Request for Proposal
for
Smart Traffic Routing with Efficient & Effective
Traffic System (STREETS)

Issued by:
THE CITY OF DUBUQUE

Response Due Date: April 24, 2020

Must be submitted no later than 1:00 PM Central Time
Responses received after this date will be rejected

For information about this notice, and during this procurement, interested persons must contact:

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50 W 13th St
Dubuque, Iowa 52001
Phone: 563-589-4270
E-Mail: Dness@cityofdubuque.org
and carbon copy,
cravada@ecia.org and aleksandarstevanovic@hotmail.com

Issued addenda will be posted to internet website:

https://www.cityofdubuque.org/Bids.aspx
**Procurement Timetable**

The following dates are set forth for informational and planning purposes. However, the Department reserves the right to change the dates. All times listed are Central Time.

<table>
<thead>
<tr>
<th>Event/Dates</th>
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<tr>
<td><strong>Issue RFP</strong></td>
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<tr>
<td><strong>Number of returned Responses required</strong> as a single electronic PDF and be formatted to print on 8.5” x 11” pages. The proposal must be limited to 25 single-sided pages. All pages will be counted including: proposal covers, cover letter, dividers, appendices, etc. The maximum size limit of a proposal is 15 megabytes., a separate cost proposal needs to be provided with the proposal. The cost proposal will not be counted towards the 25-page limit. The cost proposal should not be more than 5 pages and need to be provided in a pdf with proposal. The proposal and cost proposal combined should not exceed 20.0 megabytes.</td>
<td>March 06, 2020</td>
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<tr>
<td>No Additional Copies of Technical Response</td>
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<td><strong>Pre-Proposal Conference</strong></td>
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<tr>
<td>[X] In person attendance is mandatory at 10:00 AM at the City of Dubuque City hall.</td>
<td>March 31, 2020</td>
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<td><strong>City Response from Pre-Proposal Conference Questions</strong></td>
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<tr>
<td><strong>Responder questions, requests for clarification, &amp; changes (no later than)</strong></td>
<td>April 10, 2020</td>
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<td><strong>City Response to questions issues (no later than)</strong></td>
<td>April 10, 2020</td>
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<td><strong>Response Due Date</strong></td>
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<tr>
<td><strong>Presentations &amp; Demonstrations</strong></td>
<td>Between May 04 through May 08, 2020</td>
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<td>“Short list” (by invitation only)</td>
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<tr>
<td><strong>Announce Successful Responder Intent to Award</strong> see note below</td>
<td>Week of May 18, 2020</td>
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<td><strong>Completion of Contract negotiations</strong> (Preparation for execution of the contract)</td>
<td>June 19, 2020</td>
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<td><strong>Contract Begins</strong></td>
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<td><strong>Contract Duration</strong></td>
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<td><strong>Intent to Award</strong></td>
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<td>Responses will be evaluated and a recommendation of award will be issued within ninety (90) days of the Response Due Date. Response prices, terms and conditions must be held firm for a 180-day period from the date of the notice of intent to award the contract.</td>
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<td>Solicitation Response</td>
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Responder agrees to sell goods/services or both at the same prices, terms and conditions to any other Iowa state agency, Regent or Political Subdivisions upon request. Please check Yes or No.

- [ ] Yes  [ ] No

Responder is an Iowa Targeted Small Business

- [ ] Yes  [ ] No
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1. **ACRONYM SHEET**

ASCT - Adaptive Signal Control Technology

ATDM - Active Transportation and Demand Management

ATIS - Advanced Traveler Information System

ATMS - Advanced Traffic Management System

ATSPM – Automated Traffic Signal Performance Measures

CAV - Connected Automated Vehicle

CCTV – Closed-Circuit Television

DMATS - Dubuque Metropolitan Area Transportation Study

DMS - Dynamic Message Sign

DOT - Department of Transportation

DSRC – Dedicated Short-Range Communications

DSS - Decision Support System

ECIA - East Central Intergovernmental Association

EPAC - Eight Phase Actuated Controller

ITS – Intelligent Transportation Systems

I2V - Infrastructure to Vehicle

LOS – Level of Service

MOT - Maintenance of Traffic

MOU – Memorandum of Understanding

MTM - Microsimulation Traffic Model

NEMA - National Electrical Manufacturers Association

O/D - Origin/Destination

SIL - Software-in-the-Loop

SPaT – Signal Phase and Timing

STREETS - Smart Traffic Routing with Efficient & Effective Traffic System

TDM - Travel Demand Model

TOC – Traffic Operation Center

UI - User Interface
2. INTRODUCTION

The City of Dubuque in partnership with East Central Intergovernmental Association (ECIA), Dubuque Metropolitan Area Transportation Study (DMATS), and Iowa DOT (Department of Transportation) hereinafter referred to as the Project Team, is contacting qualified consulting firms or project teams, hereinafter referred to as the Consultant, to develop and deploy a Smart Traffic Routing with Efficient & Effective Traffic System (STREETS) that will use traffic control strategies to enable dynamic traffic routing to maximize the use of existing roadway capacities in the Dubuque metro area. The initial deployment of STREETS covers 33 intersections shown in RED which includes integration of the STREETS software, servers, camera analytics and traffic signal enhancements within the city of Dubuque as shown in Figure 1. STREETS should be scalable to allow full buildout of the city as future phases are added.

Figure 1 below provides the study area and intersections under STREETS.
It is anticipated that the timeframe for the project will be approximately 30 months following the signing of a professional services agreement. The selected consultant will be expected to complete the contracted scope of work within the specified timeframe, under the general direction and coordination of the Project Team (Project Manager) as authorized by the overseeing committee established by the Project Team.

The City of Dubuque, ECIA, and DMATS are entities established under Iowa law and, as such, they are governed by Iowa and federal laws and regulations. These laws and regulations concern a variety of matters relevant to this project, including but not limited to, open records and open meetings, competitive bidding processes and requirements, contracting, and tort and other immunities.

3. **PROJECT BACKGROUND**

The members of the Project Team partnered together to develop the Smart Traffic Routing with Efficient & Effective Traffic System (STREETS) project. The goal of the STREETS project is to develop a smart, next generation, traffic management and control system. The STREETS project will use advanced traffic control strategies to enable dynamic traffic routing to maximize the use of existing roadway capacities in the Dubuque metropolitan area. The initial deployment of STREETS covers 33 signalized intersections within the City of Dubuque. The STREETS project seeks to employ Active Transportation and Demand Management (ATDM) strategies which will require a suite of modeling tools and methods that will enable the City of Dubuque to evaluate the potential benefits of implementing ATDM strategies in a dynamic and proactive fashion using both real-time and historic data. The benefits from implementation of STREETS include, but are not limited to:

- Reduced wear and tear on major corridors
- Reduced congestion
- Improved travel times
- Improved safety
- Reduced emissions
- Enhanced system monitoring capabilities

The full set of objectives can be seen in the STREETS Concept of Operations in REFERENCES.

Currently, the City of Dubuque operates all traffic signals and other ITS devices within City limits (including state highways). The current signal system in Dubuque includes 115 traffic signals. Most of the signal controllers are M50 Siemens controller with EPAC firmware. There are also M60 Siemens controllers located along the US 20 at grade intersections. The signal cabinets are NEMA TS-1 or TS-2. Approximately 80% of the system is connected to a fiber optic communication system which is comprised of a minimum of 24 multi-mode and 48 single mode fibers. The City currently uses Siemens’ TACTICS central management software to communicate with the traffic signal system. The City primarily uses Matrix microwave vehicle detection, with some of the smaller intersection occasionally using inductive loops. The City has 31 Acyclica devices installed throughout the city for calculating travel time and origin/destination, this number is expected to grow. The City has an extensive network of CCTV cameras which are both used for traffic surveillance and post-event investigation of the events that affect safety and security of the travelers. They also record these cameras 24/7 for 30 days via a Milestone video management system. In addition to the existing ITS devices, the City has undertaken an aggressive program to expand ITS deployment within the City including fiber optic conduit, redundant failover fiber Optic Loops, Dynamic Message Sign (DMS), Smart Sensor, Traffic Camera, and wireless communication. All these will become part of future STREETS and play roles in dynamic routing. The STREETS project intends to deliver an automatic system that gives the City staff the ability to monitor traffic operations and intervene as necessary but does not require constant or significant manual operations.
4. PROJECT NEED

The level of service in 2010 is shown in Figure 2 and the 2045 forecasted level of service is shown in Figure 3 for the corridors included in the initial network of STREETS based on the DMATS Travel Demand Model. Based on the Model results, the corridors in the study area are heavily travelled, among which most of them are at level C or D, with a few locations on US Highway 20, Asbury Rd, University Ave, and US Highway 151/61 are going to reach level of service E and F in 2010. Most of the project corridors are projected to attain level of service E and F by 2045. The Travel Demand Model also shows the “imbalanced” traffic flow on different corridors within the network. With several corridors reaching LOS F, some corridors show available capacity.

This indicated the potential of encouraging traffic rerouting to further reassign traffic to utilize the “unused” capacity. This is even more beneficial during non-recurring congestion (i.e., incidents and special events) on certain corridors while others remain free flow.

Figure 2 below provides the level of service in 2010 in DMATS area.
Figure 3 below provides the level of service in 2045 in DMATS area.

5. PROJECT OBJECTIVES

The purpose of the STREETS is to provide better (or more balanced) utilization of the City of Dubuque’s highway network infrastructure. This goal is achieved through utilization of the existing and new Intelligent Transportation Systems (to be deployed within the STREETS project), which will apply strategies to dynamically address both transportation demand and supply. It is envisioned that deployment of the STREETS will accommodate the following activities.

5.1. Data Collection

- Collect O/D data from various sources (i.e., O/D spreadsheet data from IBM that needs further post-processing)
- Prioritize usage of City owned data
- Collect real time traffic data
- Incorporate signal phasing and timing data
- Include Roadway geometry data
- Ensure that the STREETS is compatible with the existing infrastructure to vehicle (I2V) systems to integrate future Connected Automated Vehicle (CAV) data into STREETS (e.g. US 20 has ~9 intersections with DSRC road-side units).

5.2. Performance Measurement System
• Provide travel time measurement system
• Explore usage of the 3rd party data (i.e. Waze for incidents, INRIX for speeds)
• Determine Traffic State and Trigger STREETS operation
• Monitor Real Time Incident/Event
• Monitor System Assets State
• Calculate System Performance Metrics

5.3. Traffic Modeling
• Develop Traffic Demand Model to estimate O/D and other necessary data for Micro-simulation Model
• Provide Simulation model covering minimum 9 key corridors
• Provide Simulation model capable of performing traffic route assignment
• Provide Simulation model capable of interacting with DSS
• Provide Simulation model capable of replicating controller functions

5.4. Decision Support System
• Provide a User Interface (UI) for data display and manual operation
• Provide a system allowing data management
• Generate response plan (Rerouting and Signal Timing)
• Evaluate response plan (Rerouting and Signal Timing)
• Recommend an optimum and context-sensitive response plan (e.g. no rerouting heavy trucks on minor streets)

5.5. Signal System
• Evaluate and Upgrade local controllers
• Evaluate and Upgrade ATMS software
• Provide Adaptive Signal Control Technology (ASCT) System
• Integrate/use ATSPM data and framework for STREETS operations

5.6. Communication System
• Increase speed, bandwidth, and reliability of center to field communications
• Provide communication among each STREETS module
• Develop and implement network security protocols
• Evaluate future connected vehicle communications system

5.7. Advanced Traveler Information System
• Enhance and develop traveler information delivery media (i.e., DMS, 511, Smart Phone App)
• Ensure that the messages, for dissemination to travelers, are provided through an open data feed so that they can be used by multiple applications and phone apps
• Develop procedures to automate information retrieving and Alarm/Notification distribution
• Disseminate accurate and real-time congestion-related information to travelers

5.8. Operations and Maintenance
• Automate STREETS system operation to reduce staff needs
• Allow system management
• Develop MOU for STREETS maintenance between the City and ECIA
• Provide adequate staff training for the City, ECIA, and other stakeholders

It is expected that, based on previously established STREETS goals and objectives, following performance measures will be used to evaluate success of the STREETS system operations.
<table>
<thead>
<tr>
<th>GOALS</th>
<th>PERFORMANCE MEASURES</th>
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</table>
| Improve Mobility    | • Average travel time per trip for the corridor and each network  
                      • Average delay per trip (for the corridor and each network)  
                      • Travel time reliability measures  
                        o Travel time index (ratio of peak period travel times to free-flow travel time)  
                        o Buffer index: extra time needed to be on-time 95% of the time  
                      • Person and vehicle throughput  
                      • Vehicle hours traveled  
                      • # of rerouting events  
                      • # of automatic retiming due to STREETS system  
                      • Other innovative performance measures which may be able to document balanced utilization of various corridors in the network, which is one of the major outputs of the project  
                      • Consider existing and new ATSPMs |
| Reduce Congestion   | • Intersection LOS  
                      • Freeway LOS  
                      • Arterial LOS  
                      • Volume/Capacity Ratios |
| Improve Safety      | • Incident rate  
                      o # of Secondary Accidents  
                      • Accident rate  
                      o Injury  
                      o Fatality |
| Information for Travelers | • # of events disseminated (i.e., travel time information)  
                        o Per O/D pair  
                        o Construction  
                        o Incidents  
                        o Special Event  
                      • System Availability  
                        o Device up-time  
                      • 511 Usage  
                        o Number of Subscribers |

6. **PROJECT SCOPE OF SERVICES**

The STREETS includes the following major components: 1) Travel Demand Model (TDM); 2) Microsimulation Traffic Model (MTM); 3) Adaptive Signal Control Technology (ASCT); 4) Decision Support System (DSS). The STREETS will also interface with other components include, but not limited to, Advanced Traffic Management System (ATMS), Advanced Traveler Information System (ATIS), and third-party data source (i.e., Waze, INRIX). The TDM will be utilized to estimate the origin/destination (O/D) and other necessary data for the microsimulation traffic model. The MTM is to represent the current roadway network and be capable of executing traffic assignment (dynamic traffic routing) based on estimated/measured traffic impedances of the network links. The ASCT will develop optimized signal timing in real time after changes of traffic conditions are determined by STREETS. The DSS is to function as a core model which communicates with TDM, MTM, ASCT and other components, provide data exchange, dynamic routing strategy generation and integrate all components into a complete STREETS. The interaction of these components is illustrated in Figure 4.
The Selected Vendor shall design, develop, integrate, and deploy a STREETS system which includes the main components and processes as depicted in Figure 1. The major components of such a system should be:

1) Travel Demand Model (TDM);
2) Microsimulation Traffic Model (MTM);
3) Adaptive Signal Control Technology (ASCT); and
4) Decision Support System (DSS).
The STREETS will also interface with other data and performance-measurement platforms. These could include Advanced Traffic Management System (ATMS), Advanced Traveler Information System (ATIS), and third-party data sources. It is important to note that the ECIA’s TDM will provide estimated O/D tables and other necessary data for traffic models.

The MTM is to represent the current roadway network and be capable of executing traffic assignment (dynamic traffic routing) based on estimated/measured traffic impedances of the network links. The existing systems and real-time traffic characteristics are expected to come from multiple sources: City-owned field data (CCTV cameras, Acyclica, other sensors), and INRIX Travel-Time data. The ASCT will develop optimized signal timing in real time after changes of traffic conditions are determined by STREETS. The DSS is to function as a core model which communicates with TDM, MTM, ASCT and other components, provide data exchange, dynamic routing strategy generation and integrate all components into a complete STREETS system.

Built on the existing and near future ITS to be deployed, implementation of the STREETS may rely on some of the City’s investments in ITS infrastructure such as data collection and performance measurement systems, processing and dissemination systems, control algorithms, and an upgraded traffic signal system. The Selected Vendor is required to communicate with the Project Team to get a proper survey of the existing and future ITS infrastructure. Then, the Vendor needs to recognize any potential gaps in the existing or planned infrastructure (for a successful deployment of their proposed STREETS system) and integrate acquisition and deployment of such missing infrastructural components, in the cost proposal of their STREETS system. Any post-award identification of infrastructural gaps (not included in the STREETS proposal) will be a sole responsibility (to purchase and install) of the Selected Vendor.

To ensure seamless and efficient functioning of the STREETS potential vendors shall develop their proposal with a goal for STREETS to deliver:

- A high-speed, reliable communications system.
- A highly accurate, reliable detection system.
- Improved traffic signal controllers.
- A high-speed, reliable series of servers and databases.
- An automated process to transfer data.
- An automated process to analyze traffic conditions.
- An automated, highly accurate means to communicate traffic conditions to the traveling public.

6.1. SYSTEM DESIGN

The selected Vendor shall design STREETS in such a way to ensure efficient and seamless operations and integrations of following system modules:

5.1.1 Data Input
The module defines the data needs for STREETS system. This module gathers data from various data sources, compile them and feed the data into Micro-Simulation Model. O/D data can be collected from traditional survey and smart phone as well. The O/D data, traffic counts for both roadway segment and intersection turning movement, signal timing data, roadway improvement (i.e., adding a travel lane) are fed into Micro-Simulation Model to simulate existing roadway network operation and used to conduct evaluation for various operation scenarios such as normal daily operation, incident, planned or unplanned events. Special attention should be given to a variety of video feed data and their potential use and applications within the STREETS. It is expected that existing video feeds will be used both as the main system inputs and data to validate inputs and performance measures based on the other data sources.

Envisioned Deliverables for 5.1.1 – A report detailing (in a list format or similar) all of the data inputs that are fed into the STREETS, classifying the data based on their type, source, spatial and temporal levels of aggregation, intended use(s), and similar. The report should be appended with examples of various data inputs in the STREETS, in their raw textual format.

5.1.2 Performance Measurement

The module includes various field devices, and/or third-party applications (i.e. Waze, INRIX, Google) that can provide real time data to represent traffic operation and system performance. Firstly, this module is to constantly monitor traffic operations within the roadway network and detect any traffic pattern change or capacity reduction which causes unbalanced traffic assignment within the network. The field devices for traffic monitoring include CCTVs for traffic surveillance, travel time and delay evaluation system (i.e. Acyclica), and other selected technologies during system design. This module shall contain a defined process to detect, identify and verify incident, and methodology to identify potential unbalanced traffic assignment within the network (i.e., significant variation in travel time/delay for a roadway segment or unusual disparity in travel time/delay among roadways). This module can also utilize third party applications to retrieve existing information such as verified incidents, lane closure and delay and feed these data into the STREETS to trigger traffic reassignment evaluation. For example, STREETS may exchange data with Waze Connected Citizens Program (CCP) to receive real-time incident information to trigger route reassignment, and use Waze to inform drivers of major events and other roadway insights such as detouring thought the app. Secondly, this module also interacts with DSS module to provide system performance data for system reporting. Performance data such as travel times, delays, and incident clearances should be exported to STREETS. These data can be retrieved in various reports over time to indicate effectiveness of STREETS and potential for future system enhancement.

Envisioned Deliverables for 5.1.2 – 1. A suite of software and hardware components developed and established to measure and report performance of the traffic conditions relevant for the STREETS. 2. A report containing description of the hardware (e.g. field devices) and software used to measure performance of the STREETS. This report should also describe all processes and methods used to identify and verify events/incidents and unbalanced traffic assignment in the network. The report essentially needs to explain to the user how the STREETS recognizes that traffic flows on the relevant routes are not balanced and the performance measures and methods which are used to detect and verify such conditions. The report should be supported with outcomes (e.g. screenshots) from the STREETS visual aids to ensure that the report truly represent STREETS operations. This report should also document connections with all of the other STREETS modules (e.g. DSS module).
5.1.3 Traffic Modeling

The module defines the process of STREETS system. The STREETS system requires both Travel Demand Modeling (TDM) and Micro-simulation model to mimic the roadway network to be included in the system.

Travel Demand Modeling

The module contains an existing or modified regional TDM. The model provides highway passenger car and truck origin-destination trip matrices needed in development of the Micro-simulation model. The regional model highway network is used as basis for developing the Micro-simulation network.

Micro/meso-simulation Modeling

STREETS system requires the development of a micro/meso-simulation traffic model of the Dubuque metro area (including all relevant roads and all signalized intersections) to represent existing traffic conditions. The model will be capable of replicating signal operations from the field and it will produce truthful outputs of the field traffic conditions (travel times, delays, etc.) so that following traffic assignments/routing can be executed based on verified data. The model will execute traffic assignments (reroute vehicles) based on the estimated/measured traffic impedances of the network links when traffic pattern, or traffic status change is identified. Prior to integration in the STREETS system, the model will be calibrated and validated to confirm that field data (e.g. travel times between signalized intersections, intersection approach delays, average phase times) are matched properly. Under STREETS operation, a traffic status change or capacity change (i.e., verified incident, planned special events, construction actives, etc.) will trigger the running of this model. This model is utilized to run and test re-routing alternatives and validate the proposed detour routes based on the field conditions (e.g., major road work or lane closures; test the same scenario in the model and confirm that the assignment can reflect conditions observed in the field). The modeling results include traffic detour represented by (rapidly) simulated traffic flows on selected corridors after traffic reassignment within the network. Then the model will feed the information into DSS module.

Envisioned Deliverables for 5.1.3 – 1. STREETS’ micro/meso model, which should be delivered as a standalone application that can be observed within STREETS operations showing at any time modeled traffic conditions and the differences between modeled and field values for a number of the selected performance measures. The last part does not have to be integrated into the micro/meso model interface itself, but it should be accessible within the STREETS. 2. A report explaining modeling process and connections and interfaces between existing ECIA Travel Demand Model and a micro/meso simulation model developed within the STREETS.

5.1.4 Decision Support System (DSS)

The DSS is a core module of the STREETS system which integrates other modules and contains functionalities that do not exist today. This module interacts with many other modules, allows for data exchange, handle data formatting/processing, detect congestion, recommend rerouting strategy, and receive feedback from other modules. Figure 2 presents the data flow to/from DSS to all other modules of the STREETS system. The DSS provides the following functionalities in STREETS system:

- Interface the user for STREETS operation with displayed inputs and outputs and allow manual intervention as necessary
- Gather, categorize, format and compile input data from other modules
- Handle erroneous and missing data
• Store and maintain a library of pre-defined timing constraints under a variety of traffic flows
• Allows special events scheduled in STREETS system to trigger new timing plan assignment
• Receive, evaluate and recommend rerouting strategy developed by Simulation Model
• Interface with ASCT to request timing changes and receive feedback
• Interface with ATIS to request dissemination of traveling information such as alternative route(s)
• Interface with Performance Measures System to validate system performance
• Conduct system performance reporting

Envisioned Deliverables for 5.1.4 – 1. A suite of software and hardware components developed and established to provide functionalities of the DSS module. 2. A report containing description of how functionalities from the list above are achieved and executed. The report should show and explain conceptual methods and interfaces between various STREETS’ modules reinforced with a number of screenshots and other visual aids (and other system outputs) to prove STREETS’ ability to perform listed functionalities.

5.1.5 Advanced Traveler Information System (ATIS)
ATIS is an essential component of the STREETS system. ATIS provides the users of the transportation system with real-time information that could be used to make decisions about route choices, estimate travel times, and to avoid congestion. Existing and proposed DMS, a traffic website (i.e. 511) and a smart phone application are envisioned to provide this data to the users.

• Dynamic Message Signs (DMS) – DMS provides en-route information to drivers regarding traffic and roadway conditions such a travel time and recommended alternative routes.
• Smart Phone App – A free smart phone App for STREETS operation is to be included in STREETS to provide alternative route information and verify motorist’s adoption of suggested route.
• 511 – Existing or enhanced 511 system is used for dissemination of travel time and traffic route recommendation by STREETS.
• Future in-car Information dissemination system

Envisioned Deliverables for 5.1.5 – 1. Software interfaces between STREETS and other relevant software and hardware components necessary for dissemination of the necessary information to the travelers. This deliverable should include any smartphone apps developed to disseminate relevant STREETS information to the travelers. 2. A report documenting how STREETS interacts with relevant dissemination modules (e.g. DMS, 511) supported by several visual aids to document STREETS interfaces and information dissemination.

5.1.6 Adaptive Signal Control Technology (ASCT)
The STREETS system contains an ASCT system to dynamically change signal timing based on observed and predicted congestion as estimated by the Micro Simulation Model. The ASCT is expected to be fed by DSS with recommended timing plans which is triggered only after optimal traffic flows are determined through a traffic assignment procedure. The ASCT then take control and utilizes it own adaptive algorithm to adjust signal timing in a partial and progressive fashion while confirming that the proposed routing changes are implemented in the field.
Most of the existing ASCT systems require extensive vehicular detection. The ASCT deployed under STREETS shall work with both field detection data and data fed by DSS. The proposed ASCT must be integrated in the STREETS properly to enable signal timing changes to be made in real time without creating disruptions to the field operations. The ASCT shall also have a Software-in-the-Loop (SIL) capability which is compatible with the field traffic controllers. Changes made in the SIL database of the ASCT need to be seamlessly transferrable to the field controllers. The ASCT shall also contain a feedback loop which suggests signal timing changes. The adopted ASCT only implements full signal timing change for optimal traffic rerouting after the assurance from the field that the drivers are adopting/following on the suggested routing options. In case the STREETS system is malfunctioning such as no DSS not feeding data to ASCT, the ASCT shall still work individually as an independent system for its deployed corridor.

It should be noted here that some of the intersections within the City of Dubuque will be equipped with Automated Traffic Signal Performance Measures (ATSPM) which is a system that could be used tighter (if not around) the intended ASCT. Actually, several signal technology vendors already developed ASCTs which interface well with the ATSPMs and thus this option could be explored as well when deciding how to integrate signal performance measures, and necessary signal modifications, into the STREETS.

Envisioned Deliverables for 5.1.6 – 1. A functional ASCT system, either commercial off-the-shelf or developed for the purpose of this project. If the latter option is used extra efforts are expected to prove validity and quality of the ASCT operations. It should be specifically documented that operations of the ASCT are accounted by the micro/meso model so that the DSS module can base decisions on relevant interaction between route-choice and dynamic traffic signal timings, as occurring in the field and mimicked in the simulation model. 2. A report containing description of the hardware (e.g. field devices) and software used to provide ASCT functionalities within the STREETS. This report should describe all fundamental processes used by the ASCT but also supported by visual aids from ASCT/STREETS documenting realization of the intended methods and processes.

5.1.7 STREETS Logical Process

The STREETS project intends to deliver an automatic system that gives the City staff the ability to monitor traffic operations and intervene as necessary, but does not require constant or significant manual operations. Ideally, if no significant traffic disturbance events occur, STREETS will run 24/7 without requiring operators to interfere manually with traffic operations. System shall use CCTV with analytical capability or other performance measurement systems to automatically capture traffic change and trigger STREETS process. The project will reduce equipment costs at individual intersections by providing signal timings through a centralized Adaptive (Dynamic) Control Traffic System. The project will help the MPO measure the performance of the system by providing 24/7 traffic volumes and delays at all major corridors and intersections. Figure 2 describes the logical process of the proposed STREETS system.

Envisioned Deliverables for 5.1.7 – A report describing logical connections between various subsystems of the STREETS. Figure 2 is only a high-level proposal of how the system should work. The vendors are given freedom to modify the proposed concept with a strong justification and explanation why an alternative logical process would be superior. Deliverable for this task should contain description of such accomplished logical process. This deliverable, similar to many others, should be supported by concrete proofs of logical correlations between STREETS’ components.
6.2. **SYSTEM INTEGRATION**

The scope of the System Integration effort includes all application systems, online services, interfaces, and data exchanges that are envisioned to be part of the STREET S. The strategy for system integration will be to remediate, develop, and perform all testing of services that will be needed for integration of all of the STREET S components into a functional, reliable, and a user-friendly system. Wherever possible, the System Integration services will be proactively designed, constructed, and tested prior to final integration with the STREET S. A Selected Vendor is responsible for deliverables of all system remediation and services associated with applications, interfaces, and data exchanges that must be integrated within the STREET S (as shown generally in Figure 2).

Figure 2 loosely depicts an expected way on integrating STREET S system components and processes into a fully operational and meaningful system, which will be able to achieve mentioned objectives. The Selected Vendor is allowed a freedom to deviate from the proposed concept if it can justify such deviations and deliver required outcomes.
7. SYSTEM VALIDATION (ABILITY TO RESPOND TO OPERATIONAL SCENARIOS)

This section presents a number of operational scenarios that are intended to capture activities associated with operation of the system. The objective of developing operational scenarios is to capture user needs from the perspective of the users.

The operational scenarios capture the activities to be performed which are both routine and non-routine, in order to identify user needs and ultimately, develop requirements. It is important that the operational scenarios are realistic and reasonable.

The operational scenarios include the following:

- Scenario 1: Traffic Monitoring & Operations - Recurrent Congestion
- Scenario 2: Traffic Monitoring & Operations - Unplanned Event
The scenarios listed above are detailed below for the proposed system. Note that the Micro-simulation Model is calibrated and ready for use prior to testing/applying any operational scenarios.

6.1 Scenario 1: Traffic Monitoring & Operations - Recurrent Congestion
Recurrent congestion represents a normal day to day operational scenario. Under this scenario, each corridor experiences its daily traffic variation depending on time of day and there is no drastic disparity in terms of congestion level among corridors and traffic flow is assumed to be naturally assigned within the network based on impedance perceived by travelers. The ASCT shall be well calibrated based on the traffic characteristic of each corridor and function independently per corridor to adaptively optimize signal timing plan progressively based on traffic variation. The performance measurement module is constantly monitor traffic, however, no drastic traffic change over historical pattern is observed and performance data are archived by the individual component (i.e., Acyclica, CCTV data storage). The outputs from the performance measurement module should be able to document seasonal and weather variations, preempt interruptions and similar recurring events.

6.2 Scenario 2: Traffic Monitoring & Operations - Unplanned Event
This scenario represents a typical STREET operation when traffic re-routing is needed. Under this scenario, the performance measurement model constantly monitors traffic status, an unplanned event, typically a crash, is reported either by third party data, or by established incident detection algorithm (i.e. unusual travel time or delay). This triggers STREETs to run Micro-simulation Model to estimate the impact of this event. Event location (i.e., mile post of the corridor) and severity (i.e., # of lane closure) is verified via CCTV, which is entered into the simulation model. The model run is performed to reassign traffic among the roadway network. This results in simulated performance measurements and a new set of traffic flow on affected corridors. The simulated traffic flow data is fed into the DSS module. The DSS compares the simulated traffic flow and field traffic flow, with a set of predetermined criteria, it then selects new timing plans for each intersection among the impacted corridors. Presumably the intersections on corridor where the event occurs will receive more relaxed signal timing plans whereas those on corridors where traffic is reassigned to will receive a more restrictive timing plans. Before sending these plans to the ASCT system, the DSS will also examine other conditions such as truck route, school zone which may restrict or limit the deployment of new plans. Once approved, the new plans are forwarded to the ASCT system. At the same time, the DSS disseminates the recommended route information to the ATIS module such as DMS, 511 and mobile apps to inform the motorist and encourage detour. The ASCT receives the recommended timing plans and deploy them within its system, then operates based on its own adaptive algorithm to adjust timing based on varying traffic.

6.3 Scenario 3: Traffic Monitoring & Operations - Planned Event
This scenario represents another typical STREET operation (e.g. road reconstruction, a bridge closure) when traffic reassignment is needed. Under this scenario, a planned event such as a game, is scheduled ahead. The city staff shall use historical data to estimate the impact of the scheduled event and new O/D trip patterns for use in Micro-simulation Model to predict the increased traffic demand on the roadway network. Prior to the planned event, STREETs runs Micro-Simulation Model with recommended O/D pairs, predict traffic flow based on field data while the performance measurement module constantly monitors traffic status. The simulation model then feeds the simulated traffic flow data into the DSS module. The DSS compares the simulated traffic flow and field traffic flow, with a set of predetermined criteria, and then selects new signal timing plans for each intersection within the impacted corridors.
Presumably, the intersections on corridor where the planned event occurs will receive more ‘relaxed’ signal timing plans whereas those on corridors where traffic is reassigned will receive timing plans modified to accommodate extra traffic. Before sending these plans to the ASCT system, the DSS will also examine other conditions such as truck route, school zone which may restrict or limit the deployment of new plans. Once approved, the new plans will be forwarded to the ASCT system. At the same time, the DSS disseminates the recommended route and special event information to the ATIS module such as DMS, 511 and mobile apps to inform the motorists. The ASCT receives the recommended timing plans and deploy them within its system, then operates based on its own adaptive algorithm to adjust signal timings based on varying traffic.

6.4 Scenario 4: Traffic Monitoring & Operations - Maintenance

This scenario represents another typical STREET operation when traffic reassignment is needed. Maintenance can be scheduled routine preventive maintenance and emergency maintenance. For routine maintenance, a series of activities should be pre-evaluated using Micro-simulation model such as duration of maintenance, number of lane blockage and scheduled Maintenance of Traffic (MOT). The results should be a set of traffic flow variation. Prior to the scheduled maintenance, STREETs runs Micro-simulation model based on field data to verify with pre-evaluation. It then feeds DSS with simulated traffic flow. The DSS receives the new traffic flow, generates response plan, and then alerts the ASCT to modify signal timing and prompt ATIS to disseminate the new routes and event information. The routine maintenance shall be scheduled in DSS. Once the maintenance activity is completed and verified, the City staff shall command STREETs to end maintenance scenario and resume normal operation. STREETs will utilize performance data and CCTV data to verify the recovery of traffic status before commanding the system to a “normal” operation scenario.

For an emergency maintenance, STREETs treats the conditions in the same manner as for an unplanned event. Under this scenario, STREET triggers Micro-simulation Model to predict the increased traffic demand among the roadway network. Verified with field data, it feeds then the simulated traffic flow data into the DSS module. The DSS compares the simulated traffic flow and the field traffic flow, with a set of predetermined criteria, and it selects new timing plans for each intersection along the impacted corridors. Before sending these plans to the ASCT system, the DSS will also examine other conditions such as truck route, school zone which may restrict or limit the deployment of new plans. Once approved, the new plans are forwarded to the ASCT system. At the same time, the DSS disseminates the recommended route and special event information to the ATIS module such as DMS, 511 and mobile apps to inform the motorists. The ASCT receives the recommended timing plans and deploy them within its system, then operates based on its own adaptive algorithm to adjust signal timings based on varying traffic. Once the maintenance activity is completed and verified, the City staff shall command STREETs to end maintenance scenario and resume normal operations. STREETs will utilize performance data and CCTV data to verify the recovery of traffic status before commanding the system to a “normal” operation scenario.

7.1. Acceptance Testing

This section identifies specific verification reviews and acceptance testing (which could happen ‘at will’) for the STREETs deployment. The acceptance test is expected to include multiple reviews and will include one or more of the following elements:

- Demonstration of integration of the STREETs’ different software modules
- Demonstration of automated data (volume, SPaT) input to the Micro-Simulation Model
- Demonstration of receiving data (volume, SPaT) automatically from the Micro-Simulation Model
- Demonstration of Traffic Demand Modeling data (O-D) output
- Demonstration of the Micro-Simulation Model’s data accuracy
• Demonstration of Performance Measurement System’s data output
• Demonstration of transmitting SPaT data to the Decision Support System (DSS)
• Demonstrations of the Decision Support System (DSS)
• Demonstration of the Advanced Traveler Information System (ATIS)
• Field demonstrations of detection system’s data accuracy
• Demonstration of City’s existing Video Data Analytics system’s data accuracy
• Demonstration of the STREETS system’s full functionalities on hand-held devices (smart phone, tablet etc.) for the STREETS system operator
• Demonstration of the STREETS system’s full functionalities on hand-held devices (smart phone, tablet etc.) for traveler
• Demonstration of the existing City owned travel time system (Acyclica) data accuracy
• Demonstration of archiving data (volume, SPaT) sent to the Microsimulation Model on both local and cloud-based storage
• Demonstration of archiving data (volume, SPaT) output from the Microsimulation Model on both local and cloud-based storage
• Demonstration of STREETS graphic summary screen showing all of the inputs and outputs at work
• Monitoring queue management at user-specified locations
• TOC test of communications
• Remote monitoring and control of the ASCT and other components of the STREETS
• Review training materials

The verification and acceptance testing will be accomplished at approved City of Dubuque locations and at specific field locations within the City. All acceptance test procedures shall conform to the approved acceptance test plans. These tests will be completed and documented by the System Vendors and supervised by the City of Dubuque Project Manager. Operational documentation of the field components is expected to be completed with a laptop, internet connection and associated cabling. The System Vendors will need to provide multiple staff in the field and at the TOC to document certain acceptance tests.

A verification test case is a logical grouping of functions and performance criteria that are to be verified together. Each test case should contain the following:

• Name and reference number
• Objective (from requirements)
• List of requirements to be verified or traced
• Data to be recorded or noted during verification, such as expected results
• Statement of requirements met, partially met, or not met
• Comments on how requirements are met, propose action if only partially met or not met.

The following preliminary test cases have been identified:
1. Local Controller Configuration
2. Upload and Download from Central Database
3. Alarms & Notifications
4. Default Settings
5. Remote Access and Operation
6. Data input to/output from Micro-Simulation Model
7. Data input to/output from DSS
8. Data output from Performance Measurement System
9. Comparison of Traffic Demand Model output and Field Traffic Data
10. Comparison of estimated traffic assignment of the Micro-Simulation Model and DSS
11. Comparison of traffic assignment from DSS and field traffic data
12. Queue Management
13. Verification of STREETS system travel time data
14. Data Archiving

8. GENERAL REQUIREMENTS

The City is following the Iowa DOT Instruction Memorandums for local public agencies I.M 3.310.

DBE GOAL

The City has determined to set the DBE goal at 5%. It is the policy of the Iowa DOT that Disadvantaged Business Enterprises shall have the maximum practicable opportunity to participate in the performance of contracts financed in whole or in part with federal-aid highway funds. Most of the work under this contract is expected to involve federal-aid highway funds. Consultants will be expected to demonstrate a good faith effort to meet this goal, and the selection process will include an evaluation of that effort. A list of certified DBE firms may be found on Iowa DOT’s web site at: https://secure.iowadot.gov/DBE/Home/Index/

9. SELECTION INFORMATION

The Selection Committee will evaluate proposals on their ability to address the evaluation criteria. The point value of each evaluation criterion is indicated below, adding up to a total of 100 points.

- Key Staff, Experience and responsiveness– 15 Points (15%)
  - This category refers to the quality, similarity and responsiveness of the consultant on previous projects to this project. In addition, technical ability and specialized expertise of the consultant’s staff or sub consultants and demonstrate abilities to address issues is also a factor for this category.
• Technical Qualities and Past Experience – 30 Points (30%)
  o This category allows the selection committee to determine if there are certain technical qualities or understanding of the project that make one consulting firm stand out over another firm. This may include but is not limited to: the detail of their work, reputation from other agencies the firm has worked with, experience working with subcontractors or subconsultants, and the success of previous projects.

• Price – 25 Points (25%)
  o Points will be awarded in this category based on the proposed price presented by each of the consulting firms. These points will be awarded after the other points are awarded.

• Work Plan and Timeline – 5 Points (5%)
  o Points will be awarded in this category based on the proposed timeline and work plan to meet schedule that is presented by each of the vendors.

• Understanding Local Issues and Resources Available to Complete the Project – 10 Points (10%)
  o This category awards points based on the staff available to work on the project, other projects the company is working on, the location of a firm and the technological resources available to complete the project. Show possible examples of risk management and mitigation.

• Knowledge of Federal and State Regulations and Ability to Work with Lead Agencies – 5 Points (5%)
  o Points will be awarded for coordination abilities with lead agencies and knowledge of Federal and State regulations. This may include but is not limited to: Federal Highway Administration, Iowa Department of Transportation, State Historic Preservation Office.

• DBE Participation – 5 Points (5%)
  o The Selection Team will consider the Project Team’s willingness and ability to meet or exceed the established DBE involvement goal as stated in “General Requirements”.

10. PROPOSAL REQUIREMENTS

Please provide the following information in the order listed:

• All responders must provide adequate information on the response’s cover page to clearly identify the submittal is for the Smart Traffic Routing with Efficient & Effective Traffic System (STREETS) along with the replying firm and an email for the point of contact for the firm.

• Include your firm’s approach to addressing the identified tasks, your eligibility to meet the requirements of the “Required Work Categories” for the work you intend to perform, your understanding of the project’s scope and key issues. Briefly discuss similar projects the members on your team have completed in the past three to five years. This listing should be limited to the three most applicable projects.
• Include the name, qualifications, experience, office address and availability of the contract manager as well as the manager in charge of each major work task. This information should include the identification of similar projects managed or participated in by these individuals. The selection of a contract manager and work task managers by a firm will constitute a commitment by that firm and NO substitute managers will be allowed without prior written approval by the Iowa DOT.

• Include experience and qualifications as related to the “Required Work Categories” for any sub-consultants to be used and work they will perform.

• Include a detailed resume, summary of current workload and a time commitment for each professional or technical person to be assigned to the project. Identify the principal or manager who will serve as the project manager.

• A project schedule outlining the timeline and estimated completion date of each major task identified in your scope of work. This should include a schedule with a description of all deliverable products throughout the period. A graphical representation of the proposed schedule should be included.

• The location of the office where the majority of work will be performed.

• A disclosure of all work for other clients that may be affected by work on the proposed contract to avoid a potential conflict of interest.

• Include a statement that the consultant will meet the DBE goal. If the consultant cannot meet the minimum goal, include a commitment statement for the percentage of participation that they can meet.

• Inclusion of promotional literature of a general nature will not be considered in the selection process.

The proposal must be submitted as a single electronic PDF and be formatted to print on 8.5” x 11” pages. The proposal must be limited to 25 single-sided pages. All pages will be counted including: proposal covers, cover letter, dividers, appendices, etc. The maximum size limit of a proposal is 15 megabytes. A separate cost proposal needs to be provided with the proposal. The cost proposal will not be counted towards the 25-page limit. The cost proposal should not be more than 5 pages and need to be provided in a pdf format with the proposal. The proposal and cost proposal combined should not exceed 20.0 megabytes.

The electronic proposal must be submitted via email to Dness@cityofdubuque.org and carbon copy, cravada@ecia.org and aleksandarstevanovic@hotmail.com. An email will be sent confirming receipt of the proposal within 30 minutes or by 3:00 p.m. on the submittal deadline date, whichever is later.

Proposals are due by 1:00 pm on April 24, 2020.

Any technical questions or questions regarding this RFP shall be submitted via email to Dness@cityofdubuque.org and carbon copy cravada@ecia.org and aleksandarstevanovic@hotmail.com. Any questions about this RFP must be received by noon on April 10, 2020. Questions and answers regarding this RFP will be posted with the RFP on the city website, https://www.cityofdubuque.org/Bids.aspx

Any proposal not complying with all requirements stated in the RFP may not be accepted.
11. PUBLIC RECORD LAW
The City of Dubuque will treat all information submitted by a consultant as open records following the conclusion of the selection process. Open records are public records that are open for public examination and copying. The City of Dubuque’s release of records is governed by Iowa Code Chapter 22 and 761 IAC Chapter 4. Consultants are encouraged to familiarize themselves with these laws before submitting a proposal.

12. STATEMENT OF NON-DISCRIMINATION
The selection and contract are subject to the provisions of Executive Order 11246 (Affirmative Action to Insure Equal Employment Opportunity). Federal and state laws prohibit employment and/or public accommodation discrimination on the basis of age, color, creed, disability, gender identity, national origin, pregnancy, race, religion, sex, sexual orientation or veteran’s status. If you believe you have been discriminated against, please contact the Iowa Civil Rights Commission at 800-457-4416 or Iowa DOT’s affirmative action officer at 515-239-1422. If you need accommodations because of a disability to access the Iowa DOT’s services, contact the agency's civil rights/ADA coordinator at: 515-239-1514

13. REFERENCES
I.M. No. 3.310 Federal-aid Participation in Consultant Costs

PPM 300.12 – Negotiated Contracts for Architectural, Engineering, and Related Professional and Technical Services (http://www.prof-tech-consultant.dot.state.ia.us/uploads/300_12.pdf)

Smart Traffic Routing with Efficient & Effective Traffic System (STREETS) --