracs supports the full range of Detector Diagnostics in NTCIP. Specific Algorithms available in Centracs, such as Traffic Responsive, account for detector failures and allow user mapping of detectors from up & down stream flows providing for historical data substitution using a distribution of recent and historically weighted volume and occupancy
297.0	The Solution should be capable of displaying system detector (or link) icons at the area wide level. When the zoom level allows for the display of system detectors, the data should be displayed instead of the corresponding link data. The Solution should be configured such that the user is able to select the time interval to display the detector data. The data should be displayable in either raw or smoothed form (operator-selectable).			✓			Centracs supports Links. The ability to specify time intervals would be a customization. The cost has been included in the Pricing exhibit.
298.0	The Solution should have the ability to collect high resolution data consistent with the Purdue enumerations located at http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1002&context=jtrpdata and based on UDOT high resolution data logging tool or other similar display mechanism for high resolution data.	✓					The Centracs MOE module, combined with an Econolite controller collects and stores individual signal event information at a frequency of 10 times per second.
OPTIONAL REQUIREMENTS	**TIME SYNC AND CONTROLLER LOCATION**						
299.0	The Solution should provide GPS latitude and longitude coordinates within 1-meter accuracy for each signal controller and use those values to populate system maps on the Solution GUI. The Solution should interface with controller GPS module or cellular modem/router to automatically import GPS coordinates.			✓			Centracs includes a user-friendly means to drag and drop entity to the map and accurately place them without requiring GPS. Centracs supports latitude and longitude through “drag and drop” of entities on the map. Econolite believes this approach may be preferable as it allows for the intersection locations

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							to be accurately placed at the center of the intersection rather than the coordinates of the traffic cabinetor other location of the GPSreceiver. However, should MDOT wish to use the requirement method - the cost has been included in the Pricing exhibit.
OPTIONAL REQUIREMENTS	**TIME SYNC AND CONTROLLER LOCATION**						
299.0	The Solution should provide GPS latitude and longitude coordinates within 1-meter accuracy for each signal controller and use those values to populate system maps on the Solution GUI. The Solution should interface with controller GPS module or cellular modem/router to automatically import GPS coordinates.			✓			Centracs includes a user-friendly means to drag and drop entity to the map and accurately place them without requiring GPS. Centracs supports latitude and longitude through “drag and drop” of entities on the map. Econolite believes this approach may be preferable as it allows for the intersection locations to be accurately placed at the center of the intersection rather than the coordinates of the traffic cabinetor other location of the GPSreceiver. However, should MDOT wish to use the requirement method - the cost has been included in the Pricing exhibit.
OPTIONAL REQUIREMENTS	**ALERTS**						
300.0	The Solution should send user alerts immediately upon exceeding user-defined thresholds.	✓					The Centracs software is able to generate alerts based on user defined thresholds, including number of occurrences in specified timeframe and being active for some number of minutes.

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
301.0	The Solution should provide users the ability to categorize alerts by priority.	✓					Centracs provides three priority levels for alerts (Informational, Warning, Critical)
302.0	The Solution should provide a process for users to acknowledge receipt of alerts.	✓					Centracs provides a process for users to acknowledge receipt of alerts.
303.0	The Solution should provide the ability to provide alert notifications to additional users if user-specified alerts are not acknowledged within a user-defined amount of time.	✓					For cases in which the alert is not acknowledged or closed within a reasonable period of time, users can configure the Alert Escalation feature of Centracs to automatically send the alert to a different recipient or set of recipients. Users can configure multiple levels of escalation, such that an alert continues to escalate until someone acknowledges or closes it.
304.0	The Solution should provide the ability to configure alerts to be sent via pop-up window, icon display, list or another format.	✓					Centracs provides the ability to configure alerts to be sent via pop-up window, list, status icons, email, SMS.
305.0	The Solution should provide an audible and visual alert with a GIS map pop-up flashing the controller location after a cabinet door has been open more than ten minutes.			✓			Centracs can provide an audible and visual alert when the system detects a cabinet door openevent that has lasted longer than ten minutes. If the door is open, the operator will see an alert with location. The operator can click on the location and automatically zoom to a location. If an actual pop-up is needed in the map, customization would be required. The cost for this is included in the Pricing exhibit.

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
OPTIONAL REQUIREMENTS	**OPERATIONS MONITORING**						
306.0	The Solution should monitor devices such that the Solution has the ability to identify failed individual components when user-defined error thresholds are exceeded.	✓					Centracs allows users to configure event triggers to have user defined thresholds.
307.0	The Solution should compare real-time phase returns to the scheduled signal timing parameters on the Solution database and alert the user to differences that exceed user-defined thresholds. This functionality should be user schedulable. The error conditions that should be detected include, but are not limited to, the following: (1) Controller is not using the proper signal timing plan; (2) Controller time clock is out of synchronization; (3) Controller is not sequencing; (4) Controller does not leave the current phase a minimum of once in a user-specified number of minutes; (5) Phase sequence in improper; (6) Phase interval is out of compliance; (7) Phase time is out of compliance. (8) Please indicate which error conditions the Solution can identify	✓					A combination of Centracs events and I/O logic processor can be used to create these alarms.
308.0	The Solution should provide users the ability to access and display split monitoring information, including but not limited to: (1) Real-time split (2) Programmed split (3) Historical splits	✓					Centracs includes the Split Monitor function to help users analyze phase utilization for standard dual-ring controllers. The Split Monitor diagram compares the actual splits for an intersection to the programmed splits. Split Monitor logging is a scheduled function that could run for as long as the user needed barring any hardware limitations. Real time splits can be seen from the signal status screen also.
309.0	The Solution should monitor beginning and end times for preemption related events.	✓					Centracs can monitor beginning and end times for preemption related events.

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
310.0	The Solution should monitor beginning and end times for priority related events.	✓					Centracs can monitor beginning and end times for signal priority events.
311.0	The Solution should monitor preemption events by unique vehicle identification codes, vehicle type, preemption type, and intersection approach, if available.	✓					Centracs is able to track and monitor vehicles such as emergency and transit through CAD and Transit systems when system connections exist. Customization and cost for the Centracs Priority feature can be included.
312.0	The Solution should monitor priority events by unique vehicle identification codes, vehicle type, priority type, and intersection approach, if available.	✓					Centracs users can monitor priority events using the priority dashboard.
313.0	The Solution should provide users with the capability to connect to third-party performance monitoring systems, add-on modules, and other external data sources through application programming Interfaces (APIs). Please describe the approach to these future connections.			✓			The Centracs architecture is designed for extensibility. Data and information can be integrated via 3rd party APIs. The nature and approach to showing or processing the data would needto be discussed, but Econolite has successfully integrated with many API's, such as: CCTV, Mapping, several C2C connections, databases, controllers, database editors, etc. If Centracs modules are used, no customization is required. For other systems that may require customization, the cost would need to be determined based on requirements. The cost has been included in the Pricing exhibit.
314.0	The Solution should provide users with the capability to connect to third-party performance monitoring systems, add-on modules and other external data sources through open database capability (ODBC). Please describe the approach to these future connections.	✓					Centracs uses a standard, ODBC-compliant SQL database system (Microsoft SQL Server) to store, retrieve, and manage all system data and parameter files.

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315.0	The Solution should have a self-diagnostic tool that runs continuously or on a schedule of at least once every 12 hours to verify that all Solution components and software and operating properly and at 100% efficiency. Any errors, failures, or anomalies should be reported and sent to the user and Solution manufacturer for refinement and upgrades to maintain the highest level of effectiveness and service. This requirement refers to the operation of hardware, central hardware, and signal operations (i.e., signal performance measures). Please describe the approach to implementing a self-diagnostic tool.	✓					Econolite has a robust monitoring system. The proposed support agreement includes proactive monitoring and logging whereby not only failure, but trends in key areas are tracked continually. For example, support can monitor and project when a hard drive will fill up and proactively address it before it becomes an issue. As well, all failure logs and diagnostics are captured and are monitored by Econolite support. Centracs also includes a system failover modular that is able to detect failures and ensure system up-time by failing over to standby systems.
316.0	The Solution should monitor the GPS communication status of all field equipment outfitted with GPS communication capability (e.g., controller, cell modem/router) and ensure the current GPS coordinates are populating the applicable system maps.			✓			Econolite is able to add GPS device monitoring including available data sets in each device API as a customization. Should multiple protocols exist across device types, this would be an additional cost. The cost to provide this is in the Pricing exhibit.
OPTIONAL REQUIREMENTS	**MOE**						
317.0	The Solution should collect and store Measures of Effectiveness (MOE) data on a continuous basis.	✓					Centracs collects MOE high resolution data on a continuous basis.
318.0	The Solution should report MOE data on a per phase basis.	✓					Centracs reports MOE data on a per phase basis where appropriate.

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
319.0	The Solution MOEs should include seconds of green time used per split. Green split data should be available for all phases and remain active under all conditions. Data should be aggregated on a per cycle basis.	✓					There are several features available in Centracs including Split Monitoring and Split Monitor Report including data such as actual to programmed use of green time.
320.0	The Solution MOEs should include percent of green time used per split.	✓					Split Monitor includes percentage of green time used,
321.0	The Solution MOEs should include a system detector health report which can be broken down by system, corridor, segment, or individual intersection and provide each detector's current operability including detector failures and detector error messages, such as but not limited to locked, omitted phase, loop detection malfunction, no communication.	✓					Econolite Signal Performance measures includes a system detector health report which fulfills the stated requirements.
322.0	The Solution MOEs should include percent arrivals on green.	✓					Econolite Signal Performance measures includes a report for percent arrivals on green.
323.0	The Solution MOEs should include turning movement counts grouped by detector and lane movement.	✓					Centracs includes these capabilities for certain devices, such as Autoscope detectors. Additional support would need to be added for additional device types.
324.0	The Solution MOEs should include number of times maxed out and forced off per phase.	✓					Econolite Signal Performance measures includes reports for number of times maxed out and forced off per phase
325.0	The Solution MOEs should include number of times a phase was skipped.	✓					Phase skipped information can be found in the Split Monitor Report.
326.0	The Solution MOEs should include number of transitions.	✓					Econolite Signal Performance measures includes reports on transitions.

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327.0	The Solution MOEs should include number of pedestrian calls.	✓					Econolite Signal Performance Measures includes reports on percent of cycles with pedestrian calls. A report on the actual number of calls would need to be created.
328.0	The Solution MOEs should include number of preemption requests (e.g., from emergency vehicle, railroad, bridge, tunnel, etc.) and beginning/ending times for each event.	✓					Econolite Signal Performance measures includes reports to show preemption requests and service.
329.0	The Solution MOEs should include number of priority vehicle requests (e.g., from transit vehicle) and beginning/ending times for each event.	✓					Econolite Signal Performance measures includes reports on signal priority requests and service.
330.0	The Solution MOEs should include any time a traffic signal controller was commanded into manual control mode (e.g., school/pedestrian crossing, special event, weather emergency, crash).	✓					Centracs includes Controller Logs report with this information.
331.0	The Solution MOEs should include real time versus historical volume, occupancy, and speed data by time-of-day and day-of-week.	✓					Centracs VOS reports include this data.
332.0	The Solution should report MOEs for individual intersections for a user-defined period of time (e.g. by day, week, month, etc.).	✓					Systems reports include date and time fields as applicable.
333.0	The Solution should report MOEs for groups of intersections for a user-defined period of time (e.g. by day, week, month, etc.).	✓					Systems reports, such as VOS include the ability to select and sort intersection as applicable.
OPTIONAL REQUIREMENTS	**REPORTS**						
334.0	The Solution should provide users the ability to create Time Space Diagram reports from real-time and historical data.	✓					Centracs Time Space analysis is a visual tool that illustrates coordination relationships between consecutive intersections. It creates a diagram with data from two or more controllers to give users a graphical representation of their timing splits.

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335.0	The Solution should provide users the ability to create High Resolution Data Report(s) from captured and processed data using the Purdue University Outcome-based approach outlined at the following link: https://docs.lib.purdue.edu/jtrpaffdocs/3/. Describe the performance measures that can be provided.	✓					Centracs has the ability to create and capture high-resolution data through the MOE module and Centracs SPM. Calculations are made from high resolution data collected by NTCIP-based Linux signal controllers.
336.0	The Solution should provide users the ability to use detection device data to create turning movement count reports grouped by detection device and lane movement.			✓			Turning movement count report can be added to the solution. . The cost to provide this is in the Pricing exhibit.
337.0	The Solution should display canned and ad hoc report results on the system map. The Solution should provide users the ability to define which results are displayed on the map.					✓	Centracs includes the ability to create new and ad-hoc reports independent from the map. Report results can be shown in a Centracs container window next to the map.
338.0	The Solution should communicate to and recognize mobile devices. Information sent to mobile phones should be reformatted to produce a text that is a useable and legible and produce a printout for use by traffic signal field staff.			✓			Econolite is able to work with MDOT to identify needs around mobile devices and provide customization for test printouts. . The cost to provide this is in the Pricing exhibit.
OPTIONAL REQUIREMENTS	**SYSTEM LOG**						
339.0	The Solution's system log should include records of detection device activity including but not limited to traffic volume, occupancy out of range and failed.	✓					Centracs provides for two types of Detector Fault reports. One is a current fault report that will only show faults in real-time and the other report shows all historical detector related faults.
340.0	The Solution's system log should include records of connected intersection device failure activity (e.g., conflict, watchdog, multiple outputs, low voltage).	✓					The Signal Events report would provide records of device failure activity if available.

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
341.0	The Solution's system log should include records of other field device failure activity.	✓					Centracs is able to include field device failure activity in its system log. The cost for customization for other party devices would be dependent on the requirements.
342.0	The Solution's system log should include records of MMU, and conflict monitor status.	✓					The Signal MMU report provides details on conflict monitor status.
343.0	The Solution's system log should include records of beginning and end times for preemption related events.	✓					The Signal Events report provides a historical list of controller-related events and errors (such as Local Flash Active and Cycle Fault) during a specified time period.
344.0	The Solution's system log should include records of intersection preemption event activity by unique vehicle identification codes, vehicle type, preemption type, and intersection approach, if available.	✓					The Signal Events report provides records of intersection preemption activity.
345.0	The Solution's system log should include records of beginning and end times for priority related events.	✓					The PR dashboard in Centracs allows the user to view priority related events.
346.0	The Solution's system log should include records of intersection priority event activity by unique vehicle identification codes, vehicle type, priority type, and intersection approach, if available.	✓					The PR dashboard provides records of intersection priority activity if available.
347.0	The Solution's system log should contain record of each time a controller operates off-line and not consistent with the scheduled time-of-day, traffic adaptive, or traffic responsive plan. The system log will include the times that the system was off-line, the time communication was restored, and the time it took to re-synchronize the signal, corridor, or corridors back to normally scheduled operations.	✓					Centracs provides users with reports detailing communications between Centracs and field devices. Attempts, failures, comm. success %, poll success % data can be found in the Comm Statistics report. The Hourly Comm. Stats report shows the percentage of communications that were successful for each signal during each hour of the day.

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Business Specification Number	**Business Specification**	**Current Capability**	**Requires Configuration**	**Requires Customization**	**Future Enhancement**	**Not Available**	**How Contractor will deliver the business Specification. Details of any configuration/customization, associated costs, and the impacted risk that may be caused if configured or customized to meet the business specification.**
348.0	The Solution's system log should contain all preemption events including type of preemption, dwell time, clearance time, and re-synchronization time.	✓					Econolite's SPM product uses 1/10 sec high-resolution data to provide Preemption information.
OPTIONAL REQUIREMENTS	**USER ACCESS CONTROLS**						
349.0	The Solution should provide user access controls definable by system administrators for a geographic area, time of day, and by device ownership.		✓				Centracs provides user access controls that are definable by system administrators for a geographic area and by device ownership. Centracs is able to provide permissions across multiple constructs, including roles and jurisdictions
350.0	The Solution should provide the same security for access via mobile devices and tablets as is provided for accessing from local computers.	✓					The same security for access to the Centracs Client is available and enforced when running the client on supported mobile devices.
351.0	The Solution should allow authorized users to download portable encrypted configuration data to or from a flash drive.					✓	Econolite supports downloading and working with numerous data sets, such as controller data bases and high-resolution data. However, standards based combability may be difficult to comply with when introducing encryption. Econolite is open to discuss this more with MDOT to determine the most appropriate way to incorporate this requirement but we cannot provide a cost at this time until we understand the recommended approach.

STATE OF MICHIGAN

Contract No. 190000001522
Central Signal Control System

SCHEDULE B
Maintenance and Support

The parties agree as follows:

1. Definitions. For purposes of this Schedule, the following terms have the meanings set forth below. All initial capitalized terms in this Schedule that are not defined in this **Section 1** to this Schedule shall have the respective meanings given to them in the Contract.

"**Contact List**" means a current list of Contractor contacts and telephone numbers set forth in the attached **Exhibit 1** to this Schedule to enable the State to escalate its Support Requests, including: (a) the first person to contact; and (b) the persons in successively more qualified or experienced positions to provide the support sought.

"**Critical Service Error**" has the meaning set forth in the Service Level Table.

"**Error**" means, generally, any failure or error referred to in the Service Level Table.

"**First Line Support**" means the identification, diagnosis and correction of Errors by the State.

"**High Service Error**" has the meaning set forth in the Service Level Table.

"Low Service Error" has the meaning set forth in the Service Level Table.

"**Medium Service Error**" has the meaning set forth in the Service Level Table.

"**Resolve**" and the correlative terms, "**Resolved**", "**Resolving**" and "**Resolution**" each have the meaning set forth in **Section 3.4**

"**Service Credit**" has the meaning set forth in **Section 4.1**

"**Second Line Support**" means the identification, diagnosis and correction of Errors by the provision of (a) telephone and email assistance by a qualified individual on the Contact List and remote application support, or (b) on-site technical support at the State's premises by a qualified individual on the Contact List.

"**Service Levels**" means the defined Error and corresponding required service level responses, response times, Resolutions and Resolution times referred to in the Service Level Table.

"**Service Level Table**" means the table set out in **Section 3.4**

"**State Cause**" means any of the following causes of an Error: (a) a State server hardware problem; (b) a desktop/laptop hardware problem; or (c) a State network communication problem.

"**State Systems**" means the State's information technology infrastructure, including the State's computers, software, databases, electronic systems (including database management systems) and networks.

"**Support Hours**" means 24 hours a day, seven days a week .

"**Support Period**" means the period of time beginning 90 days after the date the Software has entered full production mode and ending on the date the Contract expires or is terminated.

"**Support Request**" has the meaning set forth in **Section 3.2**

2. Maintenance.

2.1 Maintenance Releases and New Versions. Provided that the State is current on its Support Services Fees, during the Support Period, Contractor shall provide the State, at no additional charge, with all Maintenance Releases and New Versions for the Software.

2.2 Installation. The State has no obligation to install or use any Maintenance Release or New Version. If the State wishes to install any Maintenance Release or New Version, the State shall have the right to have such Maintenance Release or New Version installed, in the State's discretion, by Contractor or other authorized party. Contractor shall provide the State, at no additional charge, adequate Documentation for installation of the Maintenance Release or New Version, which has been developed and tested by Contractor. The State's decision not to install or implement a Maintenance Release or New Version of the Software will not affect its right to receive Support Services throughout the Term of this Contract.

3. Support Services. The State will provide First Line Support prior to making a Service Request for Second Line Support. Contractor shall perform all Second Line Support and other Support Services during the Support Hours throughout the Support Period in accordance with the terms and conditions of this Schedule and the Contract, including the Service Levels and other Contractor obligations set forth in this **Section 3**.

3.1 Support Service Responsibilities. Contractor shall:

(a) provide unlimited telephone support during all Support Hours;

(b) respond to and Resolve all Support Requests in accordance with the Service Levels;

(c) provide unlimited remote Second Line Support to the State during all Support Hours;

(d) provide on-premise Second Line Support to the State if remote Second Line Support will not Resolve the Error; and

(e) provide to the State all such other services as may be necessary or useful to correct an Error or otherwise fulfill the Service Level requirements, including defect repair, programming corrections and remedial programming.

3.2 Support Requests. Once the State has determined that an Error is not the result of a **State Cause**, the State may request Support Services by way of a Support Request. The State shall classify its requests for Error corrections in accordance with the support request classification and definitions of the Service Level Table set forth in **Section 3.4** (each a "**Support Request**"). The State shall notify Contractor of each Support Request by e-mail or telephone. The State shall include in each Support Request a description of the reported Error and the time the State first observed the Error.

3.3 State Obligations. The State shall provide the Contractor with each of the following to the extent reasonably necessary to assist Contractor to reproduce operating conditions similar to those present when the State detected the relevant Error and to respond to and Resolve the relevant Support Request:

(i) if not prohibited by the State's security policies, remote access to the State Systems, and if prohibited, direct access at the State's premises;

(ii) output and other data, documents and information, each of which is deemed the State's Confidential Information as defined in the Contract; and

(iii) such other reasonable cooperation and assistance as Contractor may request.

3.4 Service Level Table. Response and Resolution times will be measured from the time Contractor receives a Support Request until the respective times Contractor has (a) responded to that Support Request, in the case of response time and (b) Resolved that Support Request, in the case of Resolution time. "**Resolve**", "**Resolved**", "**Resolution**" and correlative capitalized terms mean, with respect to any particular Support Request, that Contractor has corrected the Error that prompted that Support Request and that the State has confirmed such correction and its acceptance of it in writing. Contractor shall respond to and Resolve all Support Requests within the following times based on the State's designation of the severity of the associated Error, subject to the parties' written agreement to revise such designation after Contractor's investigation of the reported Error and consultation with the State:

Support Request Classification	Definition	Service Level Metric (Required Response Time)	Service Level Metric (Required Resolution Time)
Critical Service Error	(a) Issue affecting entire Software system or single critical production function; (b) Software down or operating in materially degraded state;	Contractor shall acknowledge receipt of a Support Request within thirty (30) minutes.	Contractor shall Resolve the Support Request as soon as practicable and no later than four (4) hours after Contractor's receipt of the Support Request.

	(c) Data integrity at risk; (d) Material financial impact; (e) Widespread access interruptions: or (f) Classified by the state as a Critical Service Error		If the Contractor Resolves the Support Request by way of a work-around accepted in writing by the State, the support classification assessment will be reduced to a High Service Error.
High Service Error	(a) A Critical Service Error for which the State has received, within the Resolution time for Critical Service Errors, a work-around that the State has accepted in writing; or (b) Primary component failure that materially impairs Software's performance; (c) Data entry or access is materially impaired on a limited basis; or (d) performance issues of severe nature impacting critical processes	Contractor shall acknowledge receipt of a Support Request or, where applicable, the State's written acceptance of a Critical Service Error work-around, within twenty-four (24) hours.	Contractor shall Resolve the Support Request as soon as practicable and no later than two (2) Business Days after Contractor's receipt of the Support Request or, where applicable, the State's written acceptance of a Critical Service Error work-around.
Medium Service Error	An isolated or minor Error in the Software that meets any of the following requirements:	Contractor shall acknowledge receipt of the Support Request within two (2) Business Days.	Contractor shall Resolve the Support Request as soon as practicable and no later than ten (10) Business Days after

	(a) does not significantly affect Software functionality; (b) can or does impair or disable only certain non-essential Software functions; or (c) does not materially affect the State's use of the Software		Contractor's receipt of the Support Request.

3.5 Escalation to Parties' Project Managers. If Contractor does not respond to a Support Request within the relevant Service Level response time, the State may escalate the Support Request to the parties' respective Project Managers and then to their respective Contract Administrators.

3.6 Time Extensions. The State may, on a case-by-case basis, agree in writing to a reasonable extension of the Service Level response or Resolution times.

3.7 Contractor Updates. Contractor shall give the State monthly electronic or other written reports and updates of:

(a) the nature and status of its efforts to correct any Error, including a description of the Error and the time of Contractor's response and Resolution;

(b) its Service Level performance, including Service Level response and Resolution times; and

(c) the Service Credits to which the State has become entitled.

4. Service Credits.

4.1 Service Credit Amounts. If the Contractor fails to respond to a Support Request within the applicable Service Level response time or to Resolve a Support Request within the applicable Service Level Resolution time, the State will be entitled to the corresponding service credits specified in the table below ("**Service Credits**"), provided that the relevant Error did not result from a State Cause.

Support Request Classification	**Service Level Credits**	**Service Level Credits** **(For Failure to Resolve any Support Request Within the**

	(For Failure to Respond to any Support Request Within the Corresponding Response Time)	Corresponding Required Resolution Time)
Critical Service Error	An amount equal to 5% of the then current monthly Support Fee for each hour by which Contractor's response exceeds the required Response time.	An amount equal to 5% of the then current monthly Support Fee for each hour by which Contractor's Resolution of the Support Request exceeds the required Resolution time.
High Service Error	An amount equal to 3% of the then current monthly Support Fee for each Business Day, and a pro-rated share of such percentage for each part of a Business Day, by which Contractor's response exceeds the required Response time.	An amount equal to 3% of the then current monthly Support Fee for each Business Day, and a pro-rated share of such percentage for each part of a Business Day, by which Contractor's Resolution of the Support Request exceeds the required Resolution time.

4.2 Compensatory Purpose. The parties intend that the Service Credits constitute compensation to the State, and not a penalty. The parties acknowledge and agree that the State's harm caused by Contractor's delayed delivery of the Support Services would be impossible or very difficult to accurately estimate as of the Effective Date, and that the Service Credits are a reasonable estimate of the anticipated or actual harm that might arise from Contractor's breach of its Service Level obligations.

4.3 Issuance of Service Credits. Contractor shall, for each monthly invoice period, issue to the State, together with Contractor's invoice for such period, a written acknowledgment setting forth all Service Credits to which the State has become entitled during that invoice period. Contractor shall pay the amount of the Service Credit as a debt to the State within fifteen (15) Business Days of issue of the Service Credit acknowledgment, provided that, at the State's option, the State may, at any time prior to Contractor's payment of such debt, deduct the Service Credit from the amount payable by the State to Contractor pursuant to such invoice.

4.4 Additional Remedies for Service Level Failures. Contractor's repeated failure to meet the Service Levels for Resolution of any Critical Service Errors or High Service Errors, or any combination of such Errors, within the applicable Resolution time set out in the Service Level Table will constitute a material breach under the Contract. Without limiting the State's right to receive Service Credits under this **Section** 3, the State may terminate this Schedule for cause in accordance with terms of the Contract.

5. Communications. In addition to the mechanisms for giving notice specified in the Contract, unless expressly specified otherwise in this Schedule or the Contract, the parties may use e-mail for communications on any matter referred to herein.

STATE OF MICHIGAN

Contract No. 190000001522

Central Signal Control System

SCHEDULE C
Licensing Agreement

ECONOLITE SYSTEMS

CENTRACS™
Advanced Transportation Management System

Software License Agreement and Terms of Use
Centracs™ Advanced Transportation Management System Software

***Centracs* Software License Agreement (CSLA)**

IMPORTANT! READ CAREFULLY:

This ***Centracs*** SOFTWARE License Agreement ("CSLA") is a legal agreement between AGENCY ("Licensee" or "Agency") and Econolite Systems, Inc. ("Licensor" or "Econolite") for any and all ***Centracs*** software product(s), and modules, including but not limited to SPM and Edaptive, and encompassing computer software and firmware programs and associated media, printed materials, and "online" or electronic documentation ("SOFTWARE") provided under the AGENCY contract. By installing, copying, or otherwise using the SOFTWARE, you the Licensee agree to be bound by the terms of this CSLA. If you do not agree to the terms of this CSLA, you may not use the SOFTWARE.

SOFTWARE License

The SOFTWARE and its documentation are protected by copyright laws and international copyright treaties, as well as other intellectual property laws and treaties. The SOFTWARE is licensed, not sold.

This CSLA grants you the following rights:

- A non-exclusive, non-transferable, non-sublicensable, perpetual license to use the SOFTWARE only in machine-readable form.
- You may install and use the ***Centracs*** Core, Device Manager, Communications and other Server components of the SOFTWARE on computers located on Agency's premises communicating with the maximum of number of field devices set by the license key included with the SOFTWARE.
- You may use ***Centracs*** SOFTWARE to monitor and operate only those devices that are owned by and are located within the jurisdiction of the Agency. Use of ***the SOFTWARE*** to manage devices owned by another agency without express written consent of Econolite is expressly prohibited.
- You may install and use the ***Centracs*** Client/Workstation SOFTWARE on any number of Agency's authorized user workstations. The ***Centracs*** Client/Workstation SOFTWARE may only be used with the Agency's ***Centracs*** system. Use of the ***Centracs*** Client/Workstation SOFTWARE with another agency's ***Centracs*** systems is expressly prohibited.
- You may not (and will not allow any third party to) reverse engineer, decompile, or disassemble or otherwise attempt to derive the source code or underlying ideas or algorithms of the SOFTWARE, except and only to the extent that such activity is expressly permitted by applicable law, notwithstanding this limitation.
- You may not (and will not allow any third party to) modify, adapt, translate, or otherwise create derivative works of the SOFTWARE.

- You may not sell, lease, license, sublicense, distribute, disclose, provide or otherwise transfer in whole or in part the SOFTWARE or any parts thereof to another party without Econolite's express written consent.
- You must at all times maintain adequate security measures to safeguard the SOFTWARE from unauthorized access, use, and disclosure; supervise and control access to and use of the SOFTWARE in accordance with this CSLA; and maintain the markings clearly labelling the SOFTWARE as the property of Econolite and/or its suppliers.
- Without prejudice to any other rights, Econolite may terminate this CSLA if you fail to comply with the terms and conditions of this CSLA. In such event, you must destroy all copies of the SOFTWARE and all of its component parts.

SOFTWARE Ownership

Any ***Centracs*** software ("SOFTWARE") that is made available from Econolite is the copyrighted work of Econolite and/or its suppliers or others that have licensed material to Econolite. Use of the SOFTWARE is governed by these Terms of Use and CSLA contained therein. Econolite retains all right, title, and interest in and to the SOFTWARE and all related copyrights, trade secrets, patents, trademarks, and any other intellectual and industrial property and proprietary right, including registrations application, renewals, and extensions of such rights.

The SOFTWARE is made available for use by customers of Econolite and/or its subsidiaries, distributors, authorized agents or representatives or suppliers, according to this CSLA. Any reproduction or redistribution of the SOFTWARE not in accordance with the Terms of Use is expressly prohibited by law. You may not install any ***Centracs*** SOFTWARE unless you agree to these Terms of Use in their entirety.

Warranties

Econolite warrants that the media, if any, on which the SOFTWARE is delivered, and documentation supplied is free from defects in material and workmanship under normal use and service and that the SOFTWARE will substantially conform to the description contained in the documentation for a period of ninety (90) days beginning upon Agency's acceptance of the SOFTWARE. In the event of notification within the warranty period of defects in material or workmanship, or if the SOFTWARE does not substantially conform to the description contained in the documentation, ECONOLITE, at its sole option, will repair or replace the defective media or documentation or correct the defects in the SOFTWARE. The foregoing is the only warranty of any kind expressed or implied. There are no implied warranties of merchantability and fitness for a particular purpose.

SOFTWARE Copyright

The SOFTWARE is developed and marketed by Econolite in part under a license of certain copyrighted works of others as to certain elements and in part as the copyrighted work of Econolite. Use of the SOFTWARE is governed by the terms of this Agreement, certain of the terms of which relate to or incorporate other agreements respecting intellectual property contained in the SOFTWARE. The SOFTWARE is protected by copyright laws and international treaty provisions. Therefore, you must treat the SOFTWARE like any other copyrighted material. You may not copy the printed materials accompanying the SOFTWARE.

Restricted Rights Legend

Any SOFTWARE which is provided for or on behalf of the United States of America or for or on behalf of Licensee, their agencies and/or instrumentalities ("U.S. Government) is provided with Restricted Rights. Use, duplication, or disclosure by the U.S. Government is subject to restrictions as set forth in Federal Acquisition Regulations subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer SOFTWARE clause at DFARS 252.227-7013 or subparagraphs (c)(1) and (2) of the Commercial Computer SOFTWARE - Restricted Rights at 48 CFR 52.227-19, as applicable. The manufacturer is Econolite, 1250 N. Tustin Ave., Anaheim, CA 92807 (714) 630-3700. ANY RIGHTS NOT EXPRESSLY GRANTED HEREIN ARE RESERVED.

STATE OF MICHIGAN

Contract No. 190000001522
Central Signal Control System
Schedule D
PRICING

Levels of Licensing (Intersection-based) and Support and Maintenance (Intersection-Based)

Licensing	Unit Cost	Quantity	Cost
Phase 1 (Licensed up to 280 Intersections)	$ 341.00	280	$ 95,480.00
Future Phases			
Future Phase A (1,365 Intersections)	$ 174.00	1,365	$237,510.00
Future Phase B (1,498 Intersections)	$ 159.00	1,498	$238,182.00
Maximum Capacity (5,000)	$ 128.00	1,857	$237,696.00
License Levels			
50 Intersections	$ 900.00	50	$ 45,000.00
100 Intersections	$ 748.00	100	$ 74,800.00
250 Intersections	$ 350.00	250	$ 87,500.00
500 Intersections	$ 275.00	500	$137,500.00
1,000 Intersections	$ 175.00	1,000	$175,000.00
Enterprise License (Optional)	$ 108.00	5,000	$540,000.00

Note: "License Levels" is discounted as it assumes that the Phase 1 Intersections have already been purchased.

Annual Support and Maintenance	Cost
Phase 1	$ 17,202.60
Future Phases	
Future Phase A (1,365 Intersections)	$ 42,750.00
Future Phase B (1,498 Intersections)	$ 42,750.00
Maximum Capacity (5,000)	$ 42,750.00
License Levels	
50 Intersections	$ 8,100.00
100 Intersections	$ 13,464.00
250 Intersections	$ 15,750.00
500 Intersections	$ 24,750.00
1,000 Intersections	$ 31,500.00
Enterprise License (Optional)	$ 96,750.00

Notes:
1. The Econolite Software Maintenance Agreement is provided based on the total number of intersections licensed, and is annually renewed.
. The cost shown is additive to the base 280 intersection SMA cost.

Fixed Price Hourly Rate Card	
Position	**Rate**
Contract Manager/Project Director	$ 349.98
Project Manager	$ 311.10
Service Manager	$ 298.83
Central System Integrator	$ 304.62
Controller Programmer	$ 178.89
Senior ITS Engineer	$ 247.68
Systems Engineer	$ 208.79
System Architect	$ 309.90
Senior Software Developer	$ 264.58
Software Developer	$ 171.25
Master Electrician	$ 166.48
Journeyman Electrician	$ 141.35
Field/Communications Technician	$ 125.65
Local Technical Support	$ 172.76
Engineer II	$ 171.10
Engineer I	$ 147.77

Training	Rate
Onsite Training: *Includes 1 Econolite instructor for 1 - 8 hour period. Class size is expected to be less than 20 individuals, and provide their owncomputer.*	$2,500
Onsite Training: ***Includes 1 C&G instructor for 1 - 8 hour period. Class size is expected to be less than 20 individuals, and provide their own***	**$0**
Web-based Training: *Scheduled Econolite class for specific use case training . Cost is per hour*	$150
Web-based Training: *regularly scheduled Econolite Webinars.*	$0

Quick payment terms: 1% discount off invoice if paid within 10 days after receipt of invoice.

Optional Module	Price
Base CCTV Module	$ 28,678.00
Adder per camera	$ 271.46
Base DMS module	$ 10,060.00
Adder per DMS sign	$ 1,006.00
Base SPM Setup	$ 6,000.00
Per Intersection SPM Setup	$ 400.00
Annual SPM Subscription per Intersection	$ 365.00
Base Edaptive Setup	$ 6,000.00
Per Intersection Edaptive Setup	$ 600.00
Annual Edaptive Subscription per Intersection	$ 610.00
Waycare Integration	$ 50,000.00
Note: *1. Discount pricing will be applied to volume orders for CCTV, DMS, SPM and Edaptive deployments*	

Item	Price
Develop PREFERRED Requirements	
90	$ 8,322.00
119	$ 24,390.00
Develop OPTIONAL Requirements	
243	$ 34,765.00
272	$ 46,042.00
273 (Cost is included in 272)	$ -
278	$ 8,765.00
282	$ 43,087.00
297	$ 26,443.00
299	$ 17,383.00
305	$ 23,021.00
313	$ 26,443.00
316	$ 26,443.00
336	$ 24,079.00
338	$ 26,443.00

Scope of Service Item	# of Units	Unit Price	Unit	Total Cost
Implementation Services	N/A	N/A	N/A	$ 913,245.00
Licensing	N/A	N/A	N/A	$ 95,480.00
Support and Maintenance (paid per year)	5	$ 17,202.60	YR	$ 86,013.00
Hardware	280	$ 2,271.00	EA	$ 635,880.00
Optional Requirements Development	ALL	Per Table Above	N/A	$ 252,392.00
			Total Price	**1,983,010.00**
Notes: Hardware includes 4G 2-port cellular modem ($1,071), plus MFES ($1,200)				

Milestone Payments.

Milestone Event	Description	Milestone Payment *(revised)*	Unit	Total Cost
Testing and Acceptance of Software	Successful completion of UAT	25%	LS	$ 478,549.90
Testing and Acceptance of Solution (5%)	Successful completion of SAT for 5% of Phase 1 Intersections	20%	LS	$ 382,839.92
Testing and Acceptance of Solution (25%)	Successful completion of SAT for 25% of Phase 1 Intersections	10%	LS	$ 191,419.96
Testing and Acceptance of Solution (50%)	Successful completion of SAT for 50% of Phase 1 Intersections	10%	LS	$ 191,419.96
Testing and Acceptance of Solution (75%)	Successful completion of SAT for 75% of Phase 1 Intersections	10%	LS	$ 191,419.96
Testing and Acceptance of Solution (100%)	Successful completion of SAT for 100% of Phase 1 Intersections	15%	LS	$ 287,129.94
Burn-In Completion	Successful completion of 60-day burn-in for 100% of Phase 1 Intersections	10%	LS	$ 191,419.96
			TOTAL	**$ 1,914.199.60**

- "Controller, Install" as defined in Exhibit D – CU Requirements.
- "Cellular Modem, 4G, 2-Port as defined in in Exhibit E – Cellular Modem Requirements.
- "Cellular Modem, 4G, 4-Port" as defined in in Exhibit E – Cellular Modem Requirements.
- "TS, Managed Field Ethernet Switch, Layer 2, Copper" as defined in in Exhibit F – Managed Field Ethernet
- "Signalized Intersection Implementation" as defined in in Exhibit D – CU Requirements.

Implementation Services			
Description	**Qty**	**Unit**	**Unit Price**
Controller, Install	1-49	EA	$ 664.00
Controller, Install	50-99	EA	$ 664.00
Controller, Install	100-499	EA	$ 664.00
Controller, Install	500 or more	EA	$ 664.00
Signalized Intersection Implementation	1-49	EA	$ 194.00
Signalized Intersection Implementation	50-99	EA	$ 194.00
Signalized Intersection Implementation	100-499	EA	$ 194.00
Signalized Intersection Implementation	500 or more	EA	$ 194.00

Hardware			
Description	**Qty**	**Unit**	**Unit Price**
Cellular Modem, 4G, 2-Port	1-49	EA	$ 1,071.00
Cellular Modem, 4G, 2-Port	50-99	EA	$ 1,071.00
Cellular Modem, 4G, 2-Port	100-499	EA	$ 1,071.00
Cellular Modem, 4G, 2-Port	500 or more	EA	$ 1,071.00
Cellular Modem, 4G, 4-Port	1-49	EA	$ 1,717.00
Cellular Modem, 4G, 4-Port	50-99	EA	$ 1,717.00
Cellular Modem, 4G, 4-Port	100-499	EA	$ 1,717.00
Cellular Modem, 4G, 4-Port	500 or more	EA	$ 1,717.00
TS, Managed Field Ethernet Switch, Layer 2, Copper	1-49	EA	$ 1,200.00
TS, Managed Field Ethernet Switch, Layer 2, Copper	50-99	EA	$ 1,200.00
TS, Managed Field Ethernet Switch, Layer 2, Copper	100-499	EA	$ 1,200.00
TS, Managed Field Ethernet Switch, Layer 2, Copper	500 or more	EA	$ 1,200.00

STATE OF MICHIGAN

Contract No. 190000001522
Central Signal Control System
SCHEDULE E
Service Level Agreement

1. **Definitions.** For purposes of this Schedule, the following terms have the meanings set forth below. All initial capitalized terms in this Schedule that are not defined in this **Section 1** shall have the respective meanings given to them in the Contract.

"**Actual Uptime**" means the total minutes in the Service Period that the Hosted Services are Available.

"**Availability**" has the meaning set forth in **Section 4.1**.

"**Availability Requirement**" has the meaning set forth in **Section 4.1**.

"**Available**" has the meaning set forth in **Section 4.1**.

"**Contractor Service Manager**" has the meaning set forth in **Section 3.1**.

"**Corrective Action Plan**" has the meaning set forth in **Section 5.6**.

"**Critical Service Error**" has the meaning set forth in **Section 5.4(a)**.

"**Exceptions**" has the meaning set forth in **Section 4.2**.

"**Force Majeure Event**" has the meaning set forth in **Section 6.1**.

"**High Service Error**" has the meaning set forth in **Section 5.4(a)**.

"**Hosted Services**" has the meaning set forth in **Section 2.1(a)**.

"**Low Service Error**" has the meaning set forth in **Section 5.4(a)**.

"**Medium Service Error**" has the meaning set forth in **Section 5.4(a)**.

"**Resolve**" has the meaning set forth in **Section 5.4(b)**.

"**Scheduled Downtime**" has the meaning set forth in **Section 4.3**.

"**Scheduled Uptime**" means the total minutes in the Service Period.

"**Service Availability Credits**" has the meaning set forth in **Section 4.6(a)**.

"**Service Error**" means any failure of any Hosted Service to be Available or otherwise perform in accordance with this Schedule.

"**Service Level Credits**" has the meaning set forth in **Section 5.5**.

"**Service Level Failure**" means a failure to perform the Software Support Services fully in compliance with the Support Service Level Requirements.

"**Service Period**" has the meaning set forth in **Section 4.1**.

"**Software**" has the meaning set forth in the Contract.

"**Software Support Services**" has the meaning set forth in **Section 5**.

"**State Service Manager**" has the meaning set forth in **Section 3.2**.

"**State Systems**" means the information technology infrastructure, including the computers, software, databases, electronic systems (including database management systems) and networks, of the State or any of its designees.

"**Support Request**" has the meaning set forth in **Section 5.4(a)**.

"**Support Service Level Requirements**" has the meaning set forth in **Section 5.4**.

"**Term**" has the meaning set forth in the Contract.

2. **Services**.

2.1 Services. Throughout the Term, Contractor will, in accordance with all Contract Terms set forth in the Contract and this Schedule, provide to the State and its Authorized Users the following services:

(a) the hosting, management and operation of the Software and other services for remote electronic access and use by the State and its Authorized Users ("**Hosted Services**");

(b) the Software Support Services set forth in **Section 5** of this Schedule;

1. **Personnel**

1.1 Contractor Personnel for the Hosted Services. Contractor will appoint a Contractor employee to serve as a primary contact with respect to the Services who will have the authority to act on behalf of Contractor in matters pertaining to the receipt and processing of Support Requests and the Software Support Services (the "**Contractor Service Manager**"). The Contractor Service Manager will be considered Key Personnel under the Contract.

1.2 State Service Manager for the Hosted Services. The State will appoint and, in its reasonable discretion, replace, a State employee to serve as the primary contact with respect to the Services who will have the authority to act on behalf of the State in matters pertaining to the Software Support Services, including the submission and processing of Support Requests (the "**State Service Manager**").

2. **Service Availability and Service Availability Credits.**

2.1 Availability Requirement. Contractor will make the Hosted Services Available, as measured over the course of each calendar month during the Term and any additional periods during which Contractor does or is required to perform any Hosted Services (each such calendar month, a "**Service Period**"), at least 99.98% of the time, excluding only the time the Hosted Services

are not Available solely as a result of one or more Exceptions (the "**Availability Requirement**"). "**Available**" means the Hosted Services are available and operable for access and use by the State and its Authorized Users over the Internet in material conformity with the Contract. "**Availability**" has a correlative meaning. The Hosted Services are not considered Available in the event of a material performance degradation or inoperability of the Hosted Services, in whole or in part. The Availability Requirement will be calculated for the Service Period as follows: (Actual Uptime – Total Minutes in Service Period Hosted Services are not Available Due to an Exception) ÷ (Scheduled Uptime – Total Minutes in Service Period Hosted Services are not Available Due to an Exception) x 100 = Availability.

2.2 Exceptions. No period of Hosted Service degradation or inoperability will be included in calculating Availability to the extent that such downtime or degradation is due to any of the following ("**Exceptions**"):

(a) failures of the State's or its Authorized Users' internet connectivity;

(b) Scheduled Downtime as set forth in **Section 4.3**.

2.3 Scheduled Downtime. Contractor must notify the State at least twenty-four (24) hours in advance of all scheduled outages of the Hosted Services in whole or in part ("**Scheduled Downtime**"). All such scheduled outages will: (a) last no longer than five (5) hours; (b) be scheduled between the hours of 12:00 a.m. and 5:00 a.m., Eastern Time; and (c) occur no more frequently than once per week; provided that Contractor may request the State to approve extensions of Scheduled Downtime above five (5) hours, and such approval by the State may not be unreasonably withheld or delayed.

2.4 Software Response Time. Software response time, defined as the interval from the time the end user sends a transaction to the time a visual confirmation of transaction completion is received, must be less than two (2) seconds for 98% of all transactions. Unacceptable response times shall be considered to make the Software unavailable and will count against the Availability Requirement.

2.5 Service Availability Reports. Within thirty (30) days after the end of each Service Period, Contractor will provide to the State a report describing the Availability and other performance of the Hosted Services during that calendar month as compared to the Availability Requirement. The report must be in electronic or such other form as the State may approve in writing and shall include, at a minimum: (a) the actual performance of the Hosted Services relative to the Availability Requirement; and (b) if Hosted Service performance has failed in any respect to meet or exceed the Availability Requirement during the reporting period, a description in sufficient detail to inform the State of the cause of such failure and the corrective actions the Contractor has taken and will take to ensure that the Availability Requirement are fully met.

2.6 Remedies for Service Availability Failures.

(a) If the actual Availability of the Hosted Services is less than the Availability Requirement for any Service Period, such failure will constitute a Service Error for which Contractor will issue to the State the following credits on the fees payable for Hosted Services provided during the Service Period ("**Service Availability Credits**"):

Availability	Credit of Fees
≥99.98%	None
<99.98% but ≥99.0%	15%
<99.0% but ≥95.0%	50%
<95.0%	100%

(b) Any Service Availability Credits due under this **Section 4.6** will be applied in accordance with payment terms of the Contract.

(c) If the actual Availability of the Hosted Services is less than the Availability Requirement in any two (2) of four (4) consecutive Service Periods, then, in addition to all other remedies available to the State, the State may terminate the Contract on written notice to Contractor with no liability, obligation or penalty to the State by reason of such termination.

3. **Support and Maintenance Services**. Contractor will provide Hosted Service maintenance and support services (collectively, "**Software Support Services**") in accordance with the provisions of this **Section 5**. The Software Support Services are included in the Services, and Contractor may not assess any additional fees, costs or charges for such Software Support Services.

3.1 Support Service Responsibilities. Contractor will:

(a) correct all Service Errors in accordance with the Support Service Level Requirements, including by providing defect repair, programming corrections and remedial programming;

(b) provide unlimited telephone support 24 hours a day, seven days a week,

(c) provide unlimited online support 24 hours a day, seven days a week;

(d) provide online access to technical support bulletins and other user support information and forums, to the full extent Contractor makes such resources available to its other customers; and

(e) respond to and Resolve Support Requests as specified in this **Section 5**.

3.2 Service Monitoring and Management. Contractor will continuously monitor and manage the Hosted Services to optimize Availability that meets or exceeds the Availability Requirement. Such monitoring and management include:

(a) proactively monitoring on a twenty-four (24) hour by seven (7) day basis all Hosted Service functions, servers, firewall and other components of Hosted Service security;

(b) if such monitoring identifies, or Contractor otherwise becomes aware of, any circumstance that is reasonably likely to threaten the Availability of the Hosted Service, taking

all necessary and reasonable remedial measures to promptly eliminate such threat and ensure full Availability; and

(c) if Contractor receives knowledge that the Hosted Service or any Hosted Service function or component is not Available (including by written notice from the State pursuant to the procedures set forth herein):

(i) confirming (or disconfirming) the outage by a direct check of the associated facility or facilities;

(ii) if Contractor's facility check in accordance with clause (i) above confirms a Hosted Service outage in whole or in part: (A) notifying the State in writing pursuant to the procedures set forth herein that an outage has occurred, providing such details as may be available, including a Contractor trouble ticket number, if appropriate, and time of outage; and (B) working all problems causing and caused by the outage until they are Resolved as Critical Service Errors in accordance with the Support Request Classification set forth in **Section 5.4**, or, if determined to be an internet provider problem, open a trouble ticket with the internet provider; and

(iii) notifying the State that Contractor has fully corrected the outage and any related problems, along with any pertinent findings or action taken to close the trouble ticket.

3.3 Service Maintenance. Contractor will continuously maintain the Hosted Services to optimize Availability that meets or exceeds the Availability Requirement. Such maintenance services include providing to the State and its Authorized Users:

(a) all updates, bug fixes, enhancements, Maintenance Releases, New Versions and other improvements to the Hosted Services, including the Software, that Contractor provides at no additional charge to its other similarly situated customers; provided that Contractor shall consult with the State and is required to receive State approval prior to modifying or upgrading Hosted Services, including Maintenance Releases and New Versions of Software; and

(b) all such services and repairs as are required to maintain the Hosted Services or are ancillary, necessary or otherwise related to the State's or its Authorized Users' access to or use of the Hosted Services, so that the Hosted Services operate properly in accordance with the Contract and this Schedule.

3.4 Support Service Level Requirements. Contractor will correct all Service Errors and respond to and Resolve all Support Requests in accordance with the required times and other Contract Terms set forth in this **Section 5.4** ("**Support Service Level Requirements**"), and the Contract.

(a) Support Requests. The State will classify its requests for Service Error corrections in accordance with the descriptions set forth in the chart below (each a "**Support Request**"). The State Service Manager will notify Contractor of Support Requests by email, telephone or such other means as the parties may hereafter agree to in writing.

Support Request Classification	Description: Any Service Error Comprising or Causing any of the Following Events or Effects
Critical Service Error	• Issue affecting entire system or single critical production function; • System down or operating in materially degraded state; • Data integrity at risk; • Declared a Critical Support Request by the State; or • Widespread access interruptions.
High Service Error	• Primary component failure that materially impairs its performance; or • Data entry or access is materially impaired on a limited basis.
Medium Service Error	• Hosted Service is operating with minor issues that can be addressed with an acceptable (as determined by the State) temporary work around.
Low Service Error	• Request for assistance, information, or services that are routine in nature.

(b) Response and Resolution Time Service Levels. Response and Resolution times will be measured from the time Contractor receives a Support Request until the respective times Contractor has (i) responded to, in the case of response time and (ii) Resolved such Support Request, in the case of Resolution time. "**Resolve**" (including "**Resolved**", "**Resolution**" and correlative capitalized terms) means that, as to any Service Error, Contractor has provided the State the corresponding Service Error correction and the State has confirmed such correction and its acceptance thereof. Contractor will respond to and Resolve all Service Errors within the following times based on the severity of the Service Error:

Support Request Classification	Service Level Metric (Required Response Time)	Service Level Metric (Required Resolution Time)	Service Level Credits (For Failure to Respond to any Support Request Within the Corresponding Response Time)	Service Level Credits (For Failure to Resolve any Support Request Within the Corresponding Required Resolution Time)
Critical Service Error	One (1) hour	Three (3) hours	Five percent (5%) of the Fees for the month in which the initial Service Level Failure begins and five percent (5%) of such monthly Fees for each additional hour or portion thereof that the corresponding Service Error is not responded to within the required response time.	Five percent (5%) of the Fees for the month in which the initial Service Level Failure begins and five percent (5%) of such monthly Fees for the first additional hour or portion thereof that the corresponding Service Error remains un-Resolved, which amount will thereafter double for each additional one-hour increment.
High Service Error	One (1) hour	Four (4) hours	Three percent (3%) of the Fees for the month in which the initial Service Level Failure begins and three	Three percent (3%) of the Fees for the month in which the initial Service Level Failure begins and three

			percent (3%) of such monthly Fees for each additional hour or portion thereof that the corresponding Service Error is not responded to within the required response time.	percent (3%) of such monthly Fees for the first additional hour or portion thereof that the corresponding Service Error remains un-Resolved, which amount will thereafter double for each additional one-hour increment.
Medium Service Error	Three (3) hours	Two (2) Business Days	N/A	N/A
Low Service Error	Three (3) hours	Five (5) Business Days	N/A	N/A

(c) Escalation. With respect to any Critical Service Error Support Request, until such Support Request is Resolved, Contractor will escalate that Support Request within sixty (60) minutes of the receipt of such Support Request by the appropriate Contractor support personnel, including, as applicable, the Contractor Service Manager and Contractor's management or engineering personnel, as appropriate.

3.5 Support Service Level Credits. Failure to achieve any of the Support Service Level Requirements for Critical and High Service Errors will constitute a Service Level Failure for which Contractor will issue to the State the corresponding service credits set forth in **Section 5.4(b)** ("**Service Level Credits**") in accordance with payment terms set forth in the Contract.

3.6 Corrective Action Plan. If two or more Critical Service Errors occur in any thirty (30) day period during (a) the Term or (b) any additional periods during which Contractor does or is required to perform any Hosted Services, Contractor will promptly investigate the root causes of these Service Errors and provide to the State within five (5) Business Days of its receipt of notice of the second such Support Request an analysis of such root causes and a proposed written corrective action plan for the State's review, comment and approval, which, subject to and upon the State's written approval, shall be a part of, and by this reference is incorporated in, the Contract as the parties' corrective action plan (the "**Corrective Action Plan**"). The Corrective Action Plan must include, at a minimum: (a) Contractor's commitment to the State to devote the appropriate time, skilled personnel, systems support and equipment and other resources necessary to Resolve and prevent any further occurrences of the Service Errors giving rise to such Support Requests; (b) a strategy for developing any programming, software updates, fixes, patches, etc. necessary to remedy, and prevent any further occurrences of, such Service Errors; and (c) time frames for

implementing the Corrective Action Plan. There will be no additional charge for Contractor's preparation or implementation of the Corrective Action Plan in the time frames and manner set forth therein.

4. **Force Majeure.**

4.1 Force Majeure Events. Subject to **Section 6.3**, neither party will be liable or responsible to the other party, or be deemed to have defaulted under or breached the Contract, for any failure or delay in fulfilling or performing any term hereof, when and to the extent such failure or delay is caused by: acts of God, flood, fire or explosion, war, terrorism, invasion, riot or other civil unrest, embargoes or blockades in effect on or after the date of the Contract, national or regional emergency, or any passage of law or governmental order, rule, regulation or direction, or any action taken by a governmental or public authority, including imposing an embargo, export or import restriction, quota or other restriction or prohibition (each of the foregoing, a "**Force Majeure Event**"), in each case provided that: (a) such event is outside the reasonable control of the affected party; (b) the affected party gives prompt written notice to the other party, stating the period of time the occurrence is expected to continue; (c) the affected party uses diligent efforts to end the failure or delay and minimize the effects of such Force Majeure Event.

4.2 State Performance; Termination. In the event of a Force Majeure Event affecting Contractor's performance under the Contract, the State may suspend its performance hereunder until such time as Contractor resumes performance. The State may terminate the Contract by written notice to Contractor if a Force Majeure Event affecting Contractor's performance hereunder continues substantially uninterrupted for a period of five (5) Business Days or more. Unless the State terminates the Contract pursuant to the preceding sentence, any date specifically designated for Contractor's performance under the Contract will automatically be extended for a period up to the duration of the Force Majeure Event.

4.3 Exclusions; Non-suspended Obligations. Notwithstanding the foregoing or any other provisions of the Contract or this Schedule:

(a) in no event will any of the following be considered a Force Majeure Event:

(i) shutdowns, disruptions or malfunctions of Contractor Systems or any of Contractor's telecommunication or internet services other than as a result of general and widespread internet or telecommunications failures that are not limited to the Contractor Systems; or

(ii) the delay or failure of any Contractor Personnel to perform any obligation of Contractor hereunder unless such delay or failure to perform is itself by reason of a Force Majeure Event.

(b) no Force Majeure Event modifies or excuses Contractor's obligations under **Sections 22** (State Data), **23** (Confidentiality), or **28** (Indemnification) of the Contract, **Section 7** (Disaster Recovery and Backup) of this Schedule, the Availability Requirement defined in this Schedule, or any security requirements under the Contract, the Statement of Work, or applicable Schedule.

5. **Disaster Recovery and Backup**. Throughout the Term and at all times in connection with its actual or required performance of the Services, Contractor will:

(a) maintain and operate a backup and disaster recovery plan to achieve a Recovery Point Objective (RPO) of 2 hours, and a Recovery Time Objective (RTO) of 2 hours (the "**DR Plan**") and implement such DR Plan in the event of any unplanned interruption of the Hosted Services. Contractor's current DR Plan, revision history, and any reports or summaries relating to past testing of or pursuant to the DR Plan are attached as **Schedule G**. Contractor will actively test, review and update the DR Plan on at least an annual basis using industry best practices as guidance. Contractor will provide the State with copies of all such updates to the Plan within fifteen (15) days of its adoption by Contractor. All updates to the DR Plan are subject to the requirements of this **Section 7**; and

(b) provide the State with copies of all reports resulting from any testing of or pursuant to the DR Plan promptly after Contractor's receipt or preparation. If Contractor fails to reinstate all material Hosted Services within the periods of time set forth in the DR Plan, the State may, in addition to any other remedies available under this Contract, in its sole discretion, immediately terminate this Contract as a non-curable default.

6. **Firmware Revisions**. Throughout the Term and at all times in connection with its actual or required performance of the Services, Contractor will:

(a) Provide appropriate module development, software development, testing, acceptance, and central software deployment required for the fully functional integration up to two controller firmware upgrades per year. At the owner's request, the Contractor must:

(i) Complete all required central software changes required to integrate a new controller firmware version within 60 days of written request from the owner.

(ii) Coordinate with controller manufacturer as-needed to fully integrate all firmware functionality into the central software.

(iii) Provide a virtual testing environment through which MDOT can connect a controller with desired firmware to test functionality.

STATE OF MICHIGAN

Contract No. 190000001522
Central Signal Control System
SCHEDULE F
Data Security Requirements

1. **Definitions.** For purposes of this Schedule, the following terms have the meanings set forth below. All initial capitalized terms in this Schedule that are not defined in this **Section 1** shall have the respective meanings given to them in the Contract.

"**Contractor Security Officer**" has the meaning set forth in **Section 2** of this Schedule.

"**Contractor Systems**" has the meaning set forth in **Section 5** of this Schedule.

"FedRAMP" means the Federal Risk and Authorization Management Program, which is a federally approved risk management program that provides a standardized approach for assessing and monitoring the security of cloud products and services.

"**FISMA**" means The Federal Information Security Modernization Act of 2014.

"**NIST**" means the National Institute of Standards and Technology.

"**PSP**" means the State's IT Policies, Standards and Procedures.

"**SSAE**" means Statement on Standards for Attestation Engagements.

2. Contractor will appoint a Contractor employee to respond to the State's inquiries regarding the security of the Contractor Systems who has sufficient knowledge of the security of the Contractor Systems and the authority to act on behalf of Contractor in matters pertaining thereto ("**Contractor Security Officer**").

3. **Protection of the State's Confidential Information**. Throughout the Term and at all times in connection with its actual or required performance of the Services, Contractor will:

3.1 the Software must be hosted in a government cloud solution that maintains FedRAMP authorization, and Contractor must maintain an annual SSAE 16 SOC 2 Type 2 audit for the Hosted Services throughout the Term based on NIST SP 800-53 moderate controls.

3.2 ensure that the Software is securely hosted, supported, administered, and accessed in a data center that resides in the continental United States, and minimally meets Uptime Institute Tier 3 standards (www.uptimeinstitute.com), or its equivalent;

3.3 maintain and enforce an information security program including safety and physical and technical security policies and procedures with respect to its Processing of the State's Confidential Information that comply with the requirements of the State's data security policies as set forth in the Contract**,** and must, at a minimum, remain compliant with FISMA and the

NIST Special Publication 800.53 (most recent version) MOD Controls using minimum control values as established in the applicable PSP;

3.4 provide technical and organizational safeguards against accidental, unlawful or unauthorized access to or use, destruction, loss, alteration, disclosure, transfer, commingling or processing of such information that ensure a level of security appropriate to the risks presented by the processing of the State's Confidential Information and the nature of such Confidential Information, consistent with best industry practice and standards;

3.5 take all reasonable measures to:

A. secure and defend all locations, equipment, systems and other materials and facilities employed in connection with the Services against "hackers" and others who may seek, without authorization, to disrupt, damage, modify, access or otherwise use Contractor Systems or the information found therein; and

B. prevent (i) the State and its Authorized Users from having access to the data of other customers or such other customer's users of the Services; (ii) the State's Confidential Information from being commingled with or contaminated by the data of other customers or their users of the Services; and (iii) unauthorized access to any of the State's Confidential Information;

3.6 ensure that State Data is encrypted in transit and at rest using FIPS 140-2 certified modules with AES 128 bit or higher encryption;

3.7 ensure the Hosted Services support Identity Federation/Single Sign-on (SSO) capabilities using Security Assertion Markup Language (SAML) or comparable mechanisms;

3.8 ensure the Hosted Service requires FIPS/NIST compliant multi-factor authentication for privileged/administrative and other identified access; and

3.9 assist the State, at no additional cost, with development and completion of a system security plan and risk assessment using the State's automated governance, risk and compliance (GRC) platform.

4. **Unauthorized Access**. Contractor may not access, and shall not permit any access to, State systems, in whole or in part, whether through Contractor's Systems or otherwise, without the State's express prior written authorization. Such authorization may be revoked by the State in writing at any time in its sole discretion. Any access to State systems must be solely in accordance with the Contract and this Schedule, and in no case exceed the scope of the State's authorization pursuant to this **Section 4**. All State-authorized connectivity or attempted connectivity to State systems shall be only through the State's security gateways and firewalls and in compliance with the State's security policies set forth in the Contract as the same may be supplemented or amended by the State and provided to Contractor from time to time.

5. **Contractor Systems**. Contractor will be solely responsible for the information technology infrastructure, including all computers, software, databases, electronic systems (including database management systems) and networks used by or for Contractor in connection with the Services ("**Contractor Systems**") and shall prevent unauthorized access to State systems through the Contractor Systems.

6. **Security Audits**. During the Term, Contractor will:

6.1 maintain complete and accurate records relating to its data protection practices, IT security controls, and the security logs of any of the State's Confidential Information, including any backup, disaster recovery or other policies, practices or procedures relating to the State's Confidential Information and any other information relevant to its compliance with this Schedule;

6.2 upon the State's request, make all such records, appropriate personnel and relevant materials available during normal business hours for inspection and audit by the State or an independent data security expert that is reasonably acceptable to Contractor, provided that the State: (i) gives Contractor at least five (5) Business Days prior notice of any such audit; (ii) undertakes such audit no more than once per calendar year, except for good cause shown; and (iii) conducts or causes to be conducted such audit in a manner designed to minimize disruption of Contractor's normal business operations and that complies with the Contract Terms of all data confidentiality, ownership, privacy, security and restricted use provisions of the Contract. The State may, but is not obligated to, perform such security audits, which shall, at the State's option and request, include penetration and security tests, of any and all Contractor Systems and their housing facilities and operating environments; and

6.3 if requested by the State, provide a copy of Contractor's SSAE 16 SOC 2 Type 2 audit report based on NIST 800-53 MOD controls using minimum control values as established in the applicable SOM PSP's, to the State within thirty (30) days after Contractor's receipt of such report. Any such audit reports will be recognized as Contractor's Confidential Information.

7. **Nonexclusive Remedy for Security Breach**. Any failure of the Services to meet the requirements of this Schedule with respect to the security of any State Data or other Confidential Information of the State, including any related backup, disaster recovery or other policies, practices or procedures, is a material breach of the Contract for which the State, at its option, may terminate the Contract immediately upon written notice to Contractor without any notice or cure period, and Contractor must promptly reimburse to the State any Fees prepaid by the State prorated to the date of such termination.

STATE OF MICHIGAN

Contract No. 190000001522
Central Signal Control System
SCHEDULE G
Disaster Recovery Plan

Centracs® ATMS

Disaster Recovery & Backup Plan

1250 N. Tustin Avenue ◊ Anaheim, California 92807 ◊ Ph: (714) 630-3700 ◊ Fax: (714) 630-6349

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ECONOLITE SYSTEMS

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	05/20/2019	Initial Centracs® Disaster Recovery & Backup Plan Draft

Table of Contents

1. Introduction

This document will identify several typical Centracs® Advanced Traffic Management System (ATMS) installation architectures and then describe the steps and estimated time necessary for each to be recovered from a complete system failure. This approach allows for an agency to evaluate each architecture and the recovery steps needed to determine which configuration best fits their recovery needs. During the evaluation the reader should consider the typical goals associated with a disaster recovery plan

- Minimize interruptions to normal operations
- Limit the extent of disruption and damage
- Minimize financial impact of the interruption
- Establish an alternative means of operation in advance
- Train personnel with emergency and recovery procedures
- Provide a smooth and rapid restoration of service

We note that this document is not intended to be a support or troubleshooting document. Bug reporting, system configuration issues, user questions and any other issues such as a full hard drive, or a workstation unable to connect should be handled through the regular local IT help desk or Centracs support channels. This document assumes a complete system failure necessitating the replacement and recovery of entire system components.

2. Contact and Support Contract Information

Econolite encourages every Agency to maintain a Centracs system Software Maintenance Agreement (SMA) which includes regular software updates and access to our support team. For issues with Centracs functionality and keeping up to date with the latest patches and enhancements, we recommend keeping the Centracs support email and toll-free number handy.

Major service interruptions tend to require additional support outside of the scope of the Centracs SMA. While Econolite often provides server hardware during the course of a Centracs installation, the ownership and warranty is transferred to the Agency. Unless otherwise contracted as part of the project, the operation and maintenance of that hardware becomes the responsibility of the Agency. If a server has failed, then it is expected that local IT personnel will contact the warranty support channels for that server. Depending on the nature of the failure, the Centracs support team may become involved to ensure resumption of Centracs operation on the repaired hardware.

Similarly, existing Agency infrastructure such as the office LAN or field network are utilized by the Centracs system and outside of the scope of the Centracs support agreement.

Econolite recommends the Agency prepare a list of contacts and support contract information as part of their disaster recovery planning. This list should be reviewed at least annually to ensure that warranty and support for critical components is maintained. An example list of contacts and contracts could include:

- Emergency service contacts (fire, medical, etc.)
- Local Centracs users and their contact info
- After hours contacts
- Local IT contacts
- Management and Administrative contacts
- Centracs support contacts. SMA contract dates
- Server support/warranty contacts and contract dates/info

- Network support contacts and contract dates/info
- Ancillary device (UPS, printer, etc.) support contacts and contract info

3. Components of a Centracs System

The Centracs ATMS consists of several software subcomponents that operate together to provide the complete system. These subcomponents can all be installed on a single server or spread across multiple servers depending on the size and redundancy needs of the Agency. All of the Centracs software components can be installed on a Windows Server operating system operating on a physical or virtual server.

3.1 Centracs Core

This software component runs as a Windows Service which:

- Provides services to Centracs Clients including
  - User authentication
  - User alerting (on-screen, email, text messages
- Brokers access to the Centracs database tables
- Coordinates communication to field devices though Centracs Device Manager(s). This includes monitoring, configuring, and controlling field devices.
- Manages center-to-center communications with 3rd party systems (example: BlueTOAD, Genetec CCTV software, IEN interface)

Typically, there is one Centracs Core per Centracs installation, the exception being the fail-over Core service discussed later.

Failure of the Centracs Core service or the server that it operates on will render the Centracs ATMS system mostly inoperable. Clients will be unable to log into the system and existing client connections will terminate. Communication to the field devices will cease and, along with that, any monitoring and control. Connections to 3rd party systems would be terminated.

It would be possible to utilize Microsoft SQL queries to access the Centracs database tables and Reports could be run utilizing Microsoft SQL Reporting Services tools, but such access would only be available to those experienced in Microsoft SQL tools.

No operational data is collected on the Centracs Core service computer. Small configuration files exist to point the Centracs Core service to the Microsoft SQL Server location. Program execution log files are stored locally which provide information for support purposes only and are not necessary for normal system operation.

3.2 Centracs Device Manager

This software component runs as a Windows Service. There can be multiple Centracs Device Managers in a Centracs system, each operating on their own server or virtual machine. Generally speaking, there is one Centracs Device Manager per 1,000 intersection controllers. In some configurations there is no need for a Centracs Device Manager, as modules such as Centracs MMS or Centracs DCMS, if utilized on their own, do not utilize signal controller communications. This service provides the Centracs Core with functionality to monitor and control intersection signal controllers.

Failure of the Centracs Device Manager service or the server that it operates on will cause the devices being monitored or controlled by this service to show as offline within Centracs. Centracs users can continue to utilize Centracs and monitor and control devices operated by other device managers (if any).

No operational data is collected on the Centracs Device Manager service computer. Small configuration files exist to configure the Centracs Device Manager service listening ports. Program execution log files are stored locally which provide information for support purposes only and are not necessary for normal

system operation.

3.3 Centracs Client

This software runs as a typical Windows application on individual client workstations. There is no restriction to the number of Centracs Clients that can be utilized at an Agency. It is also fairly common that the Centracs Client application is installed on the Centracs Core server for access by support personnel. This application provides the user access and Graphical User Interface (GUI) for the end user to monitor, control, analyze data, generate reports, and configure the Centracs ATMS system.
Failure of the Centracs Client or the workstation that it operates on only impacts that particular user.
No operational data is collected on the Centracs Client computer. Program execution log files are stored locally which provide information for support purposes only and are not necessary for normal system operation.

3.4 Centracs Map Server

This software component runs as a Windows Service and is necessary only if the Agency has no local Geographic Information System (GIS) access to a Web Map Service (WMS) or does not utilize a web-based mapping service such as Bing Maps or OpenStreetMap. This service will provide a locally hosted equivalent of a tiling map services (like Bing Maps or OpenStreetMap), providing basic map rendering from local map data.
Failure of the Centracs Map Server service or its server will result in the Centracs Client being unable to display the background map. Monitoring and control of signals, reporting, data analysis and other Centracs functionality will continue to operate but without the map visual.
No operational data is collected on the Map Server. A one-time load of local map data is performed at system installation, with possible yearly updates of the map data.

3.5 Microsoft SQL Server

The Centracs Core service utilizes a Microsoft SQL Server instance to store all of its configuration and log data. During the Centracs Core service installation process the databases ‘Core’ and ‘Logs’ (default names but can be custom names) are created on the identified SQL instance. Generally speaking, the Core database reaches a peak size after initial system configuration and increases only slightly in size over time, for example, when adding a new user or a new signal to the system. The Logs database however will grow over time as the system collects traffic information from the field devices.
Failure of the Microsoft SQL Server will render the Centracs ATMS completely inoperable, as all operational data stored on the Microsoft SQL server.

3.6 Microsoft SQL Reporting Services

Centracs reports are defined in Microsoft SQL Reporting Services format and utilize a Microsoft SQL Reporting Services instance to execute and display report output. During the Centracs installation the report definitions and database access files are loaded onto the SQL Reporting Services server. The reports operate by accessing the Microsoft SQL Server Core and Logs database and display the report output within the Centracs Client application.

In the event the Microsoft SQL Reporting Services fails the Centracs ATMS will continue to operate with only the reporting functionality being unavailable.

3.7 Centracs Core High Availability Server

This is a secondary instance of the Centracs Core Service which normally operates in a stand-by state. In the event of a failure of the primary Centracs Core service this service will take over and continue to provide operations to Centracs Clients and signal monitoring and control.
Failure of this component will not affect overall system operation unless this component has previously taken over because of a failure of the primary Centracs Core Service.

4. Backups

A critical part of any recovery plan is the need for system data backups. Without backups the recovery plan consists of nothing more than “reinstall and reconfigure everything from scratch”. For a Centracs ATMS system, it is, at minimum, necessary to regularly backup the SQL Core and Logs databases. For the purposes of this document, we assume that a daily full backup of Core and Logs databases is being performed and that backup set is available for a system recovery.
While this is a recovery plan, it is important to emphasize that multiple backups stored in multiple locations should be considered in disaster preparedness planning. Backups stored on the same hard drive as the SQL database files are of no use should the hard drive fail. Backup tapes/disks stored in the same data center as the server are of no use if the data center catches fire.

5. Server and Software Requirements

Please refer to *Section 10 - Appendix Centracs Hardware Specifications* for an overview of typical hardware/software configurations and the specifications for operating system and database application. If replacement, or standby hardware, is to be purchased then it will need to meet these requirements.

6. Centracs Support Availability

The level of support available as part of the standard warranty and SMA package is Monday to Friday during regular business hours and is generally handled on a first-come-first-serve basis, but consideration is given to the severity of the issue.
If the Agency has a requirement for a recovery timeframe that is measured in hours on a 24/7 basis, we train local resources in the necessary Centracs technologies to be able to perform the disaster recovery process. Alternatively, and/or in combination, the Agency may opt to negotiate a support agreement with Econolite to provide prioritized and/or after-hours support.

7. Typical Configurations and Recovery – Single Server System

In this scenario we have a small Agency with a small number of signal controllers (less than 50) with all Centracs ATMS subcomponents, Microsoft SQL Server, and Microsoft SQL Reporting Services all installed onto a single server running Windows Server operating system.
It is assumed here that the typical redundancies are built into the server. Even in the most basic of configurations we recommend redundant power supplies with UPS backup, drive storage in a RAID configuration, use of ECC RAM, operation in a climate-controlled environment and the like to provide for a reliable computing base. With such a configuration, individual component failure is unlikely to

result in overall system failure. Rather than being in a situation of disaster recovery, the Centracs ATMS can continue to operate while, for example, a failed secondary power supply, is replaced.

7.1 Disaster Scenario:

Here we assume the server hardware has completely failed. All system subcomponents are offline.

7.2 Recovery Process:

The Agency will need to contact server hardware support or their computer supplier to repair or replace the server. Once the new/repaired server is operational again the Agency IT will restore/reinstall Microsoft Windows Server operating system, SQL Server and network functionality. The Centracs support can then be contacted to reinstall Centracs subcomponents, restore the SQL Core and Logs backups and return the system to an operational state.

7.3 Time Estimate for Recovery:

- Repair or replacement of the server is likely days to weeks depending on the level of service purchased and availably of components.
- Server installation and recovery of operating system, SQL Server, and networking is likely 1 to 2 days. Actual effort may only be a few hours, but it may take time to schedule an IT resource.
- Reinstallation of Centracs and recovery of SQL Core and Logs backups is likely 1 to 2 days. Again, actual effort is only a few hours but scheduling practicalities may introduce some delays.

7.4 Mitigation Strategies:

The biggest delay in this recovery process is with the replacement or repair of the failed server. The Agency can mitigate this by having a spare server stored in inventory or even in ‘stand by’ in the same computer rack. This would reduce the recovery time to the time it takes for an IT resource to perform their work and the Centracs support team to perform the Centracs installation and recovery.
Another option would be to increase the level of hardware service purchased with the server. Faster replacement options are often available and are likely less expensive than maintaining a spare server.

8. Typical Configurations and Recovery – Multi Server System

In this scenario we have a larger Agency (more than 50 traffic controllers) and have installed the Centracs ATMS and SQL server components across two or even three servers.
As in the previous scenario, we again assume the servers are properly equipped with the usual redundancies to handle single component failures.

8.1 Disaster Scenario:

Here we assume that one of servers has completely failed. In this case the system will degrade depending on which component(s) are now offline. See *Section 3* above for a description of how each component’s failure affects the overall system. A call to the Agency IT and Centracs support may be necessary to help identify which of the servers has failed.

8.2 Recovery Process:

The recovery process is essentially the same as in the Single Server System except that the system may be partially available during the recovery process. Multiple servers do present options to improve system availability during this time, however.

Working in coordination with the Agency IT and Centracs support, it may be possible to install the compromised subcomponents on the available working server. For example, in the case of a failed Device Manager server, the Centracs Device Manager Service could be installed on the Centracs Core server. Overall system functionality is recovered with the traffic signal controllers now online (but with reduced system performance). This may not always be possible though, for example, if the server hosting Microsoft SQL server were to fail, there may not be sufficient disk space to host the SQL databases on the remaining server(s). Components would be restored to their original locations once the server hardware is replaced/repaired.

8.3 Mitigation Strategies:

As with the Single Server scenario, the Agency may consider having spare hardware on hand or an increased level of support. Econolite has deployed a number of systems where a set of servers are on 'warm standby'. An identical set of server hardware, with operating system, SQL, and Centracs already installed, are powered up but services are disabled. In the event of a failure on the primary system the SQL Core and Logs databases are restored on the secondary hardware and the services enabled. System operation can be restored in under an hour.

Another option available in this scenario is to "over build" the servers. This way the servers are sufficiently equipped to take over the function of the failed server if necessary. As with the 'warm standby' option it would be possible to have a complete set of Centracs components installed but disabled on all the servers that make up the Centracs deployment. This should reduce the time to recovery, as a support person can skip the installation portion when putting the interim system online.

9. Microsoft SQL Server and Virtual Server Environments

As previously indicated, the Microsoft SQL Server subcomponent is the most critical of all the Centracs ATMS parts. The good news here is that Microsoft SQL Server has a long list of options for high availability and redundancies. Fully exercising these options can effectively eliminate downtime and accommodate significate equipment failures with little to no user-visible interruption of service. Describing all these options, their configuration, and execution of a disaster recovery process is outside the scope of this document.

This, however, does not come without a significant cost and administrative burden. It is often the case that the traffic department of an Agency cannot cover the cost of building such a system and they do not have the expertise to maintain the system. Typically, these systems are found within the Agency IT department's data center. Our experience is that Centracs ATMS is either deployed on dedicated servers and SQL instances as described in the first two scenarios above, or it is deployed within a larger IT infrastructure where it can utilize both the virtual machine and SQL services.

Here the Agency will need to coordinate their disaster recovery plan with that of the IT department's recovery plan. The traffic department will need to ensure that the IT department has properly categorized the Centracs ATMS services in terms of public safety implications and that they are prepared to participate in the recovery process (for example, the fire department system may have dependencies on the traffic system). It may be necessary that IT personnel be trained on the installation and administration of Centracs if response time requirements are short. Alternatively,

the traffic department may only desire that Centracs be hosted in the IT department, with no priority for immediate recovery.
Virtual machine environments also provide for redundancy, fail-over, and prompt disaster recovery. For example, if the physical server hosting the virtual machine running Centracs Core services fails, that virtual machine can be restarted on another physical server in seconds with almost no visible interruption in operation. Virtual machines can be backed up and later restored to accommodate faster recovery times.
As with the SQL Server environment, the virtual machine environment configuration and administration is typically handled by the Agency IT department and is outside the scope of this document. That same IT department likely already has a disaster recovery plan in place. The Agency should consider including additional requirements in their system procurement process to include the coordination between Econolite Centracs support and the Agency IT to ensure a smooth integration into the IT infrastructure and the inclusion of the Centracs ATMS into the Agency IT redundancy, backup and disaster recovery plans.

10. Appendix - Centracs Hardware Specifications (See Schedule J)

STATE OF MICHIGAN

Contract No. 190000001522
Central Signal Control System
SCHEDULE H
ACCEPTANCE TESTING

The parties agree as follows:

1. **Definitions.** For purposes of this Schedule, the following terms have the meanings set forth below. All initial capitalized terms in this Schedule that are not defined in this **Section 1** have the respective meanings given to them in the Contract.

"Acceptance" has the meaning set forth in **Section 3.5** of this Schedule.

"Acceptance Tests" means such tests as may be conducted in accordance with **Section 3** of this Schedule and the Statement of Work to determine whether the Solution meets the Requirements.

"Acceptance Test Plan" means Contractor's written plan outlining the Hardware and Solution Acceptance Testing schedule, procedures for logging defects and tracking corrections and re-testing status.

"Integration Testing" means Acceptance Tests performed on configured, customized, or modified Software as a whole to ensure full operability, integration, and compatibility among all elements of the Solution.

"Defect" means any failure or failures of the Software or Hardware to conform to the Requirements, and any applicable specifications set forth in the Documentation.

"SAT" means Solution Acceptance Testing.

"SUITE" means the State Unified Information Technology Environment, which was designed and implemented to standardize methodologies, processes, procedures, training, and tools for project management and systems development lifecycle management.

"Test Data" means Contractor's or the State's test data and testing scripts for use during Acceptance Testing.

"Test Environment" means the operating environment created by Contractor for purposes of UAT.

"Testing Period" has the meaning set forth in **Section 3** of this Schedule.

"Test Results" means the results Contractor or the State expects to be achieved by processing the Test Data using the Software.

"UAT" means User Acceptance Testing.

"**UAT Plan**" means Contractor's written plan outlining the UAT schedule, procedures for logging Defects and tracking corrections and re-testing status.

2. **Parties Obligations for Acceptance Testing**.

2.1 Contractor UAT Obligations. Contractor will complete the following tasks as part of UAT:

A. Install, configure and deploy the Software into the Test Environment;

B. Install, configure and deploy a hardware mockup, to include but not be limited to CUs (one Siemens and one Econolite) and MMU, necessary to test the full functionality of the Software, in accordance with the Requirements;

C. Create and provide to the State, sufficient Test Data and Test Results to adequately test the Software, including testing of any Hardware for purposes of Integration Testing;

D. Review any State-created Test Data and provide necessary feedback to the State;

E. Assist the State with completing any necessary SUITE documentation;

F. Conduct confirmation testing to test each combination of device, make, model, and firmware version for compatibility with the CSCS software. Confirmation tests must be performed and documented prior to any installation of equipment in the field.

G. Communicate to the State that the Testing Environment is ready for use prior to initiation of Acceptance Tests;

H. Create a written UAT Plan;

I. Train State staff on how to perform Acceptance Tests using the UAT Plan.

J. Correct Defects in Test Results in accordance with **Section 3** of this Schedule, which are identified by Contractor or the State during the testing Period;

K. Conduct regular status meetings during UAT to assess Test Data and Test Results; and

L. Provide a tracking system for Contractor and the State to log Defects and track corrections and re-testing status.

2.2 State UAT Obligations: The State will complete the following tasks as part of UAT:

A. Create its own Test Data for use in UAT;

B. Develop and add approved tests to the UAT Plan;

C. Execute tests and report Test Results to Contractor in accordance with the UAT Plan;

D. Participate in regular testing status meetings;

E. Enter defects from Test Results into the Contractor-provided issue tracking system. Details to be entered include a minimum of: (i) detailed description of the problem (include screenshot(s) if applicable); and (ii) steps needed to reproduce the issue;

F. Perform regular retest of Contractor resolved defects based on mutually agreed schedule; and

G Work with Contractor to prioritize issues that arise during UAT.

2.3 Contractor SAT Obligations. Contractor will complete the following tasks as part of SAT:

A. Install, configure and deploy the Hardware in accordance with the Requirements;

B. Communicate to the State that the Hardware, CU, and Signalized Intersection Implementation are ready for use prior to initiation of Acceptance Tests;

C. Create a written Solution ATP;

D. Perform Local Device Assembly Test (LDAT), and Final System Test (FST) as defined in the approved Acceptance Test Plan, with State oversight;

E. Correct defects and failed tests in accordance with **Section 3** of this Schedule, which are identified by Contractor or the State during the testing Period;

F. Conduct regular status meetings during SAT to assess testing progress and results; and

G. Provide a tracking system for Contractor and the State to log Defects and track corrections and re-testing status.

2.4 State SAT Obligations: The State will complete the following tasks as part of SAT:

A. Develop and add approved tests to the Solution ATP;

B. Perform Bench Testing;

C. Witness LDAT and FST while being performed by the Contractor in accordance with the Solution ATP;

D. Participate in regular testing status meetings;

E. Enter defects from tests into the Contractor-provided issue tracking system for Contractor resolution;

F. Work with Contractor to prioritize issues that arise during SAT.

3. Acceptance Testing; Acceptance.

3.1 Software User Acceptance Testing (UAT).

A. Unless otherwise specified in the Statement of Work, upon installation of the Software, Acceptance Tests will be conducted as set forth in this **Section 3** to ensure the Software conforms to the requirements of this Contract, including the applicable Specifications and Documentation. The State may, but is not obligated, to perform its own pretest on the Software utilizing Contractor's Test Package. If the State does perform a pretest, and Contractor's Test Package does not successfully pass the Test Data or Test Estimate scripts as described by Contractor, the State, at its discretion, is not obligated to move into the formal Acceptance Tests set forth in this **Section 3**. The State may elect to send Contractor's Test Package back to Contractor to correct any problems encountered with the Test Data or Test Estimates.

B. All Acceptance Tests will take place at the designated Site(s) in the Operating Environment described in the Statement of Work, commence on the Business Day following installation of the Software and be conducted diligently for up to thirty (30) Business Days, or such other period as may be set forth in the Statement of Work (the "**Testing Period**"). Acceptance Tests will be conducted by the party responsible as set forth in the Statement of Work or, if the Statement of Work does not specify, the State, provided that:

(i) for Acceptance Tests conducted by the State, if requested by the State, Contractor will make suitable Contractor Personnel available to observe or participate in such Acceptance Tests; and

(ii) for Acceptance Tests conducted by Contractor, the State has the right to observe or participate in all or any part of such Acceptance Tests.

Contractor is solely responsible for all costs and expenses related to Contractor's performance of, participation in, and observation of Acceptance Testing. Integration Testing is subject to all procedural and other Contract Terms.

C. Upon delivery and installation of any API, Configuration or Customization to the Software under the Statement of Work, additional Acceptance Tests will be performed on the modified Software as-a-whole to ensure full operability, integration, and compatibility among all elements of the Solution.

D. The State may suspend Acceptance Tests and the corresponding Testing Period by written notice to Contractor if the State discovers a material Non-Conformity in the tested Software or part or feature of the Software. In such event, Contractor will immediately, and in any case within ten (10) Business Days, correct such Non-Conformity, whereupon the Acceptance Tests and Testing Period will resume for the balance of the Testing Period.

3.2 Solution Acceptance Testing (SAT).

A.Contractor to develop a Solution Acceptance Test Plan ATP) for review and approval by MDOT. The ATP will serve as a guide to operationally test system hardware, software and integration at each Phase 1 intersection. The plan must include a detailed description of the tests to be conducted, the purpose of each test, the environment the test will be conducted, and the passing criteria.

B.Acceptance will include, at a minimum, the following tests:

(i) Bench Testing as defined in **Exhibit D** – CU Requirements.

(ii) Local Device Assembly Test (LDAT) to test each individual device once installed in the field and ready for integration with the CSCS software, as defined in **Exhibit D – CU Requirements**, **Exhibit E – Cellular Modem Requirements**, and **Exhibit F – Managed Field Ethernet Switch Requirements**. LDAT must be performed prior to final acceptance testing of the system.

(iii) Final System Test (FST) performed at an MDOT workstation and/or TOC following completion of LDAT, as defined in **Exhibit D – CU Requirements** and **Exhibit E – Cellular Modem Requirements**. FST is the last step in the ATP and serves as the basis for system acceptance. At a minimum, the FST will verify center to field communications, CSCS software functionality, and signalized intersection implementation. After successful FST, the burn-in period begins. For each device type, a test case will be developed with pass/fail criteria. All functional requirements in the test case must pass during the witness testing to grant final acceptance.

(iv) Burn-in Test will be conducted for a 60-day period to begin after acceptance of all Hardware, CU installs, and signalized intersection implementation. There may be no major failures, as defined in the ATP, during the burn-in period. If a major failure occurs, the burn-in period will be restarted. If a minor failure, as defined in the ATP, occurs, the burn-in period will be stopped and restarted after the minor failure is corrected.

3.3 Notices of Completion, Non-Conformities, and Acceptance. Within fifteen (15) Business Days following the completion of any Acceptance Tests, including any Integration Testing, the party responsible for conducting the tests will prepare and provide to the other party written notice of the completion of the tests. Such notice must include a report describing in reasonable detail the tests conducted and the results of such tests, including any uncorrected Non-Conformity in the tested Software.

A. If such notice is provided by either party and identifies any Non-Conformities, the parties' rights, remedies, and obligations will be as set forth in **Section 2** and **Section 3**.

B. If such notice is provided by the State, is signed by the State's Business Owner and Project Manager, and identifies no Non-Conformities, such notice constitutes the State's Acceptance of such Software.

C. If such notice is provided by Contractor and identifies no Non-Conformities, the State will have sixty (60) Business Days to use the Software in the Operating Environment and determine, in the exercise of its sole discretion, whether it is satisfied that the Software contains no Non-Conformities, on the completion of which the State will, as appropriate:

(i) notify Contractor in writing of Non-Conformities the State has observed in the Software and of the State's non-acceptance thereof, whereupon the parties' rights, remedies and obligations will be as set forth in **Section 2** and **Section 3**; or

(ii) provide Contractor with a written notice of its Acceptance of such Software, which must be signed by the State's Business Owner and Project Manager.

3.4 Failure of Acceptance Tests. If Acceptance Tests identify any Non-Conformities, Contractor, at Contractor's sole cost and expense, will remedy all such Non-Conformities and re-deliver the Software, in accordance with the requirements set forth in the Statement of Work. Redelivery will occur as promptly as commercially possible and, in any case, within thirty (30) Business Days following, as applicable, Contractor's:

A. completion of such Acceptance Tests, in the case of Acceptance Tests conducted by Contractor; or

B. receipt of the State's notice under **Section 3.3(a)** or **Section 3.3(c)(i)**, identifying any Non-Conformities.

3.5 Repeated Failure of Acceptance Tests. If Acceptance Tests identify any Non-Conformity in the Software after a second or subsequent delivery of the Software, or Contractor fails to re-deliver the Software on a timely basis, the State may, in its sole discretion, by written notice to Contractor:

A. continue the process set forth in this **Section 3**;

B. accept the Software as a nonconforming deliverable, in which case the Fees for such Software will be reduced equitably to reflect the value of the Software as received relative to the value of the Software had it conformed; or

C. deem the failure to be a non-curable material breach of this Contract and the Statement of Work and terminate this Contract for cause in accordance with **Section 25.1**.

3.6 Acceptance. Acceptance ("**Acceptance**") of the Software, Hardware, and Solution (subject, where applicable, to the State's right to Integration Testing) will occur on the date that is the earliest of the State's delivery of a notice accepting the Software, Hardware, and Solution under **Schedule H**.

STATE OF MICHIGAN

Contract No. 190000001522
Central Signal Control System
SCHEDULE I
Terms for On-Site Hardware

1. Definitions. All initial capitalized terms in this Schedule that are not defined herein shall have the respective meanings given to them in the Contract.

2. Hardware. Contractor must provide fully functioning Hardware that fully integrates with the Software.

3. Delivery. Contractor must deliver the Hardware to the locations designated by the State by the delivery date specified in the Statement of Work. Five days prior to the actual delivery date, Contractor must give written notice to the State specifying the precise delivery date and time. Contractor must pay all costs associated with replacing any item damaged in transit to the final destination. Contractor acknowledges that no item will be considered delivered on the delivery date if it is damaged or otherwise not ready for the State to begin its acceptance procedures. Contractor must, at a minimum, package the Hardware according to industry standards and include a packing slip with each shipment. Contractor must also arrange for any rigging and drayage necessary to deliver the Hardware. All costs associated with packaging, shipping, transportation, delivery and insurance are to be borne by Contractor.

4. Installation, Integration and Configuration.

A. Contractor must unpack, assemble, install, integrate, interconnect, and configure all the Hardware at the locations specified in the Statement of Work. Where necessary to complete installation, Contractor must provide all required moving and installation resources, including but not limited to personnel, packing material, and floor protection panels as necessary. After completing installation, Contractor must provide the State with written notification that the Hardware is ready for use.

B. Contractor must supply all materials required to complete the assembly, installation, integration, interconnection, and configuration of the Hardware at the locations specified in the Statement of Work so that they are ready for use and acceptance, including providing and setting up all required connections to the power supply and any other necessary cables and any other accessories or supplies.

C. Contractor must leave all work areas clean once installation is complete, which includes removing and disposing of all packing materials.

D. Unless otherwise provided for in the Pricing Schedule, all costs associated with the installation services described in this **Section 4** are to be borne by Contractor.

5. Documentation. Contractor must provide to the State all end-user documentation for the Hardware. The documentation, at a minimum, must include all the documentation available to consumers from the manufacturer of the Hardware about the technical specifications of the Hardware, installation requirements, and operating instructions, as well as details about the software programs with which the Hardware functions.

6. Acceptance. The following Section applies generally to the acceptance of Hardware but is subject to the more specific UAT Test Plan set forth in **Schedule G** if the Hardware being tested is part of the UAT process.

A. The Hardware is subject to inspection and acceptance by the State. As part of its acceptance process, the State may test any function of the Hardware to determine whether they meet the requirements set forth in the Statement of Work. If the Hardware does not meet the requirements set forth in the Statement of Work, the State may reject the Hardware or require that they be corrected at Contractor's sole cost and expense before accepting them.

B. Acceptance by the State does not relieve Contractor of its responsibility for defects in the Hardware or other failures to meet the requirements of the Statement of Work or of its support and maintenance obligations.

C. The procedure for acceptance will be as follows:

i. Contractor must notify the State in writing once the Hardware and CUs are ready for use, in accordance with **Section 4.a** above;

ii. the State and Contractor will perform acceptance procedures as defined in **Schedule H** (the "Acceptance Period"); and

iii. if the State provides notice of any deficiency during the Acceptance Period, Contractor must address the deficiency at no cost to the State as soon as possible and notify the State in writing once the work is complete, at which time the State will be entitled to re-inspect the Hardware and the Acceptance Period will start again.

7. Support and Warranty for Hardware.

A. Contractor will provide maintenance and support of the Hardware in accordance with the requirements set forth in the Service Level Agreement.

B. Contractor will provide manufacturer’s warranties regarding all Hardware or as otherwise provided for in the Contract.

8. Risk of Loss and Title. Until final acceptance, title and risk of loss or damage to Hardware remains with Contractor. Contractor is responsible for filing, processing, and collecting all damage claims. The State will record and report to Contractor any evidence of visible damage. If the State rejects the Hardware, Contractor must remove them from the premises within 10 calendar days after notification of rejection. The risk of loss of rejected or non-conforming Hardware remains with Contractor. Rejected Hardware not removed by Contractor within 10 calendar days will be deemed abandoned by Contractor, and the State will have the right to dispose of it as its own property. Contractor must reimburse the State for costs and expenses incurred in storing or effecting removal or disposition of rejected Hardware. Title passes to the State upon final acceptance of the Hardware.

Schedule J

Centracs®

Hardware Requirement Specifications

Centracs Hardware Requirements

This document is intended to provide hardware requirements for the Centracs® central system software package. Proposed system configurations, customers adding additional modules, and current installations exhibiting performance issues should be validated against this document to ensure best resulting system performance. The violation of these requirements can result in the derogation of system performance and in turn a poor user experience. As such, it is imperative that proper care is taken to ensure adequate hardware is used in each Centracs® deployment.

Due to the constantly changing nature of technology, and the ever growing Centracs® feature set, this document will be updated regularly to reflect the most current hardware and Centracs® configurations.

General Guidance

The single biggest bottleneck within the Centracs® system is the database. The single biggest performance gain will be realized by dedicating additional resources to the server the database is running on. This could take the form of additional RAM, faster processors, faster disks, and more disks (depending of the RAID configuration). Ideally, the database will be allotted a dedicated server, and one that is among the best of those available.

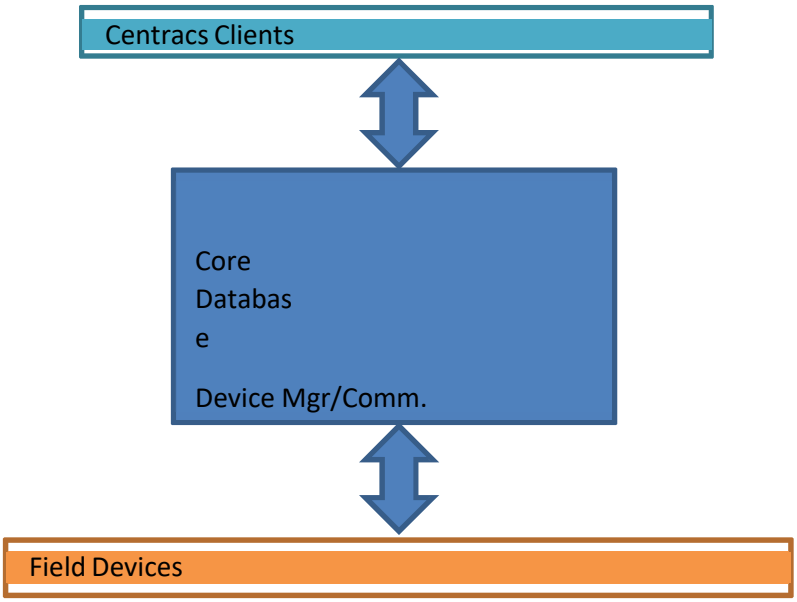
The historical guidance of adding comm. servers for every few hundred controllers is now considered to be unnecessary. Except in the case of serial communications, comm. server utilization is quite low relative to that of Core and the database. Generally, in order to realize performance gains hardware should be allocated to the middle tiers for Core and the database.

Hardware Requirements

The following hardware requirements are refined by Centracs® services and features in order to isolate the factors that contribute the most to bottom line performance.

Single Server

The single server option should be used sparingly, and only be considered in the most entry level situations.



Feature	Limit
Signals	50
Data Collection (DCMS Autoscopes)	120
DMS	150
MOE Signal Count	0
Centracs® Adaptive Instances	0
Historical Data Storage (months)	24

Hardware	Single Server
Virtualization	Not recommended

Demo Installations

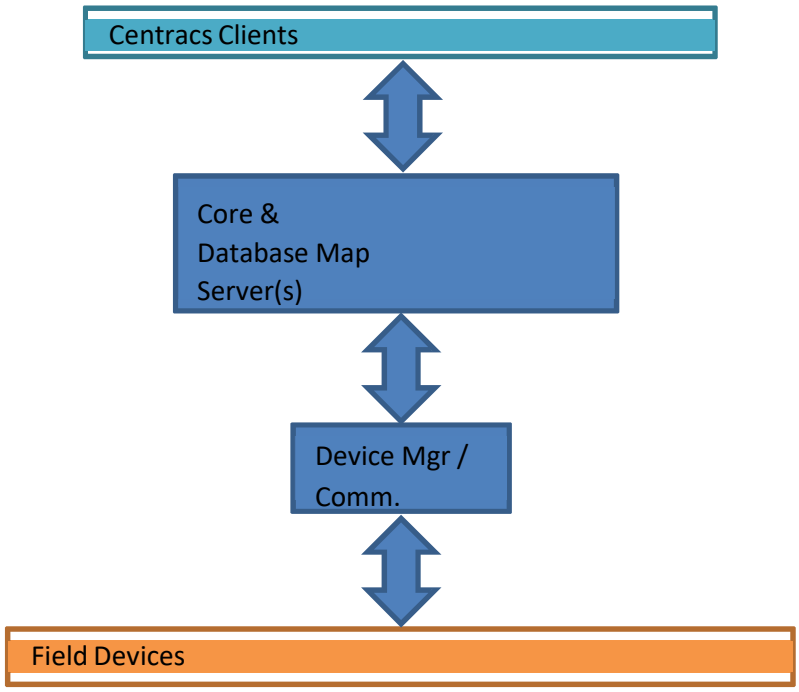
The single server installation is well suited to demo installations as it is compact and easily deployable. Most consumer A-tier level offerings will suffice for temporary customer use in a limited trial capacity. Extra care should be taken in selecting hardware when demonstrating resource intensive features, including Centracs® Adaptive and Signal MOE's.

As a rule of thumb, better hardware will help make for a better demo, as the user experience is not restricted by performance issues.

Hardware	Demo System
Virtualization	Not recommended

Combined Core and Database Server

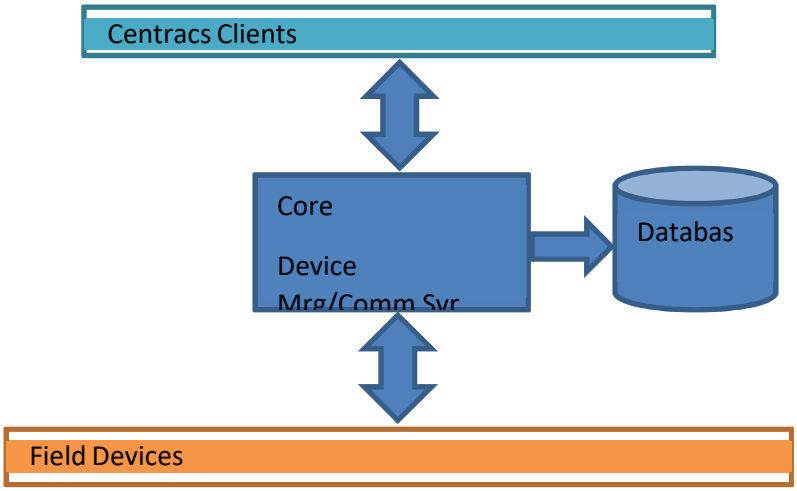
Combining Core and the Database Server is not typically recommended as these are the two most resource intensive services. This configuration should only be permitted under limited situations. If loads surpass the recommendations, or if performance issues are reported, the database should be placed on a dedicated server.



Feature	Limit
Signals	50
Data Collection (DCMS Autoscopes)	200
DMS	250
MOE Signal Count	10
Centracs® Adaptive Instances	1
Historical Data Storage (months)	24

Database Server

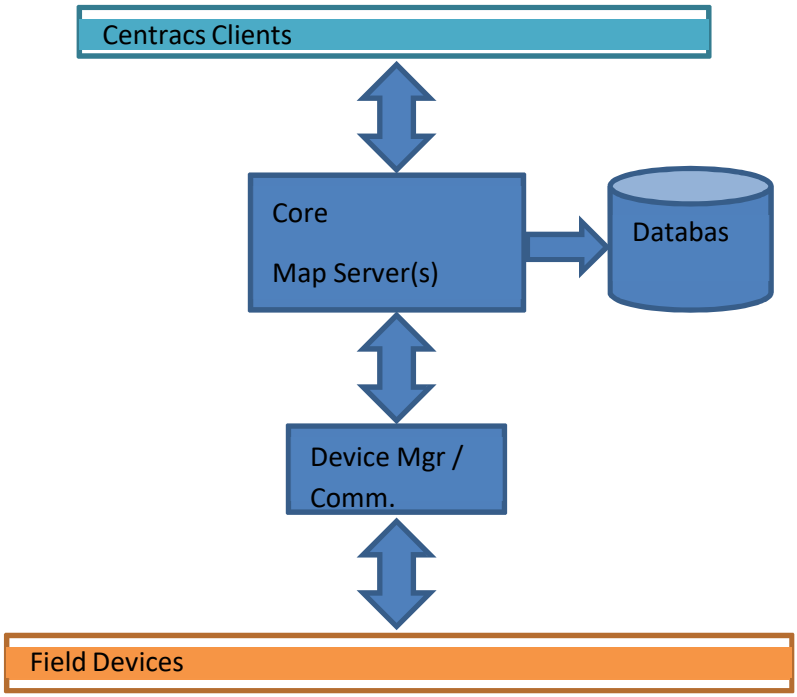
Providing a dedicated database server is typically the single biggest performance improvement gain available when moving from a combined Core-Database setup. When *any* of the following limits are exceeded, a dedicated database server should be allocated.



Feature	
Signals	>50
Data Collection (DCMS Autoscopes)	>200
DMS	>250
MOE Signal Count	>10
Centracs® Adaptive Instances	>1
Historical Data Storage (months)	>24

Core Server

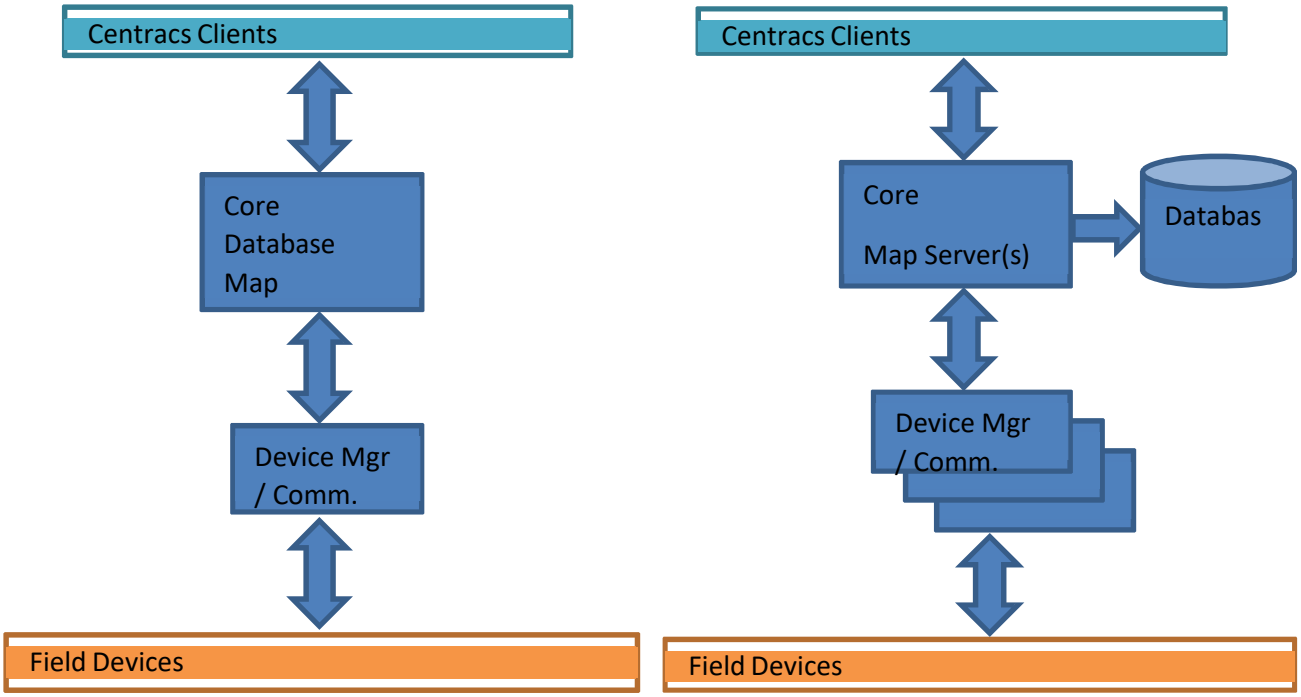
Providing a dedicated Core server is typically the second biggest performance improvement gain available when moving from a combined Core-Device Manager/Comm. Server setup. When *any* of the following limits are exceeded, a dedicated Core server should be allocated.



Feature	
Signals	>250
Data Collection (DCMS Autoscopes)	>750
MOE Signal Count	>100
Centracs® Adaptive Instances	>2

Device Manager (Communication Server)

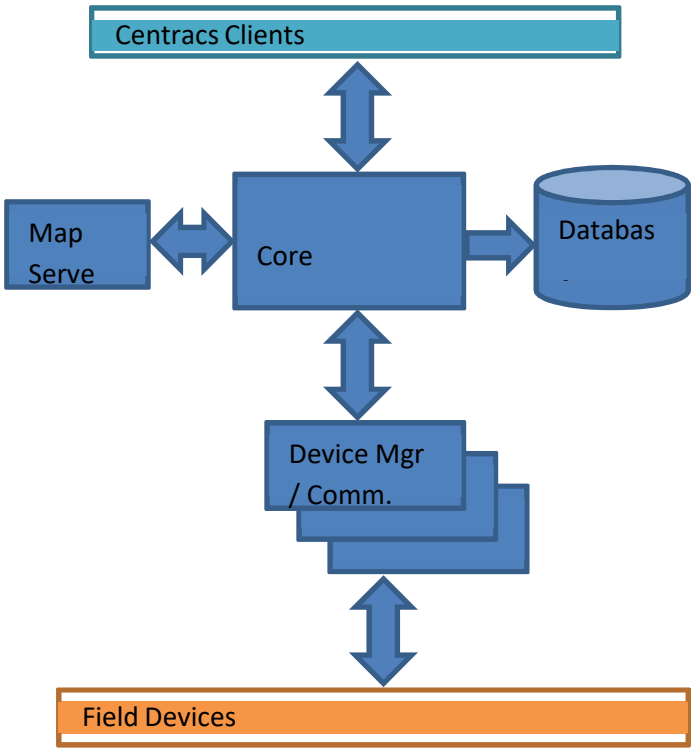
Providing a dedicated or additional Device Manager is necessary when *any* of the following conditions is met. When scaling out, it is not advisable to separate the Device Manager onto separate servers.



Device	Limit
IP Devices	1000*
Serial Devices	250

Map Server

The principal purpose of this server is for running the ECPI Tile Server service. A map server is recommended under high usage of the ECPI Tile provider feature as well as when the Core server is suffering from high resource contention. If the ECPI Tile provider feature is not being used, this server is not needed.



Device	Limit
Devices	1000

Database Storage Requirements

There are many factors that contribute to the needs of the Centracs® database. To aid in determining the storage requirements, please refer to the Centracs® Storage Requirements Excel spreadsheet. This will allow you to specify various factors that most impact storage needs, and will calculate an estimate to go by.

Appendix A

Server Recommendations At-A-Glance

	Single Server	Dedicated Database Server	Dedicated Core Server	Additional Comm Servers
Signals	50	>50	>250	1000 IP Devices 250 Serial Devices
Data Collection (DCMS Autoscopes)	120	>200	>750	
DMS	150	>250		
MOE Signal Count	0	>10	>100	
Centracs® Adaptive Instances	0	>1	>2	
Historical Data Storage (months)	24	>24		
# of Servers	1 Core/Comm/Database	1 Core/Comm, 1 Database	1 Core, 1 Comm, 1 Database	1 Core, 1 Database, 1+ Comm

Single Server Recommended Specifications

	PowerEdge R740 Server
Motherboard	PowerEdge R740/R740XD Motherboard
Chassis Configuration	Chassis with up to 8 x 3.5" SAS/SATA Hard Drives for 2CPU Configuration
Processor	Intel® Xeon® Gold 5118 2.3G, 12C/24T, 10.4GT/s, 16.5M Cache, Turbo, HT (105W) DDR4-2400
Additional Processor	Intel® Xeon® Gold 5118 2.3G, 12C/24T, 10.4GT/s, 16.5M Cache, Turbo, HT (105W) DDR4-2400
Processor Thermal Configuration	2 Standard Heatsinks for 125W or less CPUs
Memory DIMM Type and Speed	2666MT/s RDIMMs
Memory Configuration Type	Performance Optimized
Memory Capacity	(2) 16GB RDIMM, 2666MT/s, Dual Rank
RAID Configuration	C4, RAID 5 for 3 or more HDDs or SSDs (Matching Type/Speed/Capacity)
RAID/Internal Storage Controllers	PERC H730P RAID Controller, 2GB NV Cache, Adapter, Low Profile
Hard Drives	(4) 480GB SSD SATA Read Intensive 6Gbps 512 2.5in Hot-plug AG Drive,3.5in HYB CARR, 1 DWPD, 876 TBW
Operating System	Microsoft Windows Server 2016 Standard, 5 CAL

SQL Server	Microsoft SQL Server 2016 Standard, Retail , 10 CAL
Embedded Systems Management	iDRAC9,Enterprise
PCIe Riser	Riser Config 3, 2 x8, 3 x16 slots
Network Daughter Card	Broadcom 5720 QP 1Gb Network Daughter Card
IDSDM and VFlash Card Reader	IDSDM and Combo Card Reader with 16GB VFlash SD
Internal SD Module	16GB microSDHC/SDXC Card
Internal Optical Drive	DVD ROM SATA, Internal
Fans	6 Standard Fans for R740/740XD
Power Supply	Dual, Hot-plug, Redundant Power Supply (1+1), 750W
Power Cords	(2) NEMA 5-15P to C13 Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m), Power Cord, North America
Bezel	PowerEdge 2U Standard Bezel
BIOS and Advanced System Configuration Settings	Performance BIOS Setting
Advanced System Configurations	UEFI BIOS Boot Mode with GPT Partition
Rack Rails	ReadyRails™ Sliding Rails With Cable Management Arm
Hardware Support Services	3 Years Basic Hardware Warranty Repair: 5x10 HW-Only, 5x10 NBD Onsite ,PIT

Database Server Recommended Specifications

Needs (in order of importance): Fast Storage, CPU, Memory

	PowerEdge R740 Server
Motherboard	PowerEdge R740/R740XD Motherboard
Trusted Platform Module	No Trusted Platform Module
Chassis Configuration	Chassis with up to 8 x 3.5" SAS/SATA Hard Drives for 2CPU Configuration
Processor	Intel® Xeon® Gold 5118 2.3G, 12C/24T, 10.4GT/s, 16.5M Cache, Turbo, HT (105W) DDR4-2400
Additional Processor	Intel® Xeon® Gold 5118 2.3G, 12C/24T, 10.4GT/s, 16.5M Cache, Turbo, HT (105W) DDR4-2400
Memory DIMM Type and Speed	2666MT/s RDIMMs
Memory Configuration Type	Performance Optimized
Memory Capacity	< 250 Intersections (2) 32GB RDIMM, 2666MT/s, Dual Rank > 250 Intersections (4) 32GB RDIMM, 2666MT/s, Dual Rank
RAID Configuration	C4, RAID 5 for 3 or more HDDs or SSDs (Matching Type/Speed/Capacity)
RAID/Internal Storage Controllers	PERC H730P RAID Controller, 2GB NV Cache, Adapter, Low Profile
Hard Drives	(6) 480GB SSD SATA Read Intensive 6Gbps 512 2.5in Hot-plug AG Drive,3.5in HYB CARR, 1 DWPD, 876 TBW
Operating System	Microsoft Windows Server 2016 Standard, 5 CAL

SQL Server	Microsoft SQL Server 2016 Standard, Retail , 10 CAL
Embedded Systems Management	iDRAC9,Enterprise
PCIe Riser	Riser Config 3, 2 x8, 3 x16 slots
Network Daughter Card	Broadcom 5720 QP 1Gb Network Daughter Card
IDSDM and VFlash Card Reader	IDSDM and Combo Card Reader with 16GB VFlash SD
Internal SD Module	16GB microSDHC/SDXC Card
Internal Optical Drive	DVD+/-RW,SATA,Int
Fans	6 Standard Fans for R740/740XD
Power Supply	Dual, Hot-plug, Redundant Power Supply (1+1), 750W
Power Cords	(2) NEMA 5-15P to C13 Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m), Power Cord, North America
Bezel	PowerEdge 2U Standard Bezel
BIOS and Advanced System Configuration Settings	Performance BIOS Setting
Advanced System Configurations	UEFI BIOS Boot Mode with GPT Partition
Rack Rails	ReadyRails™ Sliding Rails With Cable Management Arm
Hardware Support Services	3 Years Basic Hardware Warranty Repair: 5x10 HW-Only, 5x10 NBD Onsite ,PIT

Core Server Recommended Specifications

Needs (in order of importance): CPU, Memory

	PowerEdge R640 Server
Motherboard	PowerEdge R640 Motherboard
Trusted Platform Module	No Trusted Platform Module
Chassis Configuration	3.5” Chassis with up to 4 Hard Drives and 3PCIe slots
Processor	Intel® Xeon® Gold 5122 3.6G, 4C/8T, 10.4GT/s, 16.5M Cache, Turbo, HT (105W) DDR4-2666
Additional Processor	Intel® Xeon® Gold 5122 3.6G,4C/8T,10.4GT/s, 16.5M Cache,Turbo,HT (105W) DDR4-2666
Processor Thermal Configuration	Standard Heatsink for 2 CPU
Memory DIMM Type and Speed	2666MT/s RDIMMs
Memory Configuration Type	Performance Optimized
Memory Capacity	< 250 Intersections (2) 16GB RDIMM, 2666MT/s, Dual Rank > 250 Intersections (2) 32GB RDIMM, 2666MT/s, Dual Rank
RAID Configuration	C3, RAID 1 for 2 HDDs or SSDs (Matching Type/Speed/Capacity)
RAID/Internal Storage Controllers	PERC H330 RAID Controller, Minicard
Hard Drives	(2) 600GB 10K RPM SAS 12Gbps 512n 2.5in Hot-plug Hard Drive, 3.5in HYB CARR

Operating System	Microsoft Windows Server 2016 Standard, 5 CAL
Embedded Systems Management	iDRAC9, Express
Group Manager	iDRAC Group Manager, Disabled
Password	iDRAC,Legacy Password
PCIe Riser	Riser Config 4, 2x16 LP
Network Daughter Card	Intel Ethernet I350 QP 1Gb Network Daughter Card
Internal Optical Drive	DVD ROM SATA, Internal
Fans	8 Standard Fans for R640
Power Supply	Dual, Hot-plug, Redundant Power Supply (1+1), 750W
Power Cords	(2) NEMA 5-15P to C13 Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m), Power Cord, North America
Bezel	Standard Bezel for x4 and x8 chassis
BIOS and Advanced System Configuration Settings	Performance BIOS Setting
Rack Rails	ReadyRails™ Sliding Rails With Cable Management Arm
Hardware Support Services	3 Years Basic Hardware Warranty Repair: 5x10 HW-Only, 5x10 NBD Onsite

Communications Server / CCTV Server Recommended Specifications

Needs: CPU (serial only comm servers can do with a lesser CPU)

	PowerEdge R640 Server
Motherboard	PowerEdge R640 Motherboard
Trusted Platform Module	No Trusted Platform Module
Chassis Configuration	3.5” Chassis with up to 4 Hard Drives and 3PCIe slots
Processor	Intel® Xeon® Gold 5122 3.6G, 4C/8T, 10.4GT/s, 16.5M Cache, Turbo, HT (105W) DDR4-2666
Additional Processor	Intel® Xeon® Gold 5122 3.6G,4C/8T,10.4GT/s, 16.5M Cache,Turbo,HT (105W) DDR4-2666
Processor Thermal Configuration	Standard Heatsink for 2 CPU
Memory DIMM Type and Speed	2666MT/s RDIMMs
Memory Configuration Type	Performance Optimized
Memory Capacity	(2) 8GB RDIMM, 2666MT/s, Single Rank
RAID Configuration	C3, RAID 1 for 2 HDDs or SSDs (Matching Type/Speed/Capacity)
RAID/Internal Storage Controllers	PERC H330 RAID Controller, Minicard
Hard Drives	(2) 600GB 10K RPM SAS 12Gbps 512n 2.5in Hot-plug Hard Drive, 3.5in HYB CARR

Operating System	Microsoft Windows Server 2016 Standard, 5 CAL
Embedded Systems Management	iDRAC9, Express
Group Manager	iDRAC Group Manager, Disabled
Password	iDRAC,Legacy Password
PCIe Riser	Riser Config 4, 2x16 LP
Network Daughter Card	Intel Ethernet I350 QP 1Gb Network Daughter Card
Internal Optical Drive	DVD +/-RW, SATA, Internal
Fans	8 Standard Fans for R640
Power Supply	Dual, Hot-plug, Redundant Power Supply (1+1), 750W
Power Cords	(2) NEMA 5-15P to C13 Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m), Power Cord, North America
Bezel	Standard Bezel for x4 and x8 chassis
BIOS and Advanced System Configuration Settings	Performance BIOS Setting
Rack Rails	ReadyRails™ Sliding Rails With Cable Management Arm
Hardware Support Services	3 Years Basic Hardware Warranty Repair: 5x10 HW-Only, 5x10 NBD Onsite

Map Server Recommended Specifications

Needs: CPU, Memory

	PowerEdge R640 Server
Motherboard	PowerEdge R640 Motherboard
Trusted Platform Module	No Trusted Platform Module
Chassis Configuration	3.5” Chassis with up to 4 Hard Drives and 3PCIe slots
Processor	Intel® Xeon® Gold 5122 3.6G, 4C/8T, 10.4GT/s, 16.5M Cache, Turbo, HT (105W) DDR4-2666
Processor Thermal Configuration	Standard Heatsink for 2 CPU
Memory DIMM Type and Speed	2666MT/s RDIMMs
Memory Configuration Type	Performance Optimized
Memory Capacity	(2) 8GB RDIMM, 2666MT/s, Single Rank
RAID Configuration	C3, RAID 1 for 2 HDDs or SSDs (Matching Type/Speed/Capacity)
RAID/Internal Storage Controllers	PERC H330 RAID Controller, Minicard
Hard Drives	(2) 300GB 15K RPM SAS 12Gbps 512n 2.5in Hot-plug Hard Drive, 3.5in HYB CARR
Operating System	Microsoft Windows Server 2016 Standard, 5 CAL

Embedded Systems Management	iDRAC9, Express
Group Manager	iDRAC Group Manager, Disabled
Password	iDRAC,Legacy Password
PCIe Riser	Riser Config 4, 2x16 LP
Network Daughter Card	Intel Ethernet I350 QP 1Gb Network Daughter Card
Internal Optical Drive	DVD +/-RW, SATA, Internal
Fans	8 Standard Fans for R640
Power Supply	Dual, Hot-plug, Redundant Power Supply (1+1), 750W
Power Cords	(2) NEMA 5-15P to C13 Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m), Power Cord, North America
Bezel	Standard Bezel for x4 and x8 chassis
BIOS and Advanced System Configuration Settings	Performance BIOS Setting
Rack Rails	ReadyRails™ Sliding Rails With Cable Management Arm
Hardware Support Services	3 Years Basic Hardware Warranty Repair: 5x10 HW-Only, 5x10 NBD Onsite

Workstation Recommended Specifications

Needs: Graphics Card

	Precision 3630 Tower
Processor	Intel Xeon E-2124G, 4 Core, 8MB Cache, 3.4GHz, 4.5Ghz Turbo w/ UHD Graphics 630
Operating System	Windows® 10 Pro for Workstation (up to 4 Cores) Multi - English, French, Spanish
Memory	16GB 2x8GB DDR4 2666MHz UDIMM Non-ECC
Video Card	NVIDIA® Quadro® P620, 2GB, 4 mDP
Hard Drive	3.5 inch 500GB 7200rpm SATA Hard Disk Drive
Keyboard	Dell KB216 Wired Keyboard English Black
Mouse	Dell MS116 Wired Mouse Black
Network Card	Intel I210 1Gb Ethernet Adapter (1X1GbE)
Optical or CAC/PIV reader	8x DVD+/-RW 9.5mm Optical Disk Drive
Power Cord	US Power Cord
Hardware Support Services	3 Years Hardware Service with Onsite/In-Home Service After Remote Diagnosis

Mobile Workstation Recommended Specifications

	Dell Precision 7520
Processor	Intel Core i7-7820HQ (Quad Core 2.90GHz, 3.90GHz Turbo, 8MB 45W, w/Intel HD Graphics 630)
Operating System(s)	Windows 10 Pro 64bit English, French, Spanish
Video Card	NVIDIA Quadro M1200 w/4GB GDDR5
LCD	15.6" UltraSharp™ FHD IPS(1920x1080)AG LED-backlit w/Prem Pan Grnt(72% color gamut) w/Mic, Non-touch
Memory	16GB, 2x8GB, 2400MHz DDR4 Non-ECC SDRAM
Hard Drive	500GB 2.5" 7mm SATA (7200 RPM) Hard Drive
Keyboard	Internal Dual Pointing Backlit Keyboard, English
Wireless	Dell Wireless™ 1820 802.11AC Dual-Band Wireless + BT 4.1 Card (2x2)
Primary Battery	6-cell (72 Whr) Lithium Ion Polymer Battery with ExpressCharge™
Power Supply	180W AC Adapter 7.4mm
Palmrest	Palm Rest with touch fingerprint reader, smart card and NFC
Driver	Dell Wireless 1820 802.11AC Driver
Cable	US Power Cord
Hardware Support Services	3 Years Hardware Service with Onsite/In-Home Service After Remote Diagnosis

Workstation Monitor (Optional)

Dell UltraSharp 24 InfinityEdge Monitor - U2417H	UltraSharp 24 InfinityEdge Monitor - U2417H

Peripherals (Optional)

Server Rack	TrippLite 42U SmartRack DEEP Premium Enclosure with Doors and Side Panels (SR42UBDP). Does not include Fan
UPS	SMART UPS 2200VA RM 120V 2U LCD (SMT2200RM2U)
KVM Console	16-Port NetDirector™ Rack Console USB/PS2 KVM with 19 in LCD- Comes with x8 P778-006 USB/PS2 Combo KVM Cable Kits
External Hard Drives	Buffalo TeraStation III Rackmount NAS Server (TS-RX4.0TL/R5)

STATE OF MICHIGAN

Contract No. 190000001522
Central Signal Control System
EXHIBIT D
Controller Unit (CU) REQUIREMENTS

1. "**Controller Install"** means programming, configuring, testing, installing MDOT-furnished CU, and removing existing CU at each of 280 signalized intersections. This includes all labor, equipment, and materials required to complete the following scope of work items:

A. Program MDOT-furnished CU with existing intersection timing parameters to provide the required traffic signal control operation in accordance with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). MDOT will provide the existing signal timing parameters in pdf format and CU loaded with firmware. The vendor may collect electronic versions of databases from in-service CU in the field at no additional cost to MDOT (see section 1.a.vi for controller cabinet access restrictions). The vendor will be responsible for any labor and equipment required for programming the new CU.

B. MDOT will furnish controllers within 30 days of written request from the vendor.

C. Deliver programmed CU, ready for field deployment, to MDOT signal shop facility for 24-hour bench testing, completed by the vendor and verified/approved by MDOT or designee. The facility currently has capacity to bench test 10 CU at one time. The vendor may provide additional equipment, materials, and/or an off-site facility, at no additional cost to MDOT, to increase the testing capacity on a temporary basis for this project, upon approval by MDOT.

D. Upon successful completion of bench testing, transport the CU from the MDOT signal shop to the job site for installation according to the approved implementation plan. Successful completion of bench testing must be confirmed by an MDOT Traffic Signals Unit representative or designee prior to the CU being transported to the field. Controllers must have remote monitoring and control capabilities available at the MDOT signals shop (through the CSCS or other MDOT-approved method) within 24 hours of installation in the field.

E. Remove and salvage the existing CU in the cabinet. All salvaged CU are to be delivered to an MDOT approved facility. including, at a minimum, the MDOT Traffic Signals Unit Shop located at 6333 Lansing Rd, Lansing, MI 48917.

F. Install the CU in the signal cabinet to provide traffic signal control operations as indicated in the signal timing parameters provided by MDOT and in accordance the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). MDOT will provide cabling/connectors required to provide interface between existing cabinet connectors and CU "ABCD" connectors. Complete this work in accordance with sections 819 and 820 of the MDOT Standard Specifications for Construction and as directed by the Engineer.

G. Execute Acceptance Test Plan (ATP) as indicated in **Section 3** of this Exhibit and **Schedule H**.

H. **Controller cabinet access restrictions:** The vendor must provide a licensed electrician with traffic signal experience to be present for any on-site activity with a traffic signal cabinet opened. If the vendor cannot provide a licensed electrician one will be provided by MDOT; however, the vendor must provide an experienced signal technician. MDOT does not guarantee the availability of MDOT qualified staff, and lack of MDOT qualified staff will not be accepted as a reason for not meeting contractual deadlines. Liquidated damages will be assessed for failure to meet contractual deadlines.

I. **Controller Type:** NEMA ATC Type controller refers to the two MDOT-approved controllers listed in the MDOT SP for NEMA ATC Controller: Siemens m60 NEMA ATC loaded with SEPAC v5 firmware and Econolite Cobalt loaded with EOS v03.01.28 firmware. MDOT is purchasing controllers via a separate contract. It is MDOT's choice to deploy either one or both of the approved controllers. Vendor is required to be knowledgeable and experienced with the hardware and firmware on both controllers.

2. "**Signalized Intersection Implementation"** means configuring and integrating each signalized intersection in the CSCS software to provide the full functionality specified in **Exhibit A – Table 1 – Business Specification Worksheet.** This may include but is not limited to the following:

- Signalized Intersection basic configuration set-up, including identification numbers, groups, communications, phasing, timing, and detection devices
- Set up and configuration of intersection graphics
- Set up and configuration of corridor time-space diagrams
- Set up and configuration of high-resolution data reports
- Set up and configuration of MOEs
- Set up and configuration to allow remote communication from the CU to the central software and/or Transportation Operations Center (TOC)
- Execute Acceptance Test Plan (ATP) as indicated in **Section 3 of this Exhibit and Schedule H.**

3. Provide an Acceptance Test Plan (ATP) that includes individual test cases clearly showing passing criteria for local and final system testing, as defined in **Schedule H – Acceptance Testing**. The ATP must include but not be limited to the following:

A. ATP must be approved by the Engineer prior to installation of any electronic devices in the field.

B. The ATP must include local and final system testing for all CUs to be integrated on this project.

C. Failures during testing must be included in a report that documents the defective unit or setting and the corrective action taken. Minor failures may be addressed and retested at the Engineer's discretion. Major failures, which would require additional work to multiple units and sites, may cause the Engineer to stop testing until the issue has been resolved. No extension of time or additional payments will be given or made due to delays caused by failed acceptance testing.

D. The ATP forms as well as any supplemental documentation completed during the testing are to be delivered to the Engineer upon system acceptance. The forms must be signed by the Contractor as well as the Engineer or representative.

E. Perform Local Device Assembly Test (LDAT), which includes, but is not limited to the following:

a. Verify physical construction has been completed per the contract.

b. Verify the CU is operating as intended and has been configured with the proper site details.

F. Perform Final System Testing (FST), which includes, but is not limited to the following:

a. Verify remote connectivity to the CU. The CU must be able to be monitored and configured remotely.

b. Verify set up and configuration within the CSCS, as defined in Signalized Intersection Implementation, is accurate and displaying real-time conditions.

G. ATP Execution Requirements include the following:

a. After the ATP has been accepted, submit in writing a detailed ATP schedule to MDOT for witness testing in the field. Include time and duration for each test case in the schedule.

b. Maintain an ATP progress report tracker in a tabulated format and submit to MDOT when required and at the completion of testing.

c. Maintain signed electronic and hard copies of the witness testing and submit to MDOT with the as-built documentation.

d. Integrate and test to meet MDOT specifications for integration and in accordance with the ATP.

STATE OF MICHIGAN

Contract No. 190000001522
Central Signal Control System
EXHIBIT E
CELLULAR MODEM REQUIREMENTS

1. CSCS to field communications will be established via cellular modem installed in each signal cabinet. This item includes communications equipment that will be installed/deployed on-site at signalized intersections to provide Ethernet connectivity from CU to the CSCS. Additional communications equipment to be installed at MDOT facilities (i.e., traffic operations center) that may be required for CSCS implementation is not included in this item.

2. **"Cellular Modem"** means an environmentally hardened cellular modem:

a. Description. This work consists of the complete furnishing, installation, integration and testing of an environmentally hardened cellular modem, and service coordination with MDOT to complete an end-to-end communications link. The cellular modem provides Ethernet connectivity from the traffic signal controller and other field devices to the head-end. This work must be performed in accordance with the standard specifications, except as modified herein.

1. General.

   A. Furnish, install, integrate and test all equipment and required components, including mounting hardware, power supply, cables, patch cords, antennas, and antenna cables necessary to provide full and complete functionality in all respects, without additional expense to the Department.

   B. All cellular data service will be provided by the MDOT statewide cellular data service provider agreement.

   C. Final equipment selection, procurement, and provisioning must be coordinated with MDOT and the Michigan Department of Technology, Management, and Budget (DTMB).

   D. Use identical and completely interchangeable equipment at each field location.

2. Functional and Performance Requirements:

   A. Support Virtual Private Network (VPN) connections;

   B. Support firewall capabilities, such as, Internet Protocol (IP) block/allow listings, demilitarized zone (DMZ), and port forwarding;

   C. Provide an “always-on” connection, without dialing;

   D. Support local and remote management;

   E. Domain name addressable;

   F. Port Filtering;

G. Generic Routing Encapsulation (GRE) Tunneling;

H. IP Filtering;

I. Media Access Control (MAC) Address Filtering; and

J. Capable of providing a broadband communications link between field cabinet location(s) and the head-end via the State of Michigan's cellular data service provider.

K. Throughput.

(1). Forward/download throughput of the cellular modem must meet the minimum requirements of 10 Megabits per second (Mbps) or as approved by the Engineer, on a site by site basis.

(2). Reverse/upload throughput of the cellular modem must meet the minimum requirements of 5 Mbps or as approved by the Engineer, on a site by site basis.

b. Materials. Provide equipment that meets the following requirements.

1. Full duplex transceiver.

2. Frequency Band and Cellular Network Interface.

A. 4G Long Term Evolution (LTE) models:

(1) Tri-band support for 700/1900/2100 Megahertz (MHz);

(2) Backward compatible with Evolved High Speed Packet Access (HSPA+), High Speed Packet Access (HSPA), Enhanced Data-rates for GSM Evolution (EDGE), General Packet Radio Service (GPRS) or Evolution Data Only (EV-DO) (Rev. A), Code Division Multiple Access (CDMA) EV-DO (Rev. 0), CDMA 1x Radio Transmission Technology (RTT) based on the selected provider’s network.

3. Ethernet Interfaces.

A. Support Transmission Control Protocol (TCP)/IP and User Datagram Protocol (UDP)/IP.

B. Provide a minimum of two or four registered Jacks (RJ)-45, IEEE 802.3 standard 10/100 Base-TX Ethernet ports, as defined by the pay item.

C. Four port models must be provided with an integral managed field Ethernet switch (MFES) that complies with the Institute of Electrical and Electronics Engineers (IEEE) networking standards IEEE-802.1 and IEEE-802.3. Specifically, the MFES must comply with the following IEEE 802.1 standards:

(1) IEEE 802.1D Media Access Control (MAC) Bridges, including Rapid Spanning Tree Protocol (RSTP).

(2) IEEE 802.1Q Virtual Local Area Network (VLAN) tagging and Multiple Spanning Tree Protocol (MSTP).

(3) IEEE 802.1X Port-Based Network Access Control.

D. Provide network cables that are Electronic Industries Alliance (EIA)/Telecommunications Industry Association (TIA)-568 compliant.

E. Provide DB-9 integrated serial port that is EIA232 real port compatible and preconfigured for on-street master controller applications.

4. Antenna.

A. Provide modem-mountable omnidirectional external antennas rated for outdoor usage as defined in **subsection b.7** of this special provision to be mounted inside the cabinet. Specific antenna type to be used at each site is to be determined by the Contractor to provide required throughput and maximize received signal level. Antenna for each site must be approved by the Engineer. If Site Survey as defined in **subsection c.1.A** of this special provision indicates that required throughput or received signal strength cannot be achieved with antennas mounted inside the cabinet, furnish to MDOT antennas and surge protection rated for outdoor usage as defined in **subsection b.7** of this special provision, suitable for pole mounting, and approved by the Engineer.

B. 50 Ohm SMA male connector.

C. If antenna is provided to MDOT for mounting outside of the cabinet, provide an antenna cable with surge protection and required adapters per the manufacturer's recommendation. Signal loss due to cable length must be minimized in order to meet throughput requirements.

D. Minimum Antenna gain of 2 decibels isotropic (dBi).

E. Right-angle swivel connector that allows for the antenna to be upright when connected to the cellular modem.

F. Operating Frequencies of 698-896 and 1700-2700 MHz.

5. Management, Security and Diagnostic.

A. Light-emitting diode (LED) indicators for Ethernet, power, cellular link/activity and signal strength.

B. Support signals for Transmit Data (TXD), Receive Data (RXD), Request To Send (RTS), Clear To Send (CTS), Data Terminal Ready (DTR), Data Set Ready (DSR), Data Carrier Detect (DCD) and hardware and software flow control.

C. Provide compatibility with Hypertext Transfer Protocol (HTTP)/HTTP Secure (HTTPS), Dynamic Host Communications Protocol (DHCP), Simple Network Management Protocol (SNMP) v2 or v3, Simple Mail Transfer Protocol (SMTP), Secure Socket Layer (SSL), Secure Shell (SSH)-2.

D. Web-based Graphical User Interface (GUI).

E. Command Line Interface (CLI) access via SSH connection.

F. SNMP Management Information Base (MIB)-II and SNMP Traps.

6. Power. Ensure required power supply is supplied with device.

7. Environment.

A. Operating Temperature for Cellular Modem, Power Supply, Antenna, and all connectors. -22 degrees F to 158 degrees F.

B. Storage Temperature for Cellular Modem, Power Supply, Antenna, and all connectors. -22 degrees F to 158 degrees F.

C. Relative humidity for Cellular Modem, Power Supply, Antenna, and all connectors. 5 percent to 95 percent non-condensing.

8. Mounting. Ensure all mounting hardware is supplied with device.

9. Cables. Provide patch cords, cables, and jumpers for connection to traffic signal controller and other IP-based field devices in the traffic signal cabinet.

c. Construction.

1. General.

A. Conduct a cellular site survey and submit to the Engineer for acceptance prior to the procurement of materials. The purpose of the survey is to measure the signal strength and throughput of cellular coverage at each project location. Conduct site survey with the expected conditions and settings for permanent installation, including cellular modem and antenna make/model and installation location (i.e., inside the cabinet) at each location. Testing must include upload/download speeds, latency, and received signal strength to show that the equipment will meet the minimum requirements as described in Requirements. Alert the Engineer of any sites that do not have adequate signal strength or upload/download speeds. Testing is an appurtenance to the cellular modem and will not be paid for separately.

B. Install the cellular modem in accordance with MDOT specifications and details.

C. Install antenna(s) inside the cabinet. Cabinet wall penetrations are not allowed unless approved by the Engineer due to signal strength issues.

D. Install using settings approved by the Engineer to ensure interoperability and security, including VPN settings, local IP address, port forwarding and Network Address Translation (NAT), and IP-based filtering.

E. Shop drawing Submittals.

(1) Submit shop drawings and equipment data for all equipment and components to the Engineer electronically in portable document format (.PDF).

(2) Include a letter of transmittal with all submittals that includes the following information:

(a) Date of submittal;

(b) Name and contact information of company making submittal;

(c) Name and contact information of the Contractor sending submittal;

(d) State Job Number and Control Section;

(e) Itemized list of enclosures (e.g., 5 copies of inside wiring submittals);

(f) Recipient name and department (i.e. to the attention of); and

(g) Action requested (e.g., please review submittals for approval).

(h) Equipment data sheets must demonstrate compliance with the contract.

(3) If any aspect of the proposed material differs from the description in the manufacturer's literature, mark up the literature to indicate the deviation.

(4) Allow 10 working days for the Engineer to review the submitted material, unless otherwise noted.

(5) Amended submittals must be complete, including all parts of the original submittal that were not revised. Ensure each submittal can stand alone as a complete description of the proposed items, with no need to reference earlier versions.

(6) Provide an itemized bill of materials (BOM) for all components being provided as part of the shop drawing and equipment submittal. BOM must include component type, quantity, and model number as applicable.

F. Acceptance Test Plan (ATP), as defined in **Schedule H – Acceptance Testing.**

(1) General Requirements.

(a) Provide an ATP that includes individual test cases clearly showing passing criteria for local and final system testing.

(b) ATP must be approved by the Engineer prior to installation of any electronic devices in the field.

(c) The ATP must include local and final system testing for all cellular modems to be integrated on this project.

(d) Failures during testing must be included in a report that documents the defective unit or setting and the corrective action taken. Minor failures may be addressed and retested at the Engineer's discretion. Major failures, which would require additional work to multiple units and sites, may cause the Engineer to stop testing until the issue has been resolved. No extension of time or additional payments will be given or made due to delays caused by failed acceptance testing.

(e) The ATP forms as well as any supplemental documentation completed during the testing are to be delivered to the Engineer upon system acceptance. The forms must be signed by the Contractor as well as the Engineer or representative.

(2) Local Device Assembly Test (LDAT).

(a) Verify physical construction has been completed per the contract.
(b) Verify the cellular modem has been configured with the proper site name, IP address, subnet mask, gateway, and VLAN settings.
(c) Set and verify VPN settings, local IP address, port forwarding, Network Address Translation (NAT), and IP-based filtering.
(d) Conduct an upload throughput test of the cellular modem using Iperf, Jperf, or similar approved software.
(e) Record the throughput (upload/download), signal to interference plus noise ratio (SNR), and received signal strength indicator (RSSI).

(3) Final System Testing.

(a) Verify remote connectivity to the cellular modem. The modem must be able to be monitored and configured remotely.

(b) Verify that devices connected to the cellular modem can be accessed via ping test.

G. ATP Execution Requirements.

(1) After the ATP has been accepted, submit in writing a detailed ATP schedule to MDOT for witness testing in the field. Include time and duration for each test case in the schedule.
(2) Conduct pre-testing to verify each device is performing according to the passing criteria requirements submitted with each test case, prior to scheduling formal testing with the Engineer and MDOT.
(3) Maintain an ATP progress report tracker in a tabulated format and submit to MDOT when required and at the completion of testing.
(4) Maintain signed electronic and hard copies of the witness testing and submit to MDOT with the as-built documentation.
(5) Provide all required test equipment. Prior to field testing, all test equipment datasheets and calibration records must be submitted to MDOT for approval.

H. Integrate and test to meet MDOT specifications for integration and in accordance with the ATP.

2. Warranty. Provide cellular modem with a standard manufacturer's warranty, transferable to MDOT. The cellular modem must carry a warranty (parts, software and labor) of 5 years from the date of shipment. Furnish warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, to the Engineer prior to final written acceptance.

d. Measurement. The completed work, as described, will be measured using the following items:

Item	**Unit**
Cellular Modem, TS, 4G, __ Port	Each

Cellular Modem, TS, 4G, **2 Port** includes all labor, material, and equipment necessary to furnish, install, integrate, and test the cellular modem with a minimum of two Ethernet ports to complete the communications link in accordance with the Contract.

Cellular Modem, TS, 4G, **4 Port** includes all labor, material, and equipment necessary to furnish, install, integrate, and test the cellular modem with a minimum of four Ethernet ports to complete the communications link in accordance with the Contract.

STATE OF MICHIGAN

Contract No. 190000001522
Central Signal Control System
EXHIBIT F
MANAGED FIELD ETHERNET SWITCH REQUIREMENTS

1. This item includes communications equipment that will be installed/deployed on-site at signalized intersections to provide Ethernet connectivity from CU to the CSCS. Additional communications equipment to be installed at MDOT facilities (i.e., traffic operations center) that may be required for CSCS implementation is not included in this item.

a. Description. This work consists of furnishing and installing an environmentally hardened managed field Ethernet switch (MFES) and all required power supplies, cables, patch cords and jumpers.

b. Materials. Ensure the MFES is fully compatible and interoperable with MDOT's signal controller and communications network.

1. Furnish a MFES that is suitable for a signal controller cabinet without the need for special environmental conditioning. The MFES must have no fan or other moving parts.

2. Ensure the MFES supports full-duplex Ethernet communication.

3. Provide a MFES that complies with the IEEE networking standards IEEE-802.1 and IEEE-802.3. Specifically, the MFES must comply with the following IEEE 802.1 standards:

   A. IEEE 802.1D Media Access Control (MAC) Bridges, including Rapid Spanning Tree Protocol (RSTP);

   B. IEEE 802.1ad – Q in Q / Provider Bridging Support or Stacked Virtual Local Area Networks (VLANs);

   C. IEEE 802.1Q VLAN tagging and Multiple Spanning Tree Protocol (MSTP);

   D. IEEE 802.1X (Port Based Network Access Protocol).

   E. Dynamic Host Configuration Protocol (DHCP) Snooping. Ability to filter DHCP packets to ensure clients only use addresses assigned to them by authorized DHCP servers.

   F. Dynamic Address Resolution Protocol (ARP) Inspection/Protection. Ability to verify and filter ARP packets to prevent ARP spoofing.

   G. Internet Engineering Task Force (RFC 7039) Internet Protocol (IP) Source Guard. Ability to block IP source addresses that are not assigned to clients to prevent IP spoofing.

   H. Port Security. Ability to limit the MAC addresses that are allowed on a switch port.

4. Provide a MFES that can be managed using simple network management protocol (SNMP) version 3.

5. Port Configuration. Provide a minimum of eight copper ports with Type Registered Jacks (RJ)-45 connectors that are capable of 10/100Base-TX communications. Furnish MFES with an adequate number of ports to accommodate Ethernet communications at each site as depicted on the plans, with at least one spare 10/100Base-TX copper port at each site.

6. Electrical Specifications.

    A. Provide a power supply that interfaces the MFES to 120 volts alternating current (VAC), 60 hertz (Hz) single-phase power. If the device requires operating voltages of less than 120VAC, the appropriate voltage converter will be supplied at no additional cost.

    B. The MFES must consume no more than 20 watts (W) of power.

    C. Provide a MFES resistant to electromagnetic interference (EMI).

7. Environmental Specifications.

    A. Ensure MFES and its power supply has an operating temperature range of at least -40 degrees Fahrenheit (F) to 158 degrees F.

    B. Ensure MFES and its power supply has an operating humidity range of at least 10 percent to 95 percent relative humidity (RH).

8. Provide a MFES capable of mounting on a Deutsches Institut für Normung (DIN) rail and provide all DIN rail hardware necessary to mount the MFES. If the MFES is mounted on a shelf, provide a grid-type shelf that allows proper air flow.

9. Provide a MFES with diagnostic light-emitting diodes (LED)s. These indicators must include link, activity, speed and power LEDs.

10. Ensure the MFES uses secure file transfer protocol (SFTP) to transfer configuration files to and from a central server.

11. Ensure the MFES performs multicast filtering using internet group management protocol (IGMP) snooping.

12. Provide power cables and Category 5e (CAT-5e) or Category 6 (CAT-6) patch cords as required.

13. Provide a MFES that has American Standard Code for Information Interchange (ASCII) based configuration files for offline editing and bulk configuration.

14. Ensure the MFES is configurable using a web browser or graphical user interface (GUI), in addition to the terminal emulation.

15. Ensure the MFES is able to backup and restore the complete software configuration, in the field by, without the use of a PC, powered by the console port, and only use a 1 button handheld data backup unit (DBU), capable of being used by technician with no IP knowledge.

c. Construction. Complete this work in accordance with sections 819 and 820 of the Standard Specifications for Construction, as shown on the plans and as directed by the Engineer.

1. Installation.

A. Connect the MFES to the communications network and ensure connections are made to each Ethernet/IP appliance within the cabinet. Use CAT-5e or CAT-6 patch cords for twisted pair connections to the MFES.

B. Verify MFES maintained a minimum actual measured data throughput of 10 Megabits per second (Mbps) for 10 minutes duration during the testing. These data rates must be validated and documented during acceptance testing, and any exceptions must be approved by the Engineer.

2. Local Device Assembly Testing.

A. Verify physical connections are performed as specified in contract.

B. Verify all LED indicators for link, activity, and power are functioning.

C. Verify these configuration settings: system name, location, IP address, subnet mask, and default gateway.

D. Verify all active ports have been configured properly. Check the speed, duplex, and VLAN settings.

4. Warranty. Provide MFES with a standard manufacturer's warranty, transferable to the MDOT. The MFES must carry a warranty (parts, software, and labor) of 5 years from the date of shipment. Furnish warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, to the Engineer prior to final written acceptance.

d. Measurement. The completed work, as described, will be measured using the following item:

Item	**Unit**
TS, Managed Field Ethernet Switch, Layer 2, Copper	Each

TS, Managed Field Ethernet Switch, Layer 2, Copper includes all labor, equipment, and materials to procure, install, and verify testing of a MFES.

STATE OF MICHIGAN

Contract No. 190000001522
Central Signal Control System
EXHIBIT G
PHASE 1 INTERSECTIONS

1. The table below provides the anticipated Phase 1 intersections. Locations are subject to change based on the direction of the State. Intersections with * will be prioritized as first 5% of intersections.

#	Region	County	Intersection Description	Signal Grouping ID	1st 5% of Intersections to Install
1	Superior	Chippewa County	BS75 @ MERIDIAN (DAVITT)	17-1	
2	Superior	Chippewa County	BS75 (ASHMUN) @ SPRUCE	17-1	
3	Superior	Chippewa County	BS75 (PORTAGE) @ JOHNSTON ST	17-1	
4	Superior	Chippewa County	BS75 (ASHMUN) @ M129 (DIXIE HWY)	17-1	
5	Superior	Chippewa County	BS75 (ASHMUN) @ MAPLE/RIDGE STS	17-1	
6	Superior	Chippewa County	BS75 (ASHMUN) @ EASTERDAY	17-1	
7	Superior	Chippewa County	BS75 @ 3 MILE @ MACKINAC TRAIL	17-1	
8	Superior	Chippewa County	BS75 (ASHMUN) @ PORTAGE	17-1	
9	Superior	Chippewa County	BS75 (ASHMUN) @ 12TH/MARQUETTE AVE	17-1	
10	Superior	Chippewa County	I-75 BR (3 Mile Rd) @ I-75 SB Ramps	17-2	
11	Superior	Chippewa County	I75BS @ CASCADE CROSSING SHOPPING CENTER	17-2	
12	Superior	Chippewa County	I-75 BR (3 Mile Rd) @ I-75 NB Ramps	17-2	
13	University	Clinton County	US127BR @ STURGIS	19-1	*
14	University	Clinton County	US127BR (WHITTEMORE) @ M21 (STATE)	19-1	*
15	University	Clinton County	M21 (STATE) @ CLINTON	19-1	*
16	University	Clinton County	M21 @ MAIN ST	19-1	*
17	University	Eaton County	I69BL (LANSING RD) @ ISLAND HWY	23-1	*
18	University	Eaton County	I69BL, M50 (COCHRAN) @ SEMINARY	23-1	*
19	University	Eaton County	M43 (SAGINAW) @ M100 (CLINTON)	23-1	*
20	University	Eaton County	M100 (CLINTON) @ EDWARDS ST	23-1	*
21	University	Eaton County	M99, M50 (MAIN) @ STATE ST	23-1	*
22	University	Eaton County	M50 (MAIN) @ M99 (CANAL) & BROOK ST	23-1	*
23	University	Eaton County	OLD US-27 (LANSING RD) @ MT HOPE RD	23-1	*
24	North	Emmet County	US31, M68 (KENT) @ LAKE	24-1	

#	Region	County	Intersection Description	Signal Grouping ID	1st 5% of Intersections to Install
25	North	Emmet County	US31, US131 (SPRING) @ US31 (CHARLEVOIX)	24-1	
26	North	Emmet County	US31 @ MITCHELL	24-1	
27	North	Emmet County	US31 @ CONNABLE	24-1	
28	North	Emmet County	US31, M68 (MITCHELL) @ INGALLS	24-1	
29	North	Emmet County	US131 (SPRING) @ SHERIDAN	24-1	
30	North	Emmet County	US131 @ HAYNER DR/ANDERSON RD	24-1	
31	Superior	Gogebic County	US2 (CLOVERLAND) @ Luxmore St	27-1	
32	Superior	Gogebic County	US2 (CLOVERLAND) @ US2BR (DOUGLAS)	27-1	
33	Superior	Gogebic County	US2 (CLOVERLAND) @ LAKE ST	27-1	
34	Southwest	Kalamazoo County	I94BL, US131BR (STADIUM) @ SENECA LN	39-1	
35	Southwest	Kalamazoo County	I94BL, US131BR (STADIUM) @ 12TH ST, DRAKE RD	39-1	
36	Southwest	Kalamazoo County	US131 @ BL94 (Stadium)	39-1	
37	Southwest	Kalamazoo County	I94 @ WESTNEDGE AVENUE (SPUI)	39-2	
38	Superior	Menominee County	US41 (10TH) @ 13TH (BROADWAY)	55-1	
39	Superior	Menominee County	US41 (10TH) @ 14TH AVE	55-1	
40	Superior	Menominee County	US41 (10TH) @ 30TH AVE	55-1	
41	Superior	Menominee County	US41 (10TH ST) @ US41 (10TH AVE)	55-1	
42	Superior	Menominee County	US41 (10TH) @ M35 (N SHORE DR)	55-1	
43	University	Monroe County	US24 (TELEGRAPH) @ M125 (MONROE)	58-1	
44	University	Monroe County	M125 (MONROE) @ 3RD	58-1	
45	University	Monroe County	M125 (MONROE) @ NADEAU RD	58-1	
46	University	Monroe County	M125 (MONROE) @ M50 (FRONT)	58-1	
47	University	Monroe County	M125 (MONROE) @ 2ND	58-1	
48	University	Monroe County	M125 (MONROE) @ STEWART & COLE	58-1	
49	University	Monroe County	M125, M50 (MONROE) @ M50 (ELM)	58-1	
50	University	Monroe County	M125 (MONROE) @ 6TH	58-1	
51	University	Monroe County	M125 (MONROE) @ M50 (FIRST)	58-1	
52	University	Monroe County	M125 (MONROE) @ FRENCHTOWN MALL	58-1	
53	University	Monroe County	M125 (MONROE) @ NOBLE ST	58-1	
54	University	Monroe County	US24 (TELEGRAPH) @ STERNS RD	58-2	
55	University	Monroe County	US24 (TELEGRAPH) @ M151 & LUNA PIER RD	58-2	
56	University	Monroe County	US24 (TELEGRAPH) @ ALBAIN RD	58-2	
57	Grand	Montcalm County	M91 (LAFAYETTE) @ GROVE	59-1	*
58	Grand	Montcalm County	M91 (LAFAYETTE) @ CASS ST	59-1	*

#	Region	County	Intersection Description	Signal Grouping ID	1st 5% of Intersections to Install
59	Grand	Montcalm County	M91 (LAFAYETTE) @ VAN DEINSE ST	59-1	*
60	Grand	Montcalm County	M91 (LAFAYETTE) @ CHARLES ST	59-1	*
61	Grand	Montcalm County	M91 (LAFAYETTE) @ M57 (WASHINGTON)	59-1	*
62	Grand	Ottawa County	US-31 (BEACON) @ ROBBINS RD	70-1	
63	Grand	Ottawa County	US-31 (BEACON) SB @ MCDONALDS DR	70-1	
64	Grand	Ottawa County	US-31 @ COMSTOCK ST	70-1	
65	Grand	Ottawa County	US-31 (BEACON) @ TAYLOR	70-1	
66	Grand	Ottawa County	US-31 (BEACON) SB @ COLUMBUS ST	70-1	
67	Grand	Ottawa County	US-31 NB @ X-OVER S. OF HAYES	70-1	
68	Grand	Ottawa County	US-31 (BEACON) @ GRANT ST	70-1	
69	Grand	Ottawa County	US-31 SB @ X-OVER N. OF COMSTOCK ST.	70-1	
70	Grand	Ottawa County	US-31 (BEACON) @ JACKSON ST	70-1	
71	Grand	Ottawa County	US-31 @ HAYES RD	70-1	
72	Grand	Ottawa County	US-31 (BEACON) @ WASHINGTON AVE	70-1	
73	Grand	Ottawa County	US-31 NB @ X-OVER S. OF ROBBINS	70-1	
74	Grand	Ottawa County	US-31 @ FERRIS ST	70-1	
75	Grand	Ottawa County	US-31 @ QUINCY ST	70-2	
76	Grand	Ottawa County	US-31 @ RILEY ST	70-2	
77	Grand	Ottawa County	US-31 SB @ X-OVER N. OF RILEY ST.	70-2	
78	Grand	Ottawa County	US-31 SB @ X-OVER N. OF JAMES ST	70-2	
79	Grand	Ottawa County	US-31 SB @ X-OVER N. OF FELCH ST	70-2	
80	Grand	Ottawa County	US-31 NB @ X-OVER S. OF JAMES ST	70-2	
81	Grand	Ottawa County	US-31 NB @ X-OVER S. OF FELCH ST	70-2	
82	Grand	Ottawa County	US-31 @ FELCH ST	70-2	
83	Grand	Ottawa County	US-31 @ James St	70-2	
84	Grand	Ottawa County	US31 BYPASS @ 16TH ST	70-3	
85	Grand	Ottawa County	US31 BYPASS @ 32ND ST	70-3	
86	Grand	Ottawa County	US31 BYPASS @ 24TH ST	70-3	
87	Grand	Ottawa County	US31 BYPASS @ 8TH ST	70-3	
88	Grand	Ottawa County	US31 BYPASS SB @ XOVER N OF 8TH ST	70-3	
89			3 MILE RD. @ MEIJER DR.	73-1	
90	Metro	Wayne County	M1 (WOODWARD) @ FISHER FWY SB SERV DR	82-1	
91	Metro	Wayne County	M1 (WOODWARD) @ ADELAIDE & SIBLEY ST	82-1	
92	Metro	Wayne County	M1 (WOODWARD) @ FOREST	82-1	
93	Metro	Wayne County	M1 (WOODWARD) @ PARSONS	82-1	
94	Metro	Wayne County	M1 (WOODWARD) @ WARREN	82-1	
95	Metro	Wayne County	M1 (WOODWARD) @ BALTIMORE	82-1	
96	Metro	Wayne County	M1 (WOODWARD) @ ELIZABETH	82-1	

#	Region	County	Intersection Description	Signal Grouping ID	1st 5% of Intersections to Install
97	Metro	Wayne County	M1 (WOODWARD) @ CANFIELD	82-1	
98	Metro	Wayne County	M1 (WOODWARD) @ KIRBY	82-1	
99	Metro	Wayne County	M1 (WOODWARD) @ GRAND BLVD	82-1	
100	Metro	Wayne County	M1 (WOODWARD) @ CHICAGO AVE & ARDEN PARK	82-1	
101	Metro	Wayne County	M1 (WOODWARD) @ MARTIN LUTHER KING JR & MACK	82-1	
102	Metro	Wayne County	M1 (WOODWARD) @ ANTOINETTE & MEDBURY	82-1	
103	Metro	Wayne County	M1 (WOODWARD) @ ADAMS	82-1	
104	Metro	Wayne County	M1 (WOODWARD) @ ALEXANDRINE	82-1	
105	Metro	Wayne County	M1 (WOODWARD) @ FARNSWORTH & PUTNAM	82-1	
106	Metro	Wayne County	M1 (WOODWARD) @ MILWAUKEE	82-1	
107	Metro	Wayne County	M1 (WOODWARD) @ CLAIRMONT & OWEN	82-1	
108	Metro	Wayne County	M1 (WOODWARD) @ MONTCALM	82-1	
109	Metro	Wayne County	M1 (WOODWARD) @ PETERBORO & ERSKINE	82-1	
110	Metro	Wayne County	M1 (WOODWARD) @ PALMER	82-1	
111	Metro	Wayne County	M1 (WOODWARD) @ FISHER FWY NB SERV DR	82-1	
112	Metro	Wayne County	US-12(MICHIGAN) @ SCHAEFER RD	82-10	
113	Metro	Wayne County	US-12(MICHIGAN) @ OAKMAN BLVD	82-10	
114	Metro	Wayne County	US-12(MICHIGAN) @ SCHLAFF AVE	82-10	
115	Metro	Wayne County	US-12(MICHIGAN) @ CALHOUN ST	82-10	
116	Metro	Wayne County	US-12(MICHIGAN) @ MILLER RD	82-10	
117	Metro	Wayne County	US-12(MICHIGAN) @ MAPLE RD	82-10	
118	Metro	Wayne County	US-12(MICHIGAN) @ JONATHON ST (S LEG)	82-10	
119	Metro	Wayne County	M-85 (OLD M3 FORT) @ 1ST ST	82-11	
120	Metro	Wayne County	M-85 (OLD M3 FORT) @ SHELBY	82-11	
121	Metro	Wayne County	M-85 (OLD M3 FORT) @ 3RD ST	82-11	
122	Metro	Wayne County	M-85 (OLD M3 FORT) @ CASS AVE	82-11	
123	Metro	Wayne County	M-85 (OLD M3 FORT) @ GRISWOLD	82-11	
124	Metro	Wayne County	M-85 (OLD M3 FORT) @ 2ND ST	82-11	
125	Metro	Wayne County	M-85 (OLD M3 FORT) @ WASHINGTON	82-11	
126	Metro	Wayne County	M-3(RANDOLPH) @ CONGRESS ST / CADILLAC SQUARE	82-12	
127	Metro	Wayne County	M-3(RANDOLPH) @ M-3(GRATIOT) / BROADWAY ST / MACOMB ST	82-12	
128	Metro	Wayne County	M-3(RANDOLPH) @ BATES ST / LAFAYETTE ST	82-12	
129	Metro	Wayne County	M-3(RANDOLPH) @ MONROE ST	82-12	
130	Metro	Wayne County	M1 (WOODWARD) @ MANCHESTER	82-2	
131	Metro	Wayne County	M1 (WOODWARD) @ PILGRIM & FERRIS	82-2	

#	Region	County	Intersection Description	Signal Grouping ID	1st 5% of Intersections to Install
132	Metro	Wayne County	M1 (WOODWARD) @ GERALD ST	82-2	
133	Metro	Wayne County	M1 (WOODWARD) @ CALVERT & TROWBRIDGE AVE	82-2	
134	Metro	Wayne County	M1 (WOODWARD) @ HAZELWOOD & HOLBROOK	82-2	
135	Metro	Wayne County	M1 (WOODWARD) @ 6 MILE RD (MC NICHOLS)	82-2	
136	Metro	Wayne County	M1 (WOODWARD) NB @ W GRIXDALE & XOVER	82-2	
137	Metro	Wayne County	M1 (WOODWARD) @ SEARS & FORD DR	82-2	
138	Metro	Wayne County	M1 (WOODWARD) @ STATE FAIR AVE	82-2	
139	Metro	Wayne County	M1 (WOODWARD) @ M8 (DAVISON) EB SERVICE DR	82-2	
140	Metro	Wayne County	M1 (WOODWARD) SB @ XOVER 125' S OF NEVADA	82-2	
141	Metro	Wayne County	M1 (WOODWARD) @ 7 MILE RD	82-2	
142	Metro	Wayne County	M1 (WOODWARD) @ CORTLAND	82-2	
143	Metro	Wayne County	M1 (WOODWARD) @ STATE FAIR ENTRY GATE # 5	82-2	
144	Metro	Wayne County	M1 (WOODWARD) @ GRAND	82-2	
145	Metro	Wayne County	M1 (WOODWARD) @ CHARLOTTE	82-2	
146	Metro	Wayne County	M1 (WOODWARD) NB @ XOVER 125' S OF STRATHCONA	82-2	
147	Metro	Wayne County	M1 (WOODWARD) SB @ XOVER 125' S OF GRIXDALE	82-2	
148	Metro	Wayne County	M1 (WOODWARD) @ BUENA VISTA	82-2	
149	Metro	Wayne County	M1 (WOODWARD) @ MERRILL PLAISANCE	82-2	
150	Metro	Wayne County	M1 (WOODWARD) @ EUCLID AVE	82-2	
151	Metro	Wayne County	M1 (WOODWARD) NB @ XOVER S OF 7 MILE RD	82-2	
152	Metro	Wayne County	M1 (WOODWARD) @ TUXEDO & TENNYSON AVE	82-2	
153	Metro	Wayne County	M1 (WOODWARD) @ STATE FAIR BUS LOOP	82-2	
154	Metro	Wayne County	M1 (WOODWARD) @ M8 (DAVISON) WB SERVICE DR	82-2	
155	Metro	Wayne County	M1 (WOODWARD) SB @ XOVER N OF 7 MILE RD	82-2	
156	Metro	Wayne County	M1 (WOODWARD) @ GLENDALE & MCLEAN AVE	82-2	
157	Metro	Wayne County	M1 (WOODWARD) NB @ W NEVADA & XOVER	82-2	
158	Metro	Wayne County	M-10(JEFFERSON) @ BRUSH ST	82-3	
159	Metro	Wayne County	M-10(JEFFERSON) @ M-3(RANDOLPH)	82-3	
160	Metro	Wayne County	M-10(JEFFERSON) @ GRISWOLD ST	82-3	
161	Metro	Wayne County	M-10(JEFFERSON) @ BEAUBIEN ST	82-3	
162	Metro	Wayne County	M-10(JEFFERSON) @ M-1(WOODWARD)	82-3	
163	Metro	Wayne County	M-3(GRATIOT) @ ST. ANTOINE ST	82-4	

#	Region	County	Intersection Description	Signal Grouping ID	1st 5% of Intersections to Install
164	Metro	Wayne County	M-3 (GRATIOT) @ I-94 EB OFF RAMP (EDSEL FORD)	82-4	
165	Metro	Wayne County	M-3(GRATIOT) @ E GRAND BLVD	82-4	
166	Metro	Wayne County	M-3(GRATIOT) @ WARREN AVE	82-4	
167	Metro	Wayne County	M-3(GRATIOT) @ RUSSELL ST	82-4	
168	Metro	Wayne County	M-3(GRATIOT) @ MCDOUGALL ST	82-4	
169	Metro	Wayne County	M-3(GRATIOT) @ MCCLELLAN ST	82-4	
170	Metro	Wayne County	M-3(GRATIOT) @ FOREST AVE	82-4	
171	Metro	Wayne County	M-3(GRATIOT) @ MACK AVE	82-4	
172	Metro	Wayne County	M-3(GRATIOT) @ ANTIETAM AVE	82-4	
173	Metro	Wayne County	M-3(GRATIOT) @ MT ELLIOT ST	82-4	
174	Metro	Wayne County	M-3(GRATIOT) @ BURNS ST	82-4	
175	Metro	Wayne County	M-3(GRATIOT) @ VERNOR HWY / ADELAIDE ST	82-4	
176	Metro	Wayne County	M-3 (GRATIOT) @ HARPER AVE	82-4	
177	Metro	Wayne County	M-3(GRATIOT) @ MCNICHOLS RD / SEYMOUR ST	82-4	
178	Metro	Wayne County	M-3(GRATIOT) @ LAPPIN ST	82-4	
179	Metro	Wayne County	M-3(GRATIOT) @ M-97(GUNSTON)	82-4	
180	Metro	Wayne County	M-3(GRATIOT) @ LINNHURST ST	82-4	
181	Metro	Wayne County	M-3(GRATIOT) @ FINDLAY ST / FILBERT ST	82-4	
182	Metro	Wayne County	M-3(GRATIOT) @ 7 MILE RD	82-4	
183	Metro	Wayne County	M-3 (GRATIOT) @ I-94 WB OFF RAMP (EDSEL FORD)	82-4	
184	Metro	Wayne County	M-3 (GRATIOT) @ CONNOR ST	82-4	
185	Metro	Wayne County	M-3 (GRATIOT) @ OUTER DR	82-4	
186	Metro	Wayne County	M-3 (GRATIOT) @ MARCUS AVE	82-4	
187	Metro	Wayne County	M-3(GRATIOT) @ ST AUBIN ST	82-4	
188	Metro	Wayne County	M-3(GRATIOT) @ HOUSTON WHITTIER ST	82-4	
189	Metro	Wayne County	M-3(GRATIOT) @ M-53(VAN DYKE)	82-4	
190	Metro	Wayne County	M-3(GRATIOT) @ CHENE ST	82-4	
191	Metro	Wayne County	M-3(GRATIOT) @ HAZELRIDGE ST / HICKORY ST	82-4	
192	Metro	Wayne County	M-3(GRATIOT) @ STATE FAIR ST	82-4	
193	Metro	Wayne County	M-3(GRATIOT) @ I-75 OFF RAMP / JAY ST	82-4	
194	Metro	Wayne	M-3 (GRATIOT) @ FRENCH RD	82-4	
195	Metro	Wayne County	M-3(GRATIOT) @ BRUSH ST	82-4	
196	Metro	Wayne County	M-3(GRATIOT) @ BEAUBIEN ST	82-4	
197	Metro	Wayne County	I-375 (CHRYSLER) SB OFF-RAMP @ MADISON / ST. ANTOINE	82-4	
198	Metro	Wayne County	M-5(GRAND RIVER) @ PACIFIC ST / WHITNEY ST	82-5	
199	Metro	Wayne County	M-5(GRAND RIVER) @ GRAND BLVD	82-5	

#	Region	County	Intersection Description	Signal Grouping ID	1st 5% of Intersections to Install
200	Metro	Wayne County	M-5(GRAND RIVER) @ HENRY ST / CASS TECH H.S.	82-5	
201	Metro	Wayne County	M-5(GRAND RIVER) @ M-10(LODGE) NB S.D. / TEMPLE ST.	82-5	
202	Metro	Wayne County	M-5(GRAND RIVER) @ M-10(LODGE) SB S.D.	82-5	
203	Metro	Wayne County	M-5(GRAND RIVER) @ FOREST ST	82-5	
204	Metro	Wayne County	M-5(GRAND RIVER) @ I-94 WB S.D.	82-5	
205	Metro	Wayne County	M-5(GRAND RIVER) @ SCOTTEN ST / LOTHROP ST	82-5	
206	Metro	Wayne County	M-5(GRAND RIVER) @ I-75 SB S.D. (NORTH S.D.)	82-5	
207	Metro	Wayne County	M-5(GRAND RIVER) @ WARREN AVE / 16TH ST	82-5	
208	Metro	Wayne County	M-5(GRAND RIVER) @ MAPLEWOOD ST / QUINCY ST	82-5	
209	Metro	Wayne County	M-5(GRAND RIVER) @ 1ST ST	82-5	
210	Metro	Wayne County	M-5(GRAND RIVER) @ CANFIELD ST / BUCHANAN ST	82-5	
211	Metro	Wayne County	M-5(GRAND RIVER) @ I-94 EB S.D.	82-5	
212	Metro	Wayne County	M-5(GRAND RIVER) @ M.L. KING JR BLVD / TRUMBULL ST	82-5	
213	Metro	Wayne County	M-5(GRAND RIVER) @ I-75 NB S.D. (SOUTH S.D.)	82-5	
214	Metro	Wayne County	M-5(GRAND RIVER) @ MCGRAW ST	82-5	
215	Metro	Wayne County	M-5(GRAND RIVER) @ CASS AVE / MIDDLE ST	82-5	
216	Metro	Wayne County	M-5(GRAND RIVER) @ ROSA PARKS BLVD (12TH ST)	82-5	
217	Metro	Wayne County	M-5(GRAND RIVER) @ HANCOCK ST / 15TH ST	82-5	
218	Metro	Wayne County	M-5(GRAND RIVER) @ LINWOOD ST	82-5	
219	Metro	Wayne County	M-5(GRAND RIVER) @ 2ND ST	82-5	
220	Metro	Wayne County	M-5(GRAND RIVER) @ VINEWOOD / DEXTER	82-5	
221	Metro	Wayne County	I96 (JEFFRIES) WB off ramp @ JOY RD	82-5	
222	Metro	Wayne County	I75 (FISHER) SB ON RAMP @ SCHAEFER HWY	82-5	
223	Metro	Wayne County	I-75 (FISHER) @ SECOND ST	82-5	
224	Metro	Wayne County	I-75 (FISHER) NB/SB SD @ 3RD	82-5	
225	Metro	Wayne County	M-5(GRAND RIVER) @ I-96 SB S.D. / BRYDEN ST	82-6	
226	Metro	Wayne County	M-5(GRAND RIVER) @ SCHAEFER HWY	82-6	
227	Metro	Wayne County	M-5(GRAND RIVER) @ UNDERWOOD ST	82-6	
228	Metro	Wayne County	M-5(GRAND RIVER) @ PLYMOUTH / CLOVERLAWN	82-6	
229	Metro	Wayne County	M-5(GRAND RIVER) @ SCHOOLCRAFT / FREELAND ST	82-6	
230	Metro	Wayne County	M-5(GRAND RIVER) @ WYOMING ST	82-6	

#	Region	County	Intersection Description	Signal Grouping ID	1st 5% of Intersections to Install
231	Metro	Wayne County	M-5(GRAND RIVER) @ I-96 NB S.D. / AMERICAN ST (SEE SPOT 079)	82-6	
232	Metro	Wayne County	M-5(GRAND RIVER) @ I-96 WB S.D. EAST OF SCHAEFER	82-6	
233	Metro	Wayne County	M-5(GRAND RIVER) @ ROBSON ST	82-6	
234	Metro	Wayne County	M-5(GRAND RIVER) @ JOY RD	82-6	
235	Metro	Wayne County	M-5(GRAND RIVER) @ BILTMORE ST	82-6	
236	Metro	Wayne County	M-5(GRAND RIVER) @ MEYERS RD / FULLERTON ST	82-6	
237	Metro	Wayne County	M-5(GRAND RIVER) @ GREENFIELD RD	82-6	
238	Metro	Wayne County	M-5(GRAND RIVER) @ LIVERNOIS AVE	82-6	
239	Metro	Wayne County	M-5(GRAND RIVER) @ OHIO ST	82-6	
240	Metro	Wayne County	M-5(GRAND RIVER) @ I-96 EB S.D. EAST OF SCHAEFER	82-6	
241	Metro	Wayne County	M-5(GRAND RIVER) @ HUBBELL ST	82-6	
242	Metro	Wayne County	I96 (JEFFRIES) EBSD @ SCHAEFER HWY	82-6	
243			Jeffries EB on ramp @ Joy (City of Detroit)	82-6	
244	Metro	Wayne County	M-85 (FORT) @ I-75 SWB S.D. & LAWNDALE ST	82-7	
245	Metro	Wayne County	M-85 (FORT) @ GREEN ST	82-7	
246	Metro	Wayne County	M-85 (FORT) @ JUNCTION ST	82-7	
247	Metro	Wayne County	M-85 (FORT) @ HARBAUGH ST	82-7	
248	Metro	Wayne County	M-85 (FORT) @ WATERMAN ST	82-7	
249	Metro	Wayne County	M-85 (FORT) @ DEARBORN ST	82-7	
250	Metro	Wayne County	M-85 (FORT) @ OAKWOOD BLVD & DENMARK ST	82-7	
251	Metro	Wayne County	M-85 (FORT) @ REISNER ST / MILLER RD	82-7	
252	Metro	Wayne County	M-85 (FORT) @ DRAGOON ST	82-7	
253	Metro	Wayne County	M-85 (FORT) @ WOODMERE ST	82-7	
254	Metro	Wayne County	M-85 (FORT) @ CAVALRY ST	82-7	
255	Metro	Wayne County	M-85 (FORT) @ SPRINGWELLS ST / WESTEND ST	82-7	
256	Metro	Wayne County	M-85 (FORT) @ LIVERNOIS AVE	82-7	
257	Metro	Wayne County	US-12(MICHIGAN) @ ROSA PARKS BLVD (12TH)	82-8	
258	Metro	Wayne County	US-12(MICHIGAN) @ CASS AVE	82-8	
259	Metro	Wayne County	US-12(MICHIGAN) @ TRUMBULL ST	82-8	
260	Metro	Wayne County	US-12(MICHIGAN) @ 14TH / VERNOR HWY	82-8	
261	Metro	Wayne County	US-12(MICHIGAN) @ 6TH ST / M-10(LODGE) SB S.D.	82-8	
262	Metro	Wayne County	US-12(MICHIGAN) @ 3RD ST	82-8	
263	Metro	Wayne County	M85 (FORT) NB @ XOVER 700' S OF SCHAEFER	82-8	
264	Metro	Wayne County	M85 (FORT) SB @ DOWNING	82-8	

#	Region	County	Intersection Description	Signal Grouping ID	1st 5% of Intersections to Install
265	Metro	Wayne County	M85 (FORT) @ SCHAEFER HWY	82-8	
266	Metro	Wayne County	M85 (FORT) NB @ VISGER AVE	82-8	
267	Metro	Wayne County	M85 (FORT) NB @ DOWNING ST	82-8	
268	Metro	Wayne County	M85 (FORT) SB @ VISGER	82-8	
	Metro	Wayne County	US-12(MICHIGAN) @ MERRIMAN RD	82-9	
270	Metro	Wayne County	US-12(MICHIGAN) WB @ XOVER 300' E. OF JOSEPHINE ST	82-9	
271	Metro	Wayne County	US-12(MICHIGAN) @ HANNAN RD	82-9	
272	Metro	Wayne County	US-12(MICHIGAN) WB @ XOVER E OF MERRIMAN	82-9	
273	Metro	Wayne County	US-12(MICHIGAN) EB @ HOWE RD	82-9	
274	Metro	Wayne County	US-12(MICHIGAN) EB @ XOVER 1915' E OF JOHN HIX	82-9	
275	Metro	Wayne County	I-275 NB OFF-RAMP @ US-12 (MICHIGAN) EB	82-9	
276	North	Wexford County	M55 @ M115 NW JCT	83-1	
277	North	Wexford County	M115 @ 13TH ST	83-1	
278	TBD	TBD	TBD	TBD	
279	TBD	TBD	TBD	TBD	
280	TBD	TBD	TBD	TBD	

Federal Provisions Addendum

The provisions in this addendum may apply if the purchase will be paid for in whole or in part with funds obtained from the federal government. If any provision below is not required by federal law for this Contract, then it does not apply and must be disregarded. If any provision below is required to be included in this Contract by federal law, then the applicable provision applies and the language is not negotiable. If any provision below conflicts with the State's terms and conditions, including any attachments, schedules, or exhibits to the State's Contract, the provisions below take priority to the extent a provision is required by federal law; otherwise, the order of precedence set forth in the Contract applies. Hyperlinks are provided for convenience only; broken hyperlinks will not relieve Contractor from compliance with the law.

1. Federally Assisted Construction Contracts

If this contract is a "**federally assisted construction contract**" as defined in 41 CRF Part 60-1.3, and except as otherwise may be provided under 41 CRF Part 60, then during performance of this Contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:

Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) The Contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the Contractor's legal duty to furnish information.

(4) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(8) The Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

2. Davis-Bacon Act (Prevailing Wage)

a. If applicable, the Contractor (and its Subcontractors) for **prime construction contracts** in excess of $2,000 must comply with the Davis-Bacon Act (40 USC 3141-3148) as supplemented by Department of Labor regulations (29 CFR Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction").

b. The Contractor (and its Subcontractors) shall pay all mechanics and laborers employed directly on the site of the work, unconditionally and at least once a week, and without subsequent deduction or rebate on any account, the full amounts accrued at time of payment, computed at wage rates not less than those stated in the advertised specifications, regardless of any contractual relationship which may be alleged to exist between the Contractor or subcontractor and the laborers and mechanics;

c. The Contractor will post the scale of wages to be paid in a prominent and easily accessible place at the site of the work;

d. There may be withheld from the Contractor so much of accrued payments as the contracting officer considers necessary to pay to laborers and mechanics employed by the Contractor or any Subcontractor on the work the difference between the rates of wages required by the Contract to be paid laborers and mechanics on the work and the rates of wages received by the laborers and mechanics and not refunded to the Contractor or Subcontractors or their agents.

3. Copeland "Anti-Kickback" Act

If applicable, the Contractor must comply with the Copeland "Anti-Kickback" Act (40 USC 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"), which prohibits the Contractor and subrecipients from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled.

4. Contract Work Hours and Safety Standards Act

If the Contract is **in excess of $100,000** and **involves the employment of mechanics or laborers**, the Contractor must comply with 40 USC 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5), as applicable.

5. Rights to Inventions Made Under a Contract or Agreement

If the Contract is funded by a federal "funding agreement" as defined under 37 CFR §401.2 (a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," the recipient or subrecipient must comply with 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.

6. Clean Air Act

If this Contract is **in excess of $150,000,** the Contractor must comply with all applicable standards, orders, and regulations issued under the Clean Air Act (42 USC 7401-7671q) and the Federal Water Pollution Control Act (33 USC 1251-1387). Violations must be reported to the federal awarding agency and the regional office of the Environmental Protection Agency.

7. Debarment and Suspension

A "contract award" (see 2 CFR 180.220) must not be made to parties listed on the government-wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

8. Byrd Anti-Lobbying Amendment

If this Contract **exceeds $100,000**, bidders and the Contractor must file the certification required under 31 USC 1352.

9. Procurement of Recovered Materials

Under 2 CFR 200.322, a non-Federal entity that is a state agency or agency of a political subdivision of a state **and its contractors** must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

Byrd Anti-Lobbying Certification

The following certification and disclosure regarding payments to influence certain federal transactions are made under FAR 52.203-11 and 52.203-12 and 31 USC 1352, the "Byrd Anti-Lobbying Amendment." Hyperlinks are provided for convenience only; broken hyperlinks will not relieve Contractor from compliance with the law.

1. FAR 52.203-12, "Limitation on Payments to Influence Certain Federal Transactions" is hereby incorporated by reference into this certification.

2. The bidder, by submitting its proposal hereby certifies to the best of his or her knowledge and belief that:

    a. No federal **appropriated** funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress on his or her behalf in connection with the awarding of any federal contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any federal contract, grant, loan, or cooperative agreement;

    b. If any funds **other than federal appropriated funds** (including profit or fee received under a covered federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress on his or her behalf **in connection with this solicitation**, the bidder must complete and submit, with its proposal, OMB standard form LLL, Disclosure of Lobbying Activities, to the Solicitation Manager; and

    c. He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of $150,000 must certify and disclose accordingly.

3. This certification is a material representation of fact upon which reliance is placed at the time of Contract award. Submission of this certification and disclosure is a prerequisite for making or entering into this Contract under 31 USC 1352. Any person making an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision is subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

Signed by:

_____

Abbas Mohaddes, President &

COO

Econolite Systems, Inc.

Date:

__09-27-2019_____