

## **Revised Support Material Agenda Item No. 5**

### **Board of Directors Metro Valley Study Session**

**August 11, 2016**

**9:30 a.m.**

#### **Location**

San Bernardino Associated Governments

First Floor Lobby

1170 W. 3<sup>rd</sup> Street, San Bernardino, California 92410

## **Discussion Calendar**

### **Project Delivery**

#### **5. San Bernardino Valley Coordinated Traffic Signal System (SBVCTSS) - Future Operation and Maintenance**

That the following be reviewed and recommended for final approval by the Board of Directors, acting as the San Bernardino County Transportation Authority at a regular scheduled Board meeting:

A. Authorize release of Request for Proposal (RFP) 16-1001515 to retain a consultant for the preparation of updated Coordination Timing Plans, to provide Semi-Annual Assessments and provide On-call System Support for the San Bernardino Valley Coordinated Traffic Signal System (SBVCTSS).

B. Approve the draft templates of Cooperative Agreements between the San Bernardino County Transportation Authority (SANBAG) and local agencies (Chino, Chino Hills, Colton, Fontana, Grand Terrace, Highland, Loma Linda, Montclair, Ontario, Rancho Cucamonga, Redlands, Rialto, San Bernardino City, San Bernardino County, Upland and Yucaipa) establishing responsibilities to maintain, monitor, assess and funding of the San Bernardino Valley Coordinated Traffic Signal System.

C. Authorize the Executive Director or designee to execute the final Cooperative Agreements with local agencies after approval as to form by General Counsel without further approval by the Board, provided the Cooperative Agreements are substantially in the form of the attached draft templates.

*Attached is the revised scope of work.*

## **SCOPE OF SERVICES**

### **San Bernardino Valley Coordinated Traffic Signal System Program Update Coordination Timing Plans, Semi-Annual Assessments and On-call System Support**

San Bernardino Associated Governments, acting as San Bernardino County Transportation Authority ("SANBAG") is seeking professional services to update existing coordinated traffic signal timing plans in order to reduce travel times and number of stops, and increase average speeds along coordinated routes, perform semi-annual system assessments and provide on-call system support for the San Bernardino Valley Coordinated Traffic Signal System (SBVCTSS) corridors. The SBVCTSS was implemented using a tiered approach with Tiers 1 and 2 completed in 2008 and Tiers 3 and 4 completed in 2012. There are 78 arterial corridors in the SBVCTSS with over 1,250 signalized intersections controlled by sixteen (16) local agencies (Chino, Chino Hills, Colton, Fontana, Grand Terrace, Highland, Loma Linda, Montclair, Ontario, Rancho Cucamonga, Redlands, Rialto, San Bernardino City, San Bernardino County, Upland and Yucaipa) and Caltrans.

#### **Update Coordination Timing Plans**

The updating of the timing plans will be jointly funded by SANBAG and each local agency in which the corridors are located as described by a cooperative agreement between SANBAG and the local agency. The cooperative agreement will describe the corridors that will have their timing plans updated, as only corridors that the local agency has identified as having changed conditions, such as traffic patterns or geometrics, will be updated. SANBAG may not be the lead for all corridors, as some local agencies may elect to be the lead for corridors within their jurisdictions. The updating will be completed as funds are available.

SANBAG shall issue Contract Task Orders on an on-call basis directing CONSULTANT to update coordinated timing plans.

The updated traffic signal timing and coordination timing plans shall reflect the requirements of the latest version of the California's Manual on Uniform Traffic Control Devices (2014 CA-MUTCD) and accommodate changes to traffic volumes and flow patterns along SBVCTSS corridors.

The following specific tasks are required to be performed in the course of providing service for the updated traffic signal coordination timing project. Tasks are listed in sequential order for clarity. However some tasks may run concurrently or commence prior to the order listed.

1. Project Management
  - A. CONSULTANT shall be responsible for conducting monthly progress meetings and prepare agendas and minutes, provide monthly progress reports and updated project schedules.
  - B. CONSULTANT shall lead project kick-off meetings with SANBAG and the individual local agencies to establish communication channels and protocols; discuss the scope of work, schedule, and budget; gather available information; obtain input and key local needs; and obtain a thorough understanding of the goals for the project. Specific topics to discuss include data collection needs,

and specific Traffic Signal Timing Optimization software programs.

- C. CONSULTANT shall conduct Project Development Team (PDT) meetings to obtain input and build stakeholder consensus, and conduct technical meetings with SANBAG's project manager to discuss technical approach towards addressing stakeholders' issues.
  - D. Deliverables:
    - 1. Lead a Project Kick-off Meeting and prepare agenda and meeting materials.
    - 2. Provide monthly progress reports including status of the work effort and updated schedule.
    - 3. Conduct Project Development Team meetings and prepare and distribute meeting materials, including agenda, action items, graphics, presentation aides, and notes.
2. Review of Corridors and Intersections
- A. CONSULTANT shall analyze the listing of signalized intersections on the corridors and develop a plan and schedule for implementation of updated timing plans in the most logical and cost effective manner.
  - B. CONSULTANT shall verify all signalized intersections on corridors to be retimed are to be incorporated into the retiming plan, including new signalized intersections that were installed since the completion of the SBVCTSS.
  - C. Deliverables:
    - 1. Provide Schedule for signal timing update implementation by corridor with intersections identified
3. Analysis of Existing Conditions
- A. CONSULTANT shall collect and analyze all information necessary to thoroughly understand existing traffic conditions on the listed corridors and be able to develop optimal time-of-day traffic signal coordination plans.
4. Data Collection – CONSULTANT shall collect existing conditions data including, but not limited to, the following:
- A. From the local agencies or Caltrans with jurisdiction over the corridors and intersections (project sponsor) and other involved agencies, CONSULTANT shall collect current traffic count data, existing timing sheets, existing coordination plans, and traffic signal as-built drawings. Resources for traffic volumes shall include but not be limited to SANBAG's Congestion Management Program (iPems) monitoring tool.
  - B. From the project sponsor and other involved agencies, CONSULTANT shall collect signal timing preferences, including, but not limited to, those related to pedestrian and bicycle timing, leading and lagging left-turn phasing, engineering practices for yellow and "all red" times, conditional service and railroad pre-

emption practices.

- C. CONSULTANT shall inventory all hardware, software and communications infrastructure necessary to monitor and maintain traffic signal timing. CONSULTANT shall identify all locations where communications to a project intersection or intersections are inadequate. CONSULTANT will be responsible to coordinate with the local government entity to obtain communications access to said traffic signal controllers.
- D. CONSULTANT shall possess or develop communications hardware and software necessary to maintain direct communications with traffic signal controllers subject to modifications under the terms of this contract. It will be the responsibility of the local government entity to provide communications access to said traffic signal controllers.
- E. CONSULTANT shall conduct weekday peak period turning movement counts at all study intersections, including pedestrian and bicycle counts, truck percentages and 24-hour machine counts at strategic locations to determine periods of coordination. All counts utilized in the study shall be representative of the times and days for which coordination plans will be developed. It is preferred that all counts be summarized in MS Excel format.
- F. CONSULTANT shall conduct a field review of new or modified study intersections and corridor segments to verify lane geometry, roadway grades, speed limits, storage lengths, signal phasing, distances between intersections and crosswalk lengths.
- G. CONSULTANT shall utilize travel time (iPems) data as provided by SANBAG for the Before Study. CONSULTANT may be directed to perform travel time and delay studies using the “floating car” method to substantiate iPems data.
- F. Deliverables:
  - 1. Table containing updated signal timing parameters for each project intersection.
  - 2. Results of hardware and software inventory for each project intersection
  - 3. Summary Table with Before Study results including but not limited to:
    - Travel time
    - Travel speed during AM, Mid-day and PM peak hours
    - Fuel Consumption
    - Emissions (CO2, CO, NOX, VOC)

5. Develop Traffic Signal Coordination Parameters Master Plan for each Sub-Region

SBVCTSS has been divided into five Sub-Regions. To maximize the operational efficiency within each Sub-Region, the CONSULTANT will develop traffic signal cycle lengths and other “high-level” signal operation parameters (such as phase sequence preference of the local Project Sponsors) that will be utilized in the traffic signal coordination plan for the individual corridors within the Sub-Region, and build consensus with the project sponsors within each Sub-Region. Each Sub-Region may be further broken down into sub-areas with common cycle lengths that ensure proper coordination of key arterials. Development of the Master Plan will include, but not be limited to the

following:

- A. Coordinate with local Project Sponsors of each Sub-Region to obtain their input towards dividing each Sub-Region into sub-areas with common cycle lengths. Considerations include existing cycle lengths within each Sub-Region and local travel characteristics that should operate with common cycle lengths in each of the 3 peak periods (AM, mid-day and PM peak), and refining the sub-areas definition with the inputs of the local Project Sponsors. The sub-areas (with common cycle lengths) may differ in each of the 3 peak periods (AM, mid-day, and PM peak) based on the travel characteristics and the local agency preferences.
  - B. Using SYNCHRO software, CONSULTANT shall develop a traffic signal coordination model of the five Sub-Regional areas. Key inputs to be included:
    1. Existing geometry of the Sub-Regional area, including distance between intersections, number of lanes, turn prohibitions, turn pocket storage lengths, etc.
    2. Vehicular volumes for every movement at each intersection. Traffic volumes may be adjusted to passenger car equivalents on all truck routes, or the truck percentages shall be entered into SYNCHRO to ensure proper consideration of the truck composition of each roadway segment.
    3. Pedestrian volumes at crossings with high pedestrian volumes in each of the three peak periods, with inputs from the local Project Sponsors.
    4. Existing speed limits, or prevailing 85th percentile travel speeds
    5. Existing phasing and operational characteristics at each intersection (such as pedestrian volumes, truck percentages, etc.)
  - C. CONSULTANT shall review and update signal timing parameters in accordance with the 2014 CA-MUTCD. The following parameters shall be reviewed:
    - Yellow change interval per MUTCD(CA)
    - Pedestrian clearance interval
    - Bicycle Minimum Greens
    - All-Red intervals
  - D. Three peak periods shall be modeled; A.M., Midday and P.M. peak. After the SYNCHRO model is calibrated, CONSULTANT shall optimize the signal coordination timing parameters and utilize Tru-Traffic software to analyze and adjust the time-space diagram to maximize the bandwidth of the key corridors within the sub-areas.
  - E. Deliverables:
    1. Sub-Regional Master Plan with sub-area Traffic Signal cycle lengths and other “high-level” signal operation parameters.
    2. SYNCHRO and Tru-Traffic model and data files with sub-area cycle lengths that has been agreed upon with the local agencies.
6. Update Traffic Signal Coordination Timing for individual corridors that SANBAG is the lead agency.

- A. Using the parameters and SYNCHRO model developed in Section 5, CONSULTANT shall develop a set of optimized traffic signal coordination timing plans for individual corridors and intersections. Key inputs to be included:
  - 1. Following the sub-area definition of each Sub-Region defined in the Master Plan (Task 5) to observe common cycle lengths.
  - 2. Refining the sub-area definition for each of the 3 peak periods (AM, Mid-day, and PM Peak) in consultation with the local Project Sponsors
  - 3. Refining the phase sequence and other signal operation parameters in consultation with the local Project Sponsors that would increase the efficiency of the traffic signal operations and promote signal synchronization of key corridors.
  - 4. Refining the splits and offsets based on traffic counts and local agency preferences
  
- B. Up to three peak periods shall be modeled; A.M., Midday and P.M. peak. After the SYNCHRO model is calibrated, CONSULTANT shall optimize the signal coordination timing parameters and utilize Tru-Traffic software to analyze and adjust the time-space diagram for each corridor or portion of a corridor. The CONSULTANT shall utilize professional judgment to analyze and adjust data generated from the SYNCHRO and Tru-Traffic modeling to adjust the off-sets and splits, while taking into consideration the local agencies' preferences. The CONSULTANT shall recommend the time of day (TOD) timing plans to be implemented for each the three peak periods, again taking into account the local agencies' preferences.
  
- C. CONSULTANT may recommend minor changes to the signal phasing deemed appropriate in improving the efficiency of operations, and upon approval of the local agency, adopt the new phasing into the SYNCHRO model for optimization. The SYNCHRO model results and electronic files shall be provided to all participating agencies for review.
  
- D. Deliverables:
  - 3. Individual intersection optimized traffic signal timing plans and individual corridor time space diagrams
  - 4. SYNCHRO and Tru-Traffic model and data files
  
- 7. Implementation and fine tuning of Optimized Traffic Signal Timing for individual corridors that SANBAG is the lead agency.
  - A. CONSULTANT shall implement, with oversight of the project sponsor staff. optimized traffic signal timings. CONSULTANT shall observe the results of the timing implementation in the field and fine-tune the splits and offsets to ensure that the signals are operating efficiently with minimal delay and stops, as intended. CONSULTANT shall provide final timing sheets in each agency's format.
  
  - B. Deliverables:
    - 1. Two (2) sets of Final timing sheets with updated Traffic Signal and Coordinated Timing Plans.

2. Quarterly reports documenting status of traffic signal and communications hardware, and coordinated signal timing.

8. After Study

A. Upon completion of the signal timing implementation and fine-tuning, CONSULTANT shall perform "After Studies" to obtain data for verifying the "measures of effectiveness". The "After Studies" data shall be obtained as described in Section 4.G.

B. Deliverables:

1. After Study report with Summary Table listing results including but not limited to:
  - Reduction in travel time
  - Improvement in travel speed during AM, Mid-day and PM peak periods
  - Reduction of mobile source emissions (CO<sub>2</sub>, CO, NOX, VOC)
  - Reduction of fuel costs
  - Benefit/Cost Analysis using the Cal B/C parameters

9. Traffic Signal Synchronization Report

A report shall be prepared to summarize the project benefits of traffic signal synchronization retiming. Tables and charts shall be used to analyze the "measures of effectiveness" of the 'Before' and 'After' studies. These benefits shall be quantified and, wherever possible, converted to monetary terms (using Cal B/C parameters) in order to arrive at an average annual monetary savings to the traveling public.

A. Deliverables:

1. Traffic Signal Synchronization Final Report

### **Semi-Annual Assessments**

Local agencies are responsible for the on-going monitoring, maintenance and timing adjustments for traffic signal systems included as part of the SBVCTSS. In order to determine the SBVCTSS is properly maintained, CONSULTANT shall perform semi-annual assessments of the corridors **as listed on Attachment B.**

SANBAG shall issue Contract Task Orders on an on-call basis directing CONSULTANT to perform Semi-Annual Assessments.

Assessments shall be performed remotely whenever possible via remote connection to CITY's Traffic Management Centers (TMC). CONSULTANT shall work with CITY's Information Technology (IT) department or other staff as directed by CITY to obtain remote "read-only" access, whenever possible, to perform assessments. Preliminary findings shall be reviewed with the local agencies when signals are found to be out of compliance to determine if minor corrective action can be implemented to bring signal/corridor into compliance prior to issuing Assessment Reports. Reports shall include tabled results by Agency, listing by corridor signals,

both compliant and non-compliant, with possible causes and recommended corrective actions to bring signals into compliance

A. Deliverables:

1. Semi-Annual Assessment Reports

**On-call System Support**

Given the variety of central signal systems, signal controllers and different communication systems utilized within the SBVCTSS, CONSULTANT must be familiar with various traffic signal management operating systems as well as traffic controller types, interface modems from wireless to hardwire, telephone drops, fiber optic, interconnect components, communication speed differences for different interconnect types and different controller types and how to actuate coordination for differing local controller programs and software versions.

SANBAG shall issue Contract Task Orders on an on-call basis directing CONSULTANT to investigate traffic signal related issues as reported by local agencies to the SANBAG Project Manager.

Consultant shall meet with the local agency to fully understand the reported issue. Agency preferences related to signal timing may include lead/lag phasing, minimum left-turn splits, cycle lengths, use of preferred or conditional service, coordination time periods, full actuated versus semi-actuated coordination, use of pedestrian override, weekend coordination and local timing parameters. Consultant shall perform observations and collect field data in sufficient quantity to identify existing deficiencies, existing system capabilities and operations.

Using data collected, and with input from the agencies, Consultant shall determine causes and steps necessary for resolution, including cost to resolve the reported issue.

**TRAINING**

The Consultant shall train local agency staff on an on-call basis under a Contract Task Order in the operation of the signal communication hardware to ensure that all appropriate staff fully understands the basics of the software and hardware operations. Organized training sessions will be conducted to ensure that each agency is fully aware of how to best optimize utilization of their system to promote Valleywide system effectiveness.