CONSULTANT SCOPE OF SERVICES

Task Work Order 2

City of Norman Traffic Management Center with Integrated Traffic Operations Console (iTOC) Operations Support

Stantec Consulting Services Inc.

BACKGROUND AND OVERVIEW

The City of Norman has invested significantly in signal system expansion with Econolite™ controllers and video detection technology under the Centracs® central software platform. Traffic signals and associated devices are currently managed from the standalone workstations in the Traffic Control Division (TCD) office, located at 1311 DaVinci Street and in the Municipal Complex downtown at 201A West Gray Street. Currently, 127 of the 156 signals are under the Econolite™ Centracs central platform. The City has extensive fiber optic outside plant with communication end equipment that integrate the traffic signals to the central platform under a data center managed by the Norman Information Technology (IT) Department. Workstation based operator interface (OI) provided to various Norman facilities with limited display, incident management, traveler information and center to center capabilities.

Further, the City is upgrading its traffic signals with Emergency Vehicle Preemption (EVP) capability with Opticom™ GPS technology along with Automated Vehicle Location (AVL) for tracking of emergency vehicles. The City has deployed transit fleet management technologies with a goal to provide better services to Norman residents. In order to better manage traffic and transit technologies, a Traffic Management Center (TMC) with an integrated platform was envisioned. A TMC should also be able to accommodate continuing expansion of signal and other technologies to manage growing Norman population and resulting automobile and pedestrian traffic.

In 2019, a detailed systems engineering analysis (SEA) for design of the City of Norman TMC, under Phase 1/TWO 1, was initiated in compliance with Federal Highway Administration's (FHWA) Rule 940 and completed in 2020 with the submission of a series of SEA documents. Several technical reports covering the data inventory and analysis, concept exploration (ConEx) with recommendations on future ITS technologies at identified safety/traffic hotspots and priority corridors, system communications, TMC Concept of Operations (ConOps), system requirements, staffing analysis, TMC space planning, and cost estimates were prepared.

Based on the SEA reports and extensive stakeholders feedback, a TMC with center to center (C2C) integration of key stakeholders such as the Norman Police Department, the Oklahoma Department of Transportation (ODOT), the University of Oklahoma (OU) Transportation Operations Center, etc., was recommended to enable more efficient management of traffic signals, traffic incidents, special events, weather emergencies, transit services and other emerging areas such as Connected and Autonomous Vehicles (CAV) and Smart City. Two TMC locations were considered: primary at the existing Building C in

the Norman Municipal Complex (HR/IT) and the secondary at the new Emergency Communications & Operations Center (ECOC) under design. This TWO scope is for the primary TMC, 201-C West Gray Street. The HR/IT building TMC facility will be redesigned to include (approximately 2100 square feet covering operator/iTOC room, server room, conference room and offices/corridor) under another contract.

All necessary TMC space planning shall be conducted and coordinated with Architect/TCD/Norman HR/IT and other stakeholders. The systems engineering documents are available upon request.

TMC DESIGN SCOPE OF SERVICES

The Consultant shall analyze and design the City of Noman TMC as discussed above with the following key services:

- Project management
- TMC analysis, design and specifications development,
- Post design services including submittal review, systems integration, and testing support for final acceptance,
- As-built plan development

Detailed descriptions of each task are below.

PROJECT MANAGEMENT AND MEETINGS

Project management activities shall include participation by the project manager and other key members of the technical team in all phases. The Consultant project manager shall be responsible for various aspects of the project administration and shall be the point of contact for contractual matters such as task work order review and execution, invoicing, project delivery, quality control, schedule, coordination, and status reporting. Project manager shall attend periodic meetings with the City as necessary. Technical meetings shall be held bi-weekly/monthly during the design and post-design period for the entire duration of the project. Additional technical meetings shall be convened as necessary.

TMC ANALYSIS

Two iTOCs (#1 and #2) shall be identically designed using the state of the art "Audio-Video over Internet Protocol" (AV/IP) concept with "A/V Encoders/transmitter," "AV Decoders/Receiver," and "A/V IP Switch" as the key communication end equipment. The iTOC 1 and 2 at the HR/IT location shall resemble a typical TMC video wall, in a smaller footprint, with traffic management and operations functions available to operators. Day-to-day functions of the City of Norman traffic engineering shall be enabled using iTOC including integration of all current City data servers such as Centracs/Signal System, roadway surveillance monitoring, incident detection and management, Transit, etc. One additional iTOC (#3) shall be designed similar to #1 and #2 but no data server integration required as this unit will be for future relocation to the ECOC secondary TMC (STMC) room. The iTOC #3 shall be stored in a different room as designated by the City until the ECOC is completed and a separate TWO is authorized for its relocation and integration.

Each modular iTOC shall accommodate two operator seats (4 seats total) and designed with three large 55" 4K video curved monitors, not to exceed 12 feet in total length constituting the upper monitoring area. The lower monitoring area of the iTOC shall contain four (4) dual 49" curved monitors as shown in the iTOC concept/rendering below. The City of Norman data servers shall be integrated through the client PCs per design plans, for displaying and switching among various Norman data sources/feeds and various monitors.

The upper monitoring area shall allow Norman traffic/transit platforms to be viewed with higher density as windows could be sized based on the TMC room dimension allowing for various combinations and monitor aggregations when needed with simultaneous windows. Each CCTV camera feed could be displayed in series of smaller windows.

As an example of display capabilities, a City of Norman TMC operator shall be able to view the overall signal system map with status of signals as operational or non-operational, available cameras and ITS resources such as Bluetooth travel time or arterial dynamic message sign (ADMS) systems fully zoomed out across one 55" curved monitoring area while the other two 55" monitors dedicated to key signal corridor camera feeds during an incident condition. An operator can open ADMS window for message creation, WAZE for crowd sourced traveler information and comments, Oklahoma road conditions website, and C2C module to inform and coordinate with stakeholders such as Norman Police/Fire/Medical and University of Oklahoma (OU) Traffic Operations Center (TOC). Each iTOC shall allow changing of the Norman device/server sources to review best options to manage the incident including transit vehicle locations and emergency management in the lower monitoring screens.

Figure 1: Integrated Traffic Operations Console (iTOC) Rendering
Disclaimer: Actual product will vary and may not resemble rendering as a whole

The iTOC hardware and software capabilities shall include:

- Install innovative hardware and software platforms integrating the control of disparate systems using Audio Video (AV) over IP.
- Develop a collaborative work environment with secure/multiuser keyboard video and mouse (KVM) peripheral control of five (5) types of data sources for each operator (10 rack PCs today for each iTOC)
- Use video display processors with integrated control station and servers
- Full cyber security with secured data exchange and protection from tampering, malware, and viruses.
- Allow for as needed local, remote, mobile based operator interfaces with unified control of multiple applications with drag and drop simplicity and customizable capabilities
- Support for mobile interaction (ability to push multi or single window layouts to specific users of iOS and/or Android devices

The following analysis shall be conducted for design of the HR/IT TMC:

- In coordination with the architect, analyze HR/IT TMC space for sufficiency in terms of iTOC placement, display/video wall and the overall interior space layout/circulation.
- Equipment, display, communication, monitors, software, server, end equipment, data center coordination and VLAN set up and operator module/furniture layout planning for the TMC space/field review.
- Coordination with Norman TCD/stakeholders on the design and operational features.
- TMC circulation plan with operator console(s), sizing of monitors, manager's office, and conference room.
- iTOC connectivity, details, and space requirement, and ergonomics.
- Server (PC) plan, feeds and sources for each operator, AV encoding, decoding, and switching including communications end equipment.
- Overall systems integration, VLAN development for iTOCs, integration at the existing Norman data centers (using the existing Layer 3 switch and Centracs server) at Norman IT/HR building.
- Develop CAT 6/7 routing/raceways and all cable integration for full iTOC operation
- Integrate with existing Uninterruptible Power Service (UPS) battery back-up/ building power and generator system
- Analyze electrical requirements - voltage drop, wire sizes, circuit breakers, and low voltage wiring
- Lightning/surge protection design/Audio/Video Circuits at each TMC location
- Review backbone communications fiber entry to the HR/IT building, TMC communication rack, end equipment, and all other communication details
- Computer server/software needs and sizing

- Develop CADD/MicroStation reference files and device technical reference sheets for plan development
- Analyze existing Centracs® Central platform module integration for remote control of signals, timings, signal coordination, special timing plan activation, and operation of ITS devices through centralized map icons
- New Centracs® modules such as CCTV control, Bluetooth based travel time and ADMS
- Data archive/storage system needs at each TMC location
- Quantities and cost estimates draft/final at each TMC location

The design and specifications package shall be developed using the City of Norman and Oklahoma Department of Transportation (ODOT) Standard Specifications for Highways (latest edition) and technical special provisions to be developed.

TMC SYSTEM REQUIREMENTS

The Consultant shall develop detailed TMC/iTOC design and integration Requirement Traceability Verifications Matrix (RTVM). The following steps shall be required:

a. Include all functional requirements for the major TMC elements under the iTOC concept in the HR/IT TMC,
b. Develop verification test cases/test plan or confirmations of how each requirement shall be verified (i.e., through standard specifications, inspection, and/or testing at each location),
c. Develop final acceptance/go-live criteria such that the operation of City's signal platform using Centracs® enabled fully and integrated with other proposed platforms (CCTV and ADMS) working seamlessly to fulfill the key objectives set forth in the City of Norman TMC design ConOps.

Deliverable: Project Requirements and RTVM -Draft and Final for HR/IT TMC location.

INTEGRATED TRAFFIC OPERATIONS CONSOLE DESIGN (HR/IT BUILDING)

Three of the **Stantec** iTOCs shall be designed and procured with two fully integrated at the proposed HR/IT TMC room and one unintegrated (but with all equipment procured for integration at a later date in ECOC). The third iTOC shall be stored in a different room (fully standalone tested and ready). Each iTOC shall be designed with two layered integrated displays and operations solution that is based on the client-server architecture. The existing City VLANs shall be designed to include iTOC clients such that remote processors request and receive data services from the City of Norman's centralized servers (host computers/data sources namely traffic and transit). iTOC client computers (designated as rack PC) provide an interface to allow an Operator to request data services of the City's servers to display the results the server returns.

The lower four monitors of iTOC display for each operator position shall be driven by RGB Spectrum's XtendPoint, while the upper three displays are driven by RGB Spectrum's Galileo™ end equipment. These two systems shall be designed to work together and empower each operator with a lower control plane

(XtendPoint) and an upper common operating picture (Galileo). Each operator can control individual keyboard and mouse behavior for any two source PCs on the lower four displays, while simultaneously controlling multiwindow display layouts on the large format video wall displays above.

The iTOC system shall enable any combination of visual resources to be viewed in user-sizeable windows in the upper displays, while the lower displays present two simultaneous PC resources, side-by-side, with integrated keyboard/mouse control. Each operator can switch between PCs in the lower plane, quickly and easily, by moving mouse from the left display into the right display and vice versa. Selection of alternate PCs to the 4 lower displays shall be enabled using an on-screen selector menu. This selector menu shall be activated via hot key (user definable). Similarly, control of multi-window layouts on the upper displays can be easily managed through simple presets via Web Browser, or via the Galileo's full suite of user interface controls. Galileo system shall provide a robust API so that user applications can be programmed to trigger scripts, affecting changes on the upper displays.

Each operator shall have discrete control of the 2 lower displays at his seated position. Operator should be able to easily change the PCs that are routed to the lower displays without changing or affecting the common operating picture above. By switching between PCs in the control plane, the operator shall have a high degree of redundancy and load balancing. Specific traffic management applications shall be dedicated to specialized, individual PCs. This unburdens individual source PCs from common issues related to multitasking such as applications freezing or otherwise impacting performance across shared network, CPU and GPU resources. This also enables operators to benefit from multiple network connections to source PCs, reducing the likelihood of downtime due to a network outage. For example, every PC can be on a different network. This shall not affect the XtendPoint routing and keyboard/mouse control, nor the Galileo's multiwindow display capabilities.

Each operator shall maintain discrete control of the lower displays for routinely controlling the two (dual output) PCs simultaneously and switching in/out other PCs at will for keyboard and mouse control, the upper displays provide a common operating picture to both seated operators. Operators can choose to divide up the upper displays into parallel viewing areas or combine resources for their mutual viewing. They can also display the same resource in multiple locations on the upper displays, varying the sizes and zoom settings, so that upper displays serve both operators optimally. Changing PCs in the lower control plane, display area does not affect the preferred layouts selected in the upper displays.

This allows the operators to see everything they wish in the upper monitoring plane, while independently switching between resources in the lower control plane. Any resource is available simultaneously to both the upper displays (monitoring) and the lower displays (keyboard and mouse control). Another important difference between the two working areas of displays is that the upper area can support an almost unlimited number of visual resources, scaled to any sized window or combination of windows. While the lower

displays shall display any two PC resources (per operator) at one time. The control of those two PCs is seamless, in that the operator needs only to move mouse between monitors 1-2 into monitors 3-4, in order to control the keyboard and mouse of the underlying PC resources

Design the system with 5 PCs for each operator (10 PCs per ITOC). Each PC shall support 2 Display Port outputs at 1080P/60Hz or 4K/30. This allows the TMC to operate at either higher frame rate or higher Rack unit (RU) requirements for each system (30 RU per iTOC X 3 iTOCs = 90 RU). That includes the 30 rack PCs. This will require 2 full racks - 6'/ 42U Rack. The rack requirements for one complete iTOC system:

- 4RU – QTY 1 Galileo GO24 per system
- 1RU – QTY 1 PDU per system
- 3RU – QTY 1 CAT RAK PLUS per system
- 5RU – QTY 5 XP RAK per system
- 7RU – QTY 1 CAT RAK PLUS per system
- 10RU – QTY 10 Upstream Source PCs per system
- Power requirements
- 100-240 VAC; 50/60 Hz / 1000 W single - Galileo GO24 per system X 3 per system
- 88-264 VAC; 47-63 Hz - PDU X 3 per system
- 90-269 VAC; 675W - Upstream Source PCs X 10 per system
- 100 x 240VAC; 44W max – XtendPoint X 12 per system

The Consultant shall develop the iTOC plans and specifications at the HR/IT TMC space as described below:

90% and 100% (Signed and Sealed) Plans and Specifications (HR/IT TMC)

The Consultant shall develop the 90% and 100% (signed and sealed) plans and specifications package for the City of Norman TMC and iTOCs. The plan package shall contain final design and quantity estimates of all bid items including the iTOCs monitors, servers, all wiring, end equipment, electrical/low voltage/CAT 6 connections, networking equipment, other communication media. Integration details for connecting the iTOCs PCs to Norman data servers (up to 5 sources) such as signal system, transit, ITS, etc. as designated during the analysis stage. Inside building CAT 6 runs connecting various communications end equipment and electrical wiring diagrams shall be included such that all required functionalities are included. The following shall be included in the 90% and 100% plan set:

- Title sheet/key sheet/signature sheet/quantities-pay items/layout sheets
- TMC/iTOC base plan sheet with equipment locations
- Conduit details and transition into the HR/IT iTOC room and associated plans

- Device system integration (end equipment) wiring plans covering iTOC integration with various client-server combinations for all applications desired such as signal system, transit, ITS etc. with Norman IT data center.
- Details of iTOC operator consoles, communications, and racks
- Electrical circuits/plans for all components (high/low voltage)
- Electrical power one-line diagram
- Voltage drops, communications, and other calculations
- Overall system block diagram and fiber allocation plan (if needed)
- Specifications package
- Conduct QA/QC markups -per QA procedure and sign off

Comments will be provided under Bluebeam or as a standalone document. An Oklahoma Engineer of Record (EOR) shall sign and seal the final documents for bid solicitation and procurement.

POST-DESIGN SERVICES/ TMC-iTOC INTEGRATION AND TESTING SUPPORT

Consultant shall support the City of Norman in administering the project as needed including regular meeting attendance with the selected TMC building modification contractor/iTOC installation/overall systems integration contractor. Specifically, the Consultant shall review contractor schedule, submittals, test plans, test results, request for information (RFI), and systems installation/implementation/integration issue resolution as necessary. Plan revisions will be provided if necessary and develop final as-built plans in electronic format.

Consultant shall support the systems integration task in the field working in close coordination with the contractor for test case verifications through inspection, testing (standalone, subsystem, and system) or through other means leading to the final acceptance. Also, technical support shall be provided for integration of the outside plant fiber communications system as needed. As-built design plans will be provided upon full acceptance of the TMC/iTOCs.

SCHEDULE

A 6-month schedule for the design services is anticipated. Post design services will depend on contractor schedule and to be decided later.