INTERLOCAL AGREEMENT
REGARDING THE GOVERNMENTAL PARTICIPATION IN THE DESIGN AND CONSTRUCTION OF A TRAFFIC SIGNAL AT THE BAR W RANCH BOULEVARD AND VIA DE SIENNA BOULEVARD INTERSECTION WITH RONALD W REAGAN BOULEVARD

THE STATE OF TEXAS §
§ **KNOW ALL BY THESE PRESENTS:**
COUNTY OF WILLIAMSON §

THIS INTERLOCAL AGREEMENT ("Agreement") is entered into between the CITY OF LEANDER, TEXAS, a Texas municipal corporation (the "**City**") WILLIAMSON COUNTY, TEXAS, a political subdivision of the State of Texas (the "**County**") and the LIBERTY HILL INDEPENDENT SCHOOL DISTRICT (the "**LHISD**"). In this Agreement, the City, the County and the LHISD are sometimes individually referred to as "a Party" and collectively referred to as "the Parties".

WHEREAS, V.T.C.A., Government Code, Chapter 791, the Texas Interlocal Cooperation Act, provides that any one or more public agencies may contract with each other for the performance of governmental functions or services for the promotion and protection of the health and welfare of the inhabitants of this State and the mutual benefit of the parties;

WHEREAS, the Parties desire to participate in the costs to expeditiously design and construct a traffic signal and related appurtenances at the Bar W Ranch Boulevard and Via De Sienna Boulevard intersection with Ronald W Reagan Boulevard (the "Project"); and

NOW, THEREFORE, in consideration of the foregoing premises and the mutual promises and agreements of the Parties contained in this Agreement, the Parties agree as follows:

I.
PURPOSE

1.01 General. The purpose of this Agreement is to provide for the Parties' participation in the costs to design and construct the Project at the location shown on Exhibit "A", attached hereto. At this time, the Parties intend to expeditiously design and construct a traffic signal at the location shown in Exhibit "A", in order to enhance safety and mobility at the intersection. The current estimated cost for the design and construction of the traffic signal is Nine Hundred Thousand and No/100 Dollars ($900,000.00).

II.
PARTY OBLIGATIONS

2.01 County Obligations. The County will procure and contract for the design and construction of the Project, as well as manage the construction of the Project. The County will submit the Project plans and specifications to the City and LHISD. Any changes or modifications to the plans will be submitted to the Parties for comment prior to commencing construction. The County will schedule periodic progress meetings as agreed to by the Parties.

2.02 City Obligations. In addition to the City's funding obligations, the City shall operate and maintain the traffic signal and all related appurtenances following the completion and acceptance of the construction of the Project. The City shall also provide a traffic signal cabinet and controller from its inventory for the Project. As part of the Project, a traffic signal cabinet and controller consistent with the technical specifications attached hereto as Exhibit "B" and incorporated by reference herein shall be purchased by the City to replenish the City's inventory. Should the traffic signal cabinet and controller be purchased and an invoice evidencing the purchase be presented to the County before or during the payment schedule described in Section 2.04 hereinbelow, the City's participation will be decreased by the cost of the purchase of the replacement traffic signal cabinet and controller, and in the event this cost is in excess of the then amount due under the payment schedule or the City has completed the described payments, the County will reimburse the City within 30 days of the presentment of the aforementioned invoice.

2.03 Funding Obligations. As outlined in Section 2.04, The City, County and LHISD shall share equally in all costs associated with the preliminary design, final design and construction of the Project, excepting the provision of the traffic signal cabinet and controller and subsequent reimbursement described in Section 2.02 hereinabove. .

2.04 City,LHISD and County Reimbursements for Project. Prior to the execution of this Agreement, LHISD paid the City Traffic Impact Fees relating to the Project in the amount of One Hundred Fifty Thousand and No/100 Dollars ($150,000.00). The City has agreed to contribute LHISD's Traffic Impact Fees toward this Project as a part of its reimbursement amount for the Project. Therefore, City shall reimburse the County the sum of Four Hundred Fifty Thousand and No/100 Dollars ($450,000.00) and LHISD shall reimburse the County the sum of One Hundred Fifty Thousand and No/100 Dollars ($150,000.00)for a total reimbursement of Six Hundred Thousand and No/100 Dollars ($600,000.00) ("City and LHISD Participation") as their cost to participate in the design and construction of the Project, unless altered by the provisions of Section 2.02. The County shall contribute Three Hundred Thousand and No/100 Dollars ($300,000.00) as its cost to participate in the design and construction of the Project. The County will transmit reimbursement requests to the City and LHISD that clearly sets forth the benchmark payment due and, for requests associated with construction work, describe work done for which reimbursement is sought. Reimbursement requests will be sent pursuant to the following payment schedule: 25% upon execution of this Agreement, 25% upon construction contract award, 25% when construction is 50% complete (as determined by the value of the work completed to date against the contract amount) and 25% after the County issues a Certificate of Completion and City accepts the Project for operation and maintenance. The City and the LHISD shall pay invoices pursuant to the Texas Prompt Payment Act.

2.05 Additional Funding; Surplus Funding. As set out herein-above, the current estimated cost for the design and construction of the Project is Nine Hundred Thousand and No/100 Dollars ($900,000.00); provided, however, the final actual costs may exceed or be less than said estimate. In the event the actual costs of the Project exceed the said estimated costs, the Parties agree to each contribute share of one-third (1/3) each towards the additional funding amount necessary to fully design and construct the Project. In the event the actual costs of the Project are less than the said estimated costs and a surplus of funding results, the Parties agree that

each party shall be reimbursed one-third (1/3) of the total surplus funding amount.

III.
DISPUTES

3.01 Material Breach; Notice and Opportunity to Cure.

(a) In the event that one Party or Parties believe that another Party has materially breached one of the provisions of this Agreement, the non-defaulting Party or Parties will make written demand to cure and give the defaulting Party up to 30 days to cure such material breach or, if the curative action cannot reasonably be completed within 30 days, the defaulting Party will commence the curative action within 30 days and thereafter diligently pursue the curative action to completion. Notwithstanding the foregoing, any matters specified in the default notice which may be cured solely by the payment of money must be cured within 10 days after receipt of the notice. This applicable time period must pass before the non-defaulting Party may initiate any remedies available to the non-defaulting party due to such breach.

(b) Any non-defaulting Party will mitigate direct or consequential damage arising from any breach or default to the extent reasonably possible under the circumstances.

(c) The Parties agree that they will negotiate in good faith to resolve any disputes and may engage in non-binding mediation, arbitration or other alternative dispute resolution methods as recommended by the laws of the State of Texas.

3.02 Equitable Relief. In recognition that failure in the performance of the Parties' respective obligations could not be adequately compensated in money damages alone, the Parties agrees that after providing notice and an opportunity to cure in accordance with Section 3.01 above, the Parties shall have the right to request any court, agency or other governmental authority of appropriate jurisdiction to grant any and all remedies which are appropriate to assure conformance to the provisions of this Agreement. The defaulting Party shall be liable to the other for all costs actually incurred in pursuing such remedies, including reasonable attorney's fees, and for any penalties or fines as a result of the failure to comply with the terms including, without limitation, the right to obtain a writ of mandamus or an injunction requiring the governing body of the defaulting party to levy and collect rates and charges or other revenues sufficient to pay the amounts owed under this Agreement.

3.03 Agreement's Remedies Not Exclusive. The provisions of this Agreement providing remedies in the event of a Party's breach are not intended to be exclusive remedies. The Parties retain, except to the extent released or waived by the express terms of this Agreement, all rights at law and in equity to enforce the terms of this Agreement.

V.
GENERAL PROVISIONS

4.01 Authority. This Agreement is made in part under the authority conferred in Chapter 791, *Texas Government Code*.

4.02 Term. This Agreement shall commence upon the last party's execution of this Agreement and shall end upon the completion of the Project and acceptance of the public improvements by the City.

4.03 Severability. The provisions of this Agreement are severable and, if any provision of this Agreement is held to be invalid for any reason by a court or agency of competent jurisdiction, the remainder of this Agreement will not be affected, and this Agreement will be construed as if the invalid portion had never been contained herein.

4.04 Payments from Current Revenues. Any payments required to be made by a Party under this Agreement will be paid from current revenues or other funds lawfully available to the Party for such purpose.

4.5. Force Majeure. If, by reason of force majeure, any party hereto shall be rendered wholly or partially unable to carry out its obligations under this Agreement, then such party shall give written notice of the full particulars of such force majeure to the other party within ten (10) days after the occurrence thereof. The obligations of the party giving such notice, to the extent effected by the force majeure, shall be suspended during the continuance of the inability claimed, except as hereinafter provided, but for no longer period, and the party shall endeavor to remove or overcome such inability with all reasonable dispatch. The term "force majeure" as employed herein shall mean and refer to acts of God; strikes, lockouts, or other industrial disturbances: acts of public enemies, orders of any kind of the government of the United States, the State of Texas or any civil or military authority; insurrections; riots; epidemic; landslides; lightning, earthquakes; fires, hurricanes; storms, floods; washouts; droughts; arrests; restraint of government and people; civil disturbances; explosions; breakage or accidents to machinery, pipelines, or canals; or other causes not reasonably within the control of the party claiming such inability.

4.06 Cooperation. The Parties agree to cooperate at all times in good faith to effectuate the purposes and intent of this Agreement.

4.7 Amendments. Any amendment of this Agreement must be in writing and will be effective if signed by the authorized representatives of the Parties.

4.8 Applicable Law; Venue. This Agreement will be construed in accordance with Texas law. Venue for any action arising hereunder will be in Williamson County, Texas.

4.9 Notices. Any notices given under this Agreement will be effective if (i) forwarded to a Party by hand-delivery; (ii) transmitted to a Party by confirmed telecopy; or (iii) deposited with the U.S. Postal Service, postage prepaid, certified, to the address of the Party indicated below.

CITY: 200 West Willis Street
Leander, TX 78641
Attn: City Manager
Telephone: (512) 528-2707
Facsimile: (512) 690-2193

COUNTY:

710 S. Main Street
Georgetown, TX 78626
Attn: William Gravell, Jr.
Telephone: (512) 943-1550
Facsimile: (512) 943-1662

LHISD:

301 Forrest Street
Liberty Hill, TX 78642
Attn: Superintendent
Telephone: (512) 260-5580
Facsimile: (512) 260-5581

4.10 Counterparts; Effect of Partial Execution. This Agreement may be executed simultaneously in multiple counterparts, each of which will be deemed an original, but all of which will constitute the same instrument.

4.11 Authority. Each Party represents and warrants that it has the full right, power and authority to execute this Agreement.

4.12 Entire Agreement. This Agreement contains the entire agreement of the Parties regarding the subject matter hereof and supersedes all prior or contemporaneous understandings or representations, whether oral or written, regarding the subject matter and only relates to those portions of the Project shown in the plans attached hereto as Exhibit "A."

IN WITNESS WHEREOF, the Parties have duly executed and delivered this Agreement to be effective as of the last party's execution below ("Effective Date").

CITY OF LEANDER, TEXAS

By: C. DeLisle
Mayor Christine DeLisle

Date: 12/21, 2023

ATTEST:

By: Dana Crabtree
Leander City Secretary

WILLIAMSON COUNTY, TEXAS

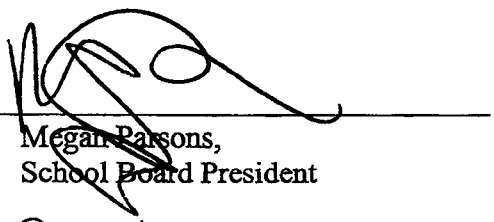
Valerie Covey

By:_____
Valerie Covey, Presisiding Officer

Jan 9, 2024

Date: _____ ____, 20____

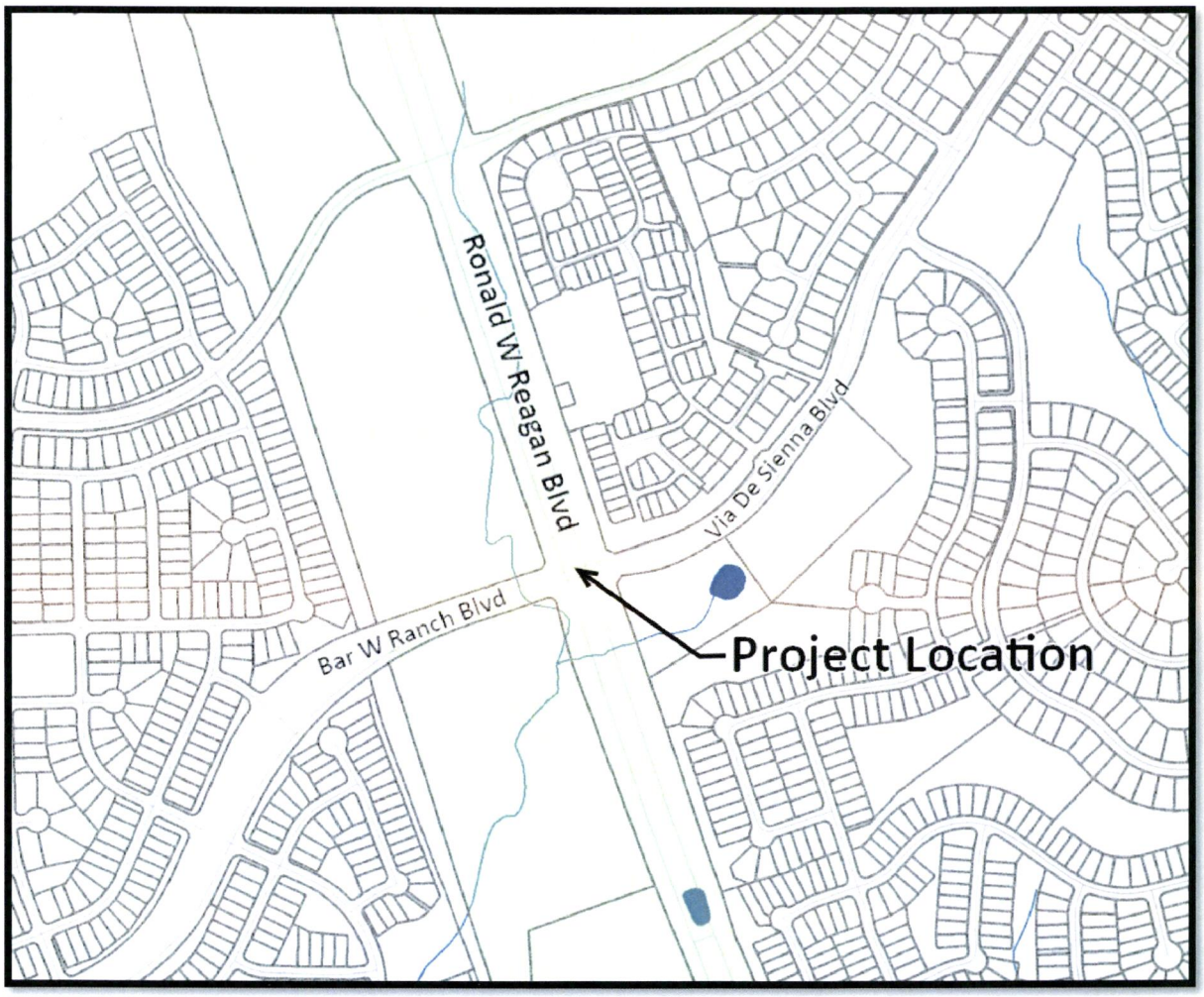
LIBERTY HILL INDEPENDENT SCHOOL DISTRICT

By: 

Megan Parsons,
School Board President

Date: December 18, 2023

EXHIBIT "A"



City of Leander

EXHIBIT B
[SEE ATTACHMENT]

City of Leander TECHNICAL SPECIFICATIONS

The following ***Standard Specifications for Construction of Highways, Streets and Bridges – June 1, 2004 Edition*** published by the **Texas Department of Transportation (TxDOT}** shall govern for all items specified in the Drawings, other than waterline and waste waterline, and except as modified or deleted, in the Special Provisions or by General Note within the Drawing Documents, on the date of advertisement for bids. The Contractor shall acquire a copy of these Specifications and keep this copy on site and available for reference at all times. The specifications are available for download and/or purchase from TxDOT at the website link: http://www.dot.state.tx.us/business/specifications.htm

ITEM 680: INSTALLATION OF HIGHWAY TRAFFIC SIGNALS

References to manufacturer's trade name or catalog numbers are for the purpose of identification only and like materials of other manufacturers can be furnished if they are of equal quality and comply with specifications for this project and are approved by the City of Leander Public Works and Traffic Signal Departments. All traffic signal equipment must be compatible with and integrated into the City of Leander existing traffic signal system.

The City of Leander currently uses a Siemens TACTICS Central Control System. In addition to all specified communication ports, the controllers shall have an active Ethernet port for communications to Central Control via 5.8 GHz Broadband Integrated MIMO radio kit. All traffic signal equipment must be compatible with and integrated into the City of Leander existing system.

The City of Leander currently uses Siemens M60 Model 8132-0000-XXX and Siemens, TS2-Type 2 LINUX Traffic Controllers. The controller supplied must be compatible with existing systems.

The City of Leander currently uses the, Iteris Vantage Next with Vantage Vector and the Vantage Next Camera with the Next ShelfMount. All Radar and Camera equipment must be compatible with the existing Iteris systems. Radars are to be used on all 45mph and above Streets or when warranted.

The City of Leander uses Eagle Traffic Control Model 2562101213 16 loadbay TS2-Type 1 Cabinets. The cabinet supplied must be compatible with existing systems.

The City of Leander currently uses Iteris UltraDish (UD-TP27 BroadBand radios for remote communication. The 5.8 GHz radios supplied must be compatible with the Pegasus Software.

The City of Leander uses ComNet Model CNGE8MS/DIN Managed Switches. Manage Switches provided must be compatible with ComNet existing switches.

This project shall consist of furnishing and installing all materials and equipment for a complete signal system at the proposed location. In addition to these items, the contractor shall be responsible for the following:

1.) Submittal literature shall be provided for all Contractor furnished traffic signal equipment prior to installation.
2) Furnishing and installing luminaire fixtures at locations shown on the plans. Luminaire ballasts shall be rated for operation at 240 volts.
3) The contractor shall notify the City of Leander at least 48 hours prior to the traffic signal turn on.
4) The contractor shall have a qualified technician on the project site to place the traffic signals in operation.
5) During the thirty-day test period, the contractor shall utilize qualified personnel to respond to and diagnose all trouble calls. They shall repair any malfunctions to signal equipment they supplied on the project. A local telephone number (not subject to frequent changes) where trouble calls are to be received on a 24-hour basis shall be provided to the Engineer by the contractor. The contractor's response time to reported calls shall be within a reasonable travel time from a City of Leander address, but not more than two (2) hours maximum. Appropriate repairs shall be made within 24 hours. The contractor shall place a logbook in each controller cabinet and keep a record of each trouble call reported. They shall notify the Public Works department of each trouble call.
6) Furnishing and installing all signs for mounting on new signal poles and mast arms are to be in accordance with Item 636. Signs shall be mounted with Astro-Sign Brackets or Sign-fix aluminum channel or equal as approved by the engineer. Five (5) sets of shop drawings shall be submitted for street name signs.
7) Furnish and install UV Rated Cat5e Cable (BC-Cat5e) and or Belden #8281 coaxial cable and 3 conductor #16 AWB (IMSA 20-1) cable from each Iteris camera assembly to the controller cabinet camera interface. Upon approval by the City of Leander, a combination coaxial/3 conductor cable may be substituted.
8) The contractor shall coordinate with the City of Leander to make Iteris video detection equipment and broadband radio equipment operational.
9) The traffic signal pole heights and mast arm lengths shown on the plans and in the material summary are to be used for bidding purposes only. Prior to fabrication, the contractor, in cooperation with the Inspector, shall make field measurements to determine the actual pole height necessary to ensure a vertical clearance of 17 ft. (5.2 m) minimum, and 19 ft. (5.8 m) maximum from the roadway surface to the bottom of the lowest point on the signal head assembly or mast aim and to determine the mast arm lengths required to mount the traffic signal heads over the traffic signal heads over the traffic lanes. The mast arms shall be straight and level in the area where the signal heads are attached. These field measurements and evaluations shall be determined from the actual field location of the pole foundations, considering all above and below ground utilities and the existing roadway elevations and lane widths.
10) Relocate and/or remove the existing signal heads from the existing signs to the new signals as directed and shown on the plans.
11) Relocate and/or remove the existing sign panels and street name sign panels from existing signals to new signals as directed and shown on the plans. Furnish and install new sign panels as shown on the plans. New sign panels shall be fabricated in accordance with Item 636. Span wire mounted signs shall be mounted as shown on the plans. Furnish all mounting hardware for all signs.

12) Relocate the existing Iteris VIVDS or Radars and equipment from the existing signals to the new signals as directed and shown on the plans.
13) No extra compensation will be allowed for fulfilling the requirements stated above.

Protect all adjoining pavement sections during all phases of construction and any damages incurred due to operations will be repaired and/or replaced at own expense.

Accomplish the erection of poles and luminaires located near any overhead electrical lines using established industry and utility safety practices. Consult with the appropriate utility company before beginning such work.

Furnish and install aluminum signs and brackets to be mounted on traffic signal pole mast arm assemblies with option "C" bracket assemblies for signs as described on the Traffic Signal Support Structures Details. Mount signs horizontal as shown on the plans. This work will not be paid for directly but will be subsidiary to Item 680, "Installation of Highway Traffic Signals".

Clean-up and remove from the work area all loose material resulting from operations each day before work is suspended for the day.

ITEM 682: VEHICLE AND PEDESTRAIN SIGNAL HEADS

All signal heads shall be pre-certified by TxDOT. All pedestrian signal heads shall be countdown pedestrian heads pre-certified by TxDOT.

Provide and install LIGHT EMITTING DIODE (LED) traffic signal lamp units in all vehicle and pedestrian signal head sections.

Provide new signal head housings with TxDOT standard detail TS-BP-20 fluorescent yellow back plates. Cover all signal heads installed, but not in operation, in an approved manner from the time of installation until the signal is placed in operation. This will not be paid for directly, but will be subsidiary to Item 682, "Vehicle and Pedestrian Signal Heads".

Provide and install standard detachable tunnel visors on all signal heads. Provide and install all necessary mounting hardware to insure proper mounting of all signal heads. The mounting hardware and attachments will be new (no reuse of old existing attachment hardware) and the same color as the signal head housings. Use signal heads made of aluminum with 12 inch LED indications and aluminum back plates.

Install signal heads mounted on mast arms, except for heads mounted on end of mast arm, with the OPTION "A" bracket assembly, or OPTION "C" ASTRO-BRAC cable type clamp, as described on the Traffic Signal Support Structures Details, or as approved.

Mount signal heads mounted on end of arm with a 90 degree mast arm elbow fitting as shown on the Structure Assembly on the Traffic Signal Support Structures Details.

Use standard 1 1/2-inch diameter steel pipe side pole mount for pedestrian signal heads.

Provide aluminum pedestrian signal heads. Pedestrian indications will be LED signal sections with symbolized messages as shown on the plans and in accordance with the 2011 TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES. Symbols will be a minimum of 9 inches in height.

Mount pedestrian signals with all wiring enclosed within the signal pole arm mounting hardware, in accordance with ARTICLE 688.3 and 688.4.

Item 684: TRAFFIC SIGNAL CABLES

The conductors in the traffic signal cable shall be stranded for this project. Individual conductors shall be No.14 AWG.

The multi conductor signal cable shown on the plans shall be terminated on the terminal strip in the hand hole of the mast arm signal poles.

Unless otherwise shown on the plans a separate multi-conductor (14 AWG) shall be used inside pedestal poles and mast arm signal poles from the terminal strip to each signal head.

Splices in the conductors from the terminal strip at the hand hole to the signal heads will not be permitted in the pole shaft or in the mast arm.

Each cable shall be identified as shown on the plans with permanent marking labels (Panduit Type PLM standard single marker tie, Thomas & Betts Type 5512M or equivalent) at each ground box, pole base and controller cabinet.

ITEM 686: TRAFFIC SIGNAL POLE ASSEMBLIES (STEEL)

Payment for traffic signal pole foundations is per Item 416, "Drill Shaft Foundations". Furnish and use a circular steel anchor bolt templates as shown on the Traffic Signal Pole Foundation Details for all signal pole foundations on this project.

Attach dampening devices on mast arms 40 feet in length and longer. Make attachment using ASTRO-SIGN-BRAC type mounts option "C" on the Traffic Signal Support Structures Details. Dampening will not be paid for directly, but will be considered subsidiary to Item 680, "Install Highway Traffic Signal".

No exposed signal cable on the mast arm assemblies will be allowed. Install the signal cable so it will exit the mast arm directly behind each signal head as directed. This will require drilling holes in the mast at the exact location for each signal head. Drip loops are not allowed. Provide either option "A" or option "C" signal head bracket assemblies as described on the Traffic Signal Support Structures Details.

ITEM 688: PEDESTRIAN DETECTORS AND VIVDS/Radars

Pedestrian push buttons are required to be a minimum of 2 inches in the smallest dimension and be mounted a minimum height of 38 to a maximum of 42 inches above the sidewalk or landing. The Engineer will approve the location of each pedestrian push button.

Install pedestrian push button signs (R 10-4B) directly above the push buttons.

Installation of pedestrian push buttons signs, electrical connections and all mounting hardware shall not be paid for directly, but considered subsidiary to Item 688, "Traffic Signal Detectors".

ITEM 6266: VEHICLE IMAGING VIDEO DETECTION SYSTEM

The Iteris Radar and Camera currently used by the City of Leander are the Iteris Vantage Next or Vantage Vector. The Iteris Radar and Camera equipment supplied must be compatible and interchangeable with the current City of Leander equipment. The Iteris NEXT System allows the remote monitoring of 4 simultaneous videos and provides remote reconfiguration of Detection Zones through wireless or wired communication.

Install, and make **fully operational** the Iteris Vehicle Imaging Video Detection System (Radars). This includes all radars, mounting hardware, and cable, field set up devices, color monitor, detection processor, connectors and surge suppression panel for AV & Video.

SPECIAL SPECIFICATION 6083

Specification for a Modular (Multi or Single Camera) Hybrid Video Imaging and Radar Detection System

1. General

This specification sets forth the minimum requirements for a system that detects vehicles on a roadway using a multi-sensor detection system.

The multi-sensor system shall utilize two different sensors of different technologies, video imaging and radar, to detect and track licensed and unlicensed vehicles at up to 600 feet. The sensor system shall fuse vehicle information from the two sensors to provide highly accurate and precise detection for simultaneous stop bar presence detection, advanced detection, and special or advanced applications.

1.1 System Hardware

The multi-sensor detection system (MSDS) shall consist of up to four hybrid video camera/radar sensors, one NEXT Central Control Unit Shelf-Mount (CCU), (For input/output

extension modules, video surge suppressors, HDMI monitor and a pointing device, or any combination thereof.

The MSDS will be deployed at locations where site conditions and roadway geometry vary. The MSDS system may also be deployed at locations where existing cabinets or equipment exist. Existing site configurations will dictate the availability of cabinet space and MSDS usage.

1.2 System Software

The system shall include software that discriminately detects the presence of individual vehicles and bicycles in a single or multiple lanes using only the video image. Detection zones shall be defined using only an embedded software application. A monitor, a keyboard and a pointing device are used to place the zones on a video image. A minimum of 32 video detection zones and 32 radar detection zones plus 5 trip lines per sensor shall be available.

A separate computer shall not be required to program the detection zones. In addition to creating vehicle and bicycle zones, the system shall automatically define a pedestrian crossing area in front of the stop bar zones. The system shall provide a tracking mechanism that counts pedestrian volume moving within this crossing area, and also determine the average, maximum, and minimum speed of pedestrians moving within this crossing zone. The system shall also provide discrete outputs when pedestrians are in the crosswalk during normal crossing phases (one for each direction of travel) and when a red phase input has been detected. The system shall also provide a visual indication on the video image that a pedestrian is in the crosswalk.

1.3 *The MSDS shall be made in the U.S.A. in compliance with FTA "Buy America" regulations.*

2. MSDS Hardware

2.1 *Detection Processor (DP) System Interfaces*

The DP shall be a single-rack detector card width, and provide provision for up to two sensors per DP. It may be possible for the DPs to be embedded in the CCU to provide a single cabinet interface. The following interfaces shall be provided on each video detection processor:

2.1.1 Video Input

Each DP will be supplied with video from the MSDS Sensor via Ethernet cables plugged into the front of the Central Control Unit. The interface connectors shall be RJ-45 type.

2.1.2 Video Lock LED

A LED indicator shall be provided to indicate the presence of the video signal. The LED shall illuminate upon valid video synchronization and turn off when the presence of a valid video signal is removed.

2.1.3 Contact Closure Output

Open collector (contact closure) outputs shall be provided. Four (4) open collector outputs shall be provided for the Detection Processor rack-mount configuration. Additionally, the MSDS shall allow the use of extension modules to provide up to 32 open collector contact closures per sensor input. Each open collector output shall be capable of sinking 30mA at 24VDC. Open collector outputs will be used for vehicle detection indicators as well as discrete outputs for alarm conditions. The DP outputs shall be compatible with industry standard detector racks assignments.

2.1.4 Logic Inputs

Logic inputs such as delay/extend or delay inhibit shall be supported through the appropriate detector rack connector pin or front panel connector in the case of the I/O module. For DPs and extension modules, 4 inputs shall be supported via detector rack interface. The I/O module shall accommodate eight (8) inputs through a 15-pin "D" connector.

2.1.5 Detection LEDs

Detection status LEDs shall be provided on the front panel. The LEDs shall illuminate when a contact closure output occurs. Rack-mounted video processors shall have a minimum of four (4) LEDs. Rack-mounted extension modules shall have two (2), four (4) or eight (8) LEDs (depending upon extension module type) to indicate detection.

Where the DP's are integrated into the CCU the detection LEDs shall be displayed virtually on the setup tool.

2.1.6 Test Switches

The front panel of the DP shall have detector test switches to allow the user to manually place vehicle and bicycle calls on each DP output channel. The test switch shall be able to place a momentary call.

Where the DP's are integrated into the CCU the detector test switched shall be activated virtually through the setup tool.

2.2 ***Both the DP and EM shall be specifically designed to mount in a standard detector rack, using the edge connector to obtain power, provide contact closure outputs and accept logic inputs (e.g. delay/extend). No adapters shall be required to mount the DP or EM in a standard detector rack and no rack rewiring shall not be required.***

2.3 ***DP printed circuit boards (PCBs) shall be conformally coated in accordance with Caltrans and NEMA specifications.***

2.4 ***On-board Memory***

The DP shall utilize non-volatile memory technology to store on-board firmware and operational data.

2.5 ***Firmware Upgrade***

The CCU shall enable the loading of modified or enhanced software through either the Ethernet or front-panel USB port (using a USB thumb drive) and without removing or modifying the CCU hardware. The upgrade will affect both the CCU and DP hardware when connected into a single system.

2.6 ***DP and EM Power***

The DP and EM shall be powered by 12 or 24 volts DC. DP and EM modules shall automatically compensate for either 12 or 24 VDC operation. DP power consumption shall not exceed 7.5 watts. The EM power consumption shall not exceed 3 watts.

2.7 ***Operating Temperature***

The MSDS shall operate satisfactorily in a temperature range from -30° F to +165° F (-34° C to +74° C) and a humidity range from 0%RH to 95%RH, non-condensing as set forth in NEMA specifications.

3. MSDS CCU

The MSDS Central Control Unit (CCU) shall be supplied by the MSDS manufacturer.

3.1 *Hardware*

The CCU shall be supplied in One form factors.

1. **Shelf-Mount format; TS2 version. The CCU shall be able to stand up on available shelf-space within the cabinet. All connections shall be made from the front of the CCU, and no external DPs will be required.**

3.2 *CCU Power*

3.2.1 The 19" Rack-mount CCU shall be powered from an 110V or 230V, 50Hz or 60Hz supply. CCU power consumption shall not exceed 20 Watts.

3.2.2 The shelf-mount format CCU shall be powered from a 48V DC power supply. CCU power consumption shall not exceed 150 Watts.

3.3 *Operating Temperature*

The MSDS shall operate satisfactorily in a temperature range from -30° F to +165° F (-34° C to +74° C) and a humidity range from 0%RH to 95%RH, non-condensing as set forth in NEMA specifications.

3.4 *On-board Memory*

The CCU shall utilize non-volatile memory technology to store on-board firmware and operational data.

3.5 *Video Surge Suppression*

The CCU shall incorporate surge suppression for each sensor input. The CCU shall be appropriately grounded to the cabinet ground rod using 14 AWG ($2.5mm^2$) minimum.

3.6 *Power Surge Suppression*

The CCU shall incorporate power surge suppression both on the input power and on the power supplied to the sensors. The CCU shall be appropriately grounded to the cabinet ground rod using 14 AWG ($2.5mm^2$) minimum.

3.7 *Power Management*

The CCU shall incorporate power management for the various parts of the MSDS such that if fault conditions are detected the power supply will safely shut down the power to that peripheral.

3.8 *Interfaces*

3.8.1 Extension Modules

Extension modules (EM) shall be available to eliminate the need of rewiring the detector rack, by enabling the user to plug an extension module into the appropriate slot in the detector rack to provide additional open collector outputs. The EM shall be available in both 2- and 4-channel configurations. EM configurations shall be programmable from the CCU. A separate I/O module shall also be available having 32 outputs through a 37-pin "D" connector on the front panel and 8 inputs through a 15-pin "D" connector using an external wire harness for expanded flexibility.

3.8.2 The CCU shall provide four ports for connection to MSDS sensors. The connector shall be an RJ-45 type.

3.8.3 The CCU shall provide four ports for connection to DPs. The connector shall be an RJ-45 type. These connectors will not be required for the Shelf-Mount TS2 version CCU.

3.8.4 The CCU shall provide 2 USB 'A' ports on the front panel of the rack mount CCU unit. These ports can be utilized for various functions. For example, keyboard and mouse functions during system configuration, USB storage devices can be utilized for bin data and video collection. The USB ports shall not require special mouse software drivers. The USB ports shall be used as part of system setup and configuration

3.8.5 The CCU shall provide an output to a monitor. The port shall be HDMI. The native resolution of the monitor port shall be 1024 x 768.

3.8.6 Communications

An Ethernet communications port shall be provided on the front panel. The Ethernet port shall be compliant with IEEE 802.3 and shall use a RJ-45 type connector mounted on the front panel of the CCU. The Ethernet communications interface shall allow the user to remotely configure the system and/or to extract calculated vehicle/roadway information. The interface protocol shall be documented or interface software shall be provided. Each MSDS shall have the capability to be IP addressable. The DP shall support data rates of up to100Mbps.

3.8.7 The CCU shall provide an SDLC connection to the Traffic Controller. The connector shall be a 'D-15' type, in compliance with NEMA TS-2 specifications.

3.8.8 The CCU shall provide an indicator when the SDLC port is active.

3.8.9 The CCU shall provide an indicator when the unit has power.

3.8.10 The CCU shall provide an indicator when the unit is on line.

3.8.11 The CCU shall provide a Wi-Fi connection. The connection shall be over a standard 2.4GHz connection. The Wi-Fi connection shall be enabled and disabled by a switch on the CCU. The CCU shall provide an indicator when the Wi-Fi connection is active.

3.8.12 The CCU shall provide a connection for a removable antenna. The antenna connection shall be a SMA Male type.

3.8.13 The CCU shall provide system status via an on-board Organic Light Emitting Diode display. The display shall indicate various system parameters, such as sensor health and DP health, firmware version and sensor air temperature. The display will be enabled with a switch on the CCU. The display will automatically disable 15 minutes after the button is pressed.

4. MSDS Sensor

The MSDS sensor shall be supplied by the MSDS manufacturer and consist of two components; a camera sensor and a radar sensor.

4.1 ***The MSDS sensor shall utilize a single shielded CAT5E or CAT6 cable for power, communications and video. Cable termination at the camera shall not require crimping or special tools. The cable termination shall only require a standard wire stripper and a screw driver. No connectors (e.g. BNC) shall be allowed.***

An optional RJ45 direct connector shall be made available if a user chooses to connect the sensor cable with RJ45 connections at the sensor.

4.2 ***Camera Sensor***

4.2.1 The camera sensor shall allow the user to set the focus and field of view of the camera imager via the MSDS software. Sensor control from the controller cabinet shall communicate over a single Cat-5e or CAT6 cable. No additional wires shall be required.

4.2.2 The camera imager shall produce a useable video image of the features of vehicles under all roadway lighting conditions, regardless of time of day. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the

minimum range from nighttime to daytime, but not less than the range 0.003 lux to 10,000 lux.

4.2.3 **The camera imager electronics shall include automatic gain control (AGC) to produce a satisfactory image at night for the MSDS algorithms.**

4.2.4 **The camera imager luminance signal to noise ratio (S/N) shall be more than 50 dB with the automatic gain control (AGC) disabled.**

4.2.5 **The camera imager shall employ three dimensional dynamic noise reduction (3D-DNR) to remove unwanted image noise.**

4.2.6 **The camera imager shall employ wide dynamic range (WDR) technology to compensate for wide dynamic outdoor lighting conditions. The dynamic range shall be greater than 100 dB.**

4.3 ***The camera imager shall be digital signal processor (DSP) based and shall use a CCD sensing element and shall output color video with resolution of not less than 540 TV lines. The color CCD imager shall have a minimum effective area of 811(h) x 508(v) pixels.***

4.3.1 **The camera imager shall include an electronic shutter control based upon average scene luminance and shall be equipped with an auto-iris lens that operates in tandem with the electronic shutter. The electronic shutter shall operate between the range of 1/60th to 1/90,000th second.**

4.3.2 **The camera imager shall utilize automatic white balance.**

4.3.3 **The camera imager shall include a variable focal length lens with variable focus that can be adjusted, without opening up the camera housing, to suit the site geometry by means of a portable interface device designed for that purpose and manufactured by the detection system supplier.**

4.3.4 **The horizontal field of view shall be adjustable from 4.5 to 48 degrees. The sensor camera lens shall be a 12x zoom lens with a focal length of 3.5mm to 35mm.**

4.3.5 **The sensor camera lens shall also have an auto-focus feature with a manual override to facilitate ease of setup.**

4.3.6 **The sensor shall incorporate the use of preset positioning that store zoom and focus positioning information. The sensor shall have the capability to recall the previously stored preset upon application of power.**

4.3.7 The camera imager shall be housed in a weather-tight sealed enclosure. The housing shall allow the sensor camera to be rotated to allow proper alignment between the sensor camera and the traveled road surface.

4.3.8 The sensor camera enclosure shall be equipped with a sunshield. The sunshield shall include a provision for water diversion to prevent water from flowing in the camera sensor's field of view. The camera sensor enclosure with sunshield shall be less than 3.5" (89mm) diameter, less than 5.25" (133mm) long, and shall weigh less than 2.5 pounds (1.14kg) when the camera and lens are mounted inside the enclosure.

4.3.9 The enclosure shall be designed so that the pan, tilt and rotation of the camera sensor assembly can be accomplished independently without affecting the other settings.

4.3.10 Camera Lens

The camera sensor enclosure shall include a proportionally controlled Indium Tin Oxide (ITO) lens coating for the heating element of the front glass that maximizes heat transfer to the lens. The output power of the heater shall vary with temperature, to assure proper operation of the lens functions at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure. The transparent coating shall not impact the visual acuity and shall be optically clear. The glass face on the front of the camera sensor enclosure shall have an anti-reflective coating to minimize light and image reflections.

4.3.11 When mounted outdoors in the enclosure, the camera sensor shall operate satisfactorily in a temperature range from -30° F to +140° F (-34 °C to +60 °C) and a humidity range from 0% RH to 100% RH. Measurement of satisfactory video shall be based upon DP system operation.

4.4 *Radar Sensor*

4.4.1 The radar sensor shall operate in the 24 GHz frequency band and shall operate on 1 of 7 available enumerated channels that is user selectable.

4.4.2 The radar detection range shall be over 500 feet (152 meters) minimum, +/- 5%.

4.4.3 The radar sensor shall be able to track up to 64 independent objects simultaneously.

4.4.4 Object speed detection shall be within a range of 0 to 150 miles per hour +/- 1.0 miles per hour (240 km per hour ± 1.5 km per hour).

4.4.5 The radar sensor shall be able to detect vehicles in 1 to 6 traffic lanes.

4.4.6 The radar sensor shall be housed in a weather-tight sealed enclosure conforming to IP-67 specifications. The housing shall allow the radar to be adjusted to allow proper alignment between the sensor and the traveled road surface.

4.4.7 When mounted outdoors in the enclosure, the radar shall operate in a temperature range from -30 °F to +165 °F (-34 °C to +74 °C) and a humidity range from 0% RH to 100% RH.

4.4.8 The radar sensor shall communicate with the sensor data combiner.

4.4.9 The radar sensor shall acquire its power from the sensor data combiner.

4.5 ***Both camera imager and radar sensors shall be housed in an overall, single enclosure assembly.***

4.6 ***The overall size of the multi-sensor enclosure shall not exceed 14 inches x 15 inches x 17 inches (355mm x 380mm x 430mm).***

4.7 ***The overall weight of the multi-sensor unit shall not exceed 11 pounds (5kg).***

4.8 ***The effective projected area (EPA) shall not exceed 2.0 square feet (0.6 square meters).***

4.9 ***The maximum power consumption for the multi-sensor assembly shall be less than 10 watts typical, 20 watts peak.***

4.10 ***Recommended sensor placement height shall be 33 feet (or 10 meters) above the roadway, and over the traveled way on which vehicles are to be detected. For optimum detection the MSDS sensor should be centered above the traveled roadway. The camera shall view approaching vehicles at a distance not to exceed 350 feet (107 meters) for reliable detection (height to distance ratio of 10:100). Camera placement and field of view (FOV) shall be unobstructed and as noted in the installation documentation provided by the supplier.***

4.11 ***The video signal shall be fully isolated from the sensor enclosure.***

4.12 ***Sensor Data Combiner***

4.12.1 A sensor data combiner that combines sensor information from both video and radar sensors shall be employed.

4.12.2 The sensor data combiner shall supply primary power to each sensor unit.

4.12.3 The sensor data combiner shall facilitate digital communications between the sensor data combiner and each of the sensor units.

4.12.4 The sensor data combiner shall get its primary power from DC power sourced from the CCU using outdoor rated, shielded Cat5E or Cat6 cable.

4.12.5 The sensor data combiner shall communicate with the detection processor using a single outdoor rated, shielded Cat5E or Cat 6 cable. Both video imaging and radar data shall use the single cable.

4.12.6 The sensor data signal shall be fully isolated from the mechanical enclosure

4.12.7 Cable terminations at the sensor data combiner shall not require crimping tools.

4.12.8 The sensor data combiner shall be housed in a weather-tight sealed enclosure conforming to IP-67 specifications.

4.13 ***A weather-proof protective cover shall be provided shall be provided to protect all terminations at the sensor.***

4.14 ***The sensor assembly shall include a temperature sensor. The sensor will be polled by the MSDS every minute and will supply the current air temperature. The MSDS software will display this information on the On-Screen Display for each sensor.***

5. MSDS Software

5.1 *General System Functions*

5.1.1 Detection zones shall be programmed via an embedded application displayed on a video monitor and a keyboard and a pointing device connected to the CCU. The menu shall facilitate placement of detection zones and setting of zone parameters or to configure system parameters. A separate computer shall not be required for programming detection zones or to view system operation. All programming function shall occur on live video images and radar blips, no snapshots or still images are allowed.

5.1.2 The MSDS software shall store up to five completely independent detection zone patterns in non-volatile memory. The MSDS can switch to any one of the five different detection patterns within 1 second of user request via menu selection with the pointing device. Each configuration shall be uniquely labeled and able to be edited by the user for identification. The currently active configuration indicator shall be displayed on the monitor.

5.1.3 The MSDS shall detect vehicles and bicycles in real time as they travel across each camera detection zone.

5.1.4 The MSDS shall detect vehicles in real time as they travel across each radar detection zone.

5.1.5 The DP shall automatically define a pedestrian crossing area, and track pedestrians in real-time as they travel across this pedestrian crossing area in both directions of the camera image. The DP shall count pedestrians moving left-to-right, and right-to-left. The DP shall measure the speed of pedestrians moving left-to-right, and right-to-left, and provide the minimum, maximum, and average speed of the pedestrians per the bin interval. These values shall be displayed on-screen for both directions, and an option shall be provided to the user to turn this on-screen display on or off. This data will be stored in local memory for later retrieval via a remote device. The data will be stored at the Bin Interval set in the system.

5.1.6 The MSDS shall accept new detection patterns from an external computer through the Ethernet port when the external computer uses the correct communications protocol for downloading detection patterns. A Windows™-based software designed for local or remote connection and providing video capture, real-time detection indication and detection zone modification capability shall be provided with the system.

5.1.7 The MSDS shall have the capability to automatically switch to any one of the stored configurations based on the time of day which shall be programmable by the user.

5.1.8 The MSDS shall send its detection patterns to an external computer through the Ethernet port when requested when the external computer uses the appropriate communications protocol for uploading detection patterns.

5.1.9 The MSDS shall default to a safe condition, such as a constant call on each active detection channel, in the event of unacceptable interference or loss of the video and/or radar signal.

5.1.10 The MSDS shall be capable of automatically detecting a low-visibility condition of the camera sensor such as fog and respond by placing all affected detection zones in a constant call mode. A user-selected alarm output shall be active during the low-visibility condition that can be used to modify the controller operation if connected to the appropriate controller input modifier(s). The system shall automatically revert to normal detection mode when the low-visibility condition no longer exists. An On-Screen Icon will be displayed while the system is in this mode.

5.1.11 Up to 32 detection zones per camera input shall be supported and each detection zone must be user-sizeable to suit the site and the desired vehicle detection region.

5.1.12 Up to 32 detection zones per radar input shall be supported and each detection zone must be user-sizeable to suit the site and the desired vehicle detection region.

5.1.13 Up to 5 trip lines per radar input shall be supported and each trip line must be user-positionable to suit the site and the desired vehicle detection application.

5.1.14 The system shall provide a Group output. When a user defined number of vehicles are present in the radar FOV the system shall activate an output.

5.1.15 The MSDS shall provide up to 32 open collector output channels per camera or radar input using one or more extension modules.

5.1.16 The MSDS shall provide discrete outputs when pedestrians are being tracked in the crosswalk. An output may be assigned to pedestrians crossing from left to right and a separate output may be assigned to pedestrians crossing from right to left.

5.1.17 The MSDS shall provide a discrete output when pedestrians are crossing against a red phase. The MSDS shall allow up to 4 phase inputs to be assigned to each crosswalk.

5.1.18 A single video detection zone shall be able to replace multiple inductive loops and the video detection zones shall be OR'ed as the default or may instead be AND'ed together to indicate vehicle presence on a single approach of traffic movement.

5.1.19 When a vehicle is detected within a detection zone, a visual indication of the detection shall activate on the video and radar overlay display to confirm the detection of the vehicle for the zone.

5.1.20 Detection shall be at least 98% accurate in good weather conditions, with slight degradation possible under adverse weather conditions (e.g. rain, snow, or fog) which reduce visibility. Detection accuracy is dependent upon site geometry, sensor placement, camera image quality and detection zone location, and these accuracy levels do not include allowances for occlusion or poor video due to sensor location or quality.

5.1.21 The MSDS shall provide dynamic zone reconfiguration (DZR). DZR sustains normal operation of existing detection zones when one zone is being added or modified during the setup process. The new zone configuration shall not go into effect until the configuration is saved by the operator.

5.1.22 Detection zone setup shall not require site specific information such as latitude and longitude to be entered into the system.

5.1.23 The RDS shall process the radar signals from each sensor at 50mS intervals. Multiple processors shall process all radar signals simultaneously.

5.1.24 The MSDS shall process the video input from each camera sensor at 30 frames per second. Multiple camera processors shall process all video inputs simultaneously.

5.1.25 The MSDS shall output a constant call during the background learning period of no longer than 3 minutes.

5.1.26 Detection zone outputs shall be individually configurable to allow the selection of presence, pulse, extend, and delay outputs. Timing parameters of pulse, extend, and delay outputs shall be user definable between 0.1 to 25.0 seconds.

5.1.27 Up to six detection zones per camera sensor view shall have the capability to count the number of vehicles detected. The count value shall be internally stored for later retrieval through the Ethernet port. The zone shall also have the capability to calculate and store average speed and lane occupancy at user-selectable bin intervals of 10 seconds, 20 seconds, 1 minute, 5 minutes, 15 minutes, 30 minutes and 60 minutes.

5.1.28 The system shall provide an automatic count function for right turn vehicles. Once standard detection zones have been configured the system will determine the path of right turn vehicles and begin to track them. The data will be stored at the chosen bin interval. The current count will be displayed on the video image. The current count display may be disabled by the user.

5.1.29 In addition to the count type zone, the MSDS shall be able to calculate average speed and lane occupancy for all of the video detection zones independently. These values shall be stored in non-volatile memory for later retrieval.

5.1.30 The MSDS shall have an "advance" zone type where raw detection output duration to the traffic controller is compensated for angular occlusion and distance.

5.1.31 The MSDS shall employ color overlays on the video output.

5.1.32 The MSDS shall have the ability to show controller phase status (green, yellow, or red) for up to 8 phases. These indications shall also be color coded.

5.1.33 The user shall have the ability to enable or disable the display of the phase information on the video output.

5.1.34 The MSDS shall have the capability to change the characteristics of a detection zone based on external inputs such as signal phase. Each detection zone shall be able to switch from one zone type (i.e. presence, extension, pulse, etc.) to another zone type based on the signal state. For

example, a zone may be a "count" zone when the phase is green but change to a "presence" zone type when the phase is not green. Another application would be zone type of "extension" when the signal phase is green and then "delay" when red.

5.1.35 The MSDS software shall aid the user in drawing additional detection zones by automatically drawing and placing zones at appropriate locations with only a single click of the mouse. The additional zone shall utilize geometric extrapolation of the parent zone when creating the child zone. The process shall also automatically accommodate lane marking angles and zone overlaps.

5.1.36 The radar sensor shall have the capability to control the output of each radar detection zone based on a minimum or maximum speed. The minimum speed can be set from 0 mph (0 kph) to 249 mph (400 kph). The maximum speed can be set between 1 mph (1 kph) to 250 mph (402 kph).

5.1.37 When the user wishes to modify the location of a zone, the MSDS software shall allow the user move a single zone, multiple zones or all zones simultaneously.

5.1.38 When the user wishes to modify the geometric shape of the zone, the MSDS software shall allow the user to change the shape by moving the zone corner or zone sides.

5.1.39 On screen zone identifiers shall be modifiable by the user. The user shall be allowed to select channel output assignments, zone type, input status, zone labels or zone numbers to be the identifier.

5.1.40 The MSDS shall have the capability to show pedestrian activity in the crosswalk through a visual indication on the video output.

5.1.41 The MSDS software shall support bicycle type zones where the zone can differentiate between motorized vehicles and bicycles, producing a call for one but not the other.

5.1.42 Bicycle zone types shall only output when a bicycle is detected. Larger motorized vehicles such as cars and trucks that traverse a bicycle zone shall not provide an output.

5.1.43 The MSDS software shall provide the ability to assign a separate output channel for bicycle zones to allow traffic controllers to implement special bicycle timing.

5.1.44 Placement of bicycle type zones in vehicle lanes shall be allowed.

5.1.45 Upon detection of a bicycle, the video output overlay shall indicate active detection as well as providing a unique bicycle detection identifier to visually distinguish bicycle detection versus vehicle detection.

5.1.46 Up to six bicycle detection zones per camera view shall have the capability to count the number of bicycles detected in addition to their normal detection function. The count value shall be internally stored for later retrieval through the Ethernet port.

5.1.47 Automatic Traffic Volume Graph

The On-Screen Display shall include an Automatic Traffic Volume graph. This graph will display estimated Vehicles Per Hour (VPH) per movement for each camera view. The graph will display a rolling 24 hour period of VPH.

5.1.48 Occupancy Graph

The On-Screen Display shall include an Occupancy Graph. This graph will display estimated approach occupancy for each camera view. The graph will display a rolling 24 hour period of Occupancy.

5.1.49 Speed Graph

The On-Screen Display shall include a Speed Graph. This graph will display average speed of vehicles through the each sensor view for the last Bin Interval. The graph will display a rolling 24 hour period of Speed.

5.1.50 Radar Zone Data Display

Current conditions for the 32 radar zones shall be displayed on the video. The conditions are; un-configured, configured and inactive and configured and active.

5.1.51 Radar Trip Line and Activity Display

Current conditions of the 5 trip lines and any warning flags from the radar shall be displayed on the video.

5.2 *User Interfaces*

This section sets forth the minimum requirements for the MSDS to provide a single point interface to remote and local users. The MSDS shall also have the capability to stream up to four simultaneous video streams over an Ethernet interface.

5.2.1 The user interface shall provide capabilities to enable multiple rack-mounted detection processors to be locally and remotely accessed from a single point via an Ethernet connection.

5.2.2 The device shall allow the operator to view four videos simultaneously or any one video by controls embedded in the MSDS.

5.2.3 Local user access to video detection programming shall be limited to the detection processor unit that is currently being displayed on the monitor.

5.2.4 All local programming and setup parameters for the video detection processor shall be user accessible through the interface unit without requiring the user to swap user interface cables between video detection processors.

5.2.5 Remote access to the device shall be through the built-in Ethernet port via access software running on a Microsoft Windows based personal computer.

5.2.6 A Windows OS remote access firmware shall also be available for remote setup and diagnostics of the interface unit.

5.2.7 The MSDS shall support streaming video technology using H.264 standards to allow the user to monitor video detection imagery over the Ethernet interface. Motion JPEG streaming video shall not be allowed.

5.2.8 The interface unit shall allow eight independent streams, one from each detection processor, to be transported via Ethernet to four independent streaming video players simultaneously in D1 resolution.

5.2.9 The interface shall allow the user to select the resolution of the displayed streamed video.

5.2.10 The interface unit shall support the streaming and display of four concurrent streams in D1 resolution.

5.2.11 The interface shall allow the user to change the unit's Ethernet network settings of IP address, subnet mask and default gateway.

5.2.12 The MSDS shall allow the user to upload new application firmware through the use of the interface, remotely or on-site.

5.2.13 A Windows OS based application will be provided to remotely view video streams from the MSDS.

5.2.14 An iOS and Android based application shall be available to remotely access each configured MSDS on the agency's network. This application shall allow the user to choose between any number of pre-configured intersection locations. Using the iOS or Android device, the application will allow the user to view live video from any camera at that intersection, including vehicle and bicycle detections in real-time. The application will also allow the user to view individual intersection data, including turning movement counts and occupancy. The application will show each data set in time periods of day, week, or month, and have the capability of turning on or off right, left, and thru movement data for turning movement count data. The application will also allow the user to view current system diagnostic data, including the following, but not limited to; individual camera glare and low contrast information, system low contrast, constant call, alarm, reboots, logins, and menu access information.

5.2.15 A Windows based PC application shall be available to remotely access each configured MSDS on the agency's network. The application shall allow the user to choose multiple intersection locations to be displayed simultaneously on the screen. Intersections can be displayed in alphanumeric order. Groups of intersections can be configured to be displayed simultaneously to allow the user to monitor particular corridors of detection. Multiple groups may be configured in the application.

6. SDLC Functionality

This section sets forth the minimum requirements for a full-function BIU and integrated MSDS detection communication. The MSDS shall provide outputs to the controller of vehicle calls from DPs that reside within the detector rack.

6.1 *Functional Capabilities*

The MSDS shall have the capability of monitoring phase information and passing that information and other system data such as "time" from the controller to video detection processor modules. The DP shall also accept data from video processor modules and relay the information to the controller. The unit shall provide a maximum of 64 detector outputs to the controller via the SDLC interface.

6.2 *Requirements*

The module shall be in compliance with the following industry specifications:

- *Transportation Electrical Equipment Specifications (TEES)*, August 16, 2002 (or latest edition), California Department of Transportation

- *NEMA Standard Publication TS 1-1989* (or latest edition), *Traffic Control Systems,* National Electrical Manufacturers Association

- *NEMA Standard Publication TS 2-2003, Traffic Controller Assemblies With NTCIP Requirements, Version 02.06* (or latest edition), National Electrical Manufacturers Association

6.3 *Data Interfaces*

The MSDS shall have two data interfaces:

- The interface to the controller shall be accomplished by the use of the TS-2 SDLC port and protocol in accordance with the TS-2 specifications. The module shall be able to be configured to respond to BIU addresses 8, 9, 10 and 11 or a combination thereof.
- The interface to communicate with card rack video detection processors shall be manufacturer specific.

6.4 *SDLC Communication Indicators*

One LED indicator shall be provided for the TS-2 SDLC interface. The indicator shall be used to inform the user of any communication activity on the SDLC port.

7. Installation

7.1 ***The cable to be used between the sensor and the CCU in the traffic cabinet shall be Cat-5e, shielded, outdoor rated. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. Shielded RJ-45 connectors shall be used where applicable. The Cat-5e cable, RJ-45 connector, stripping and crimping tool shall be approved by the supplier of the video detection system, and the manufacturer's instructions must be followed to ensure proper connection.***

7.2 ***The detection sensor shall be installed by factory-certified installers as recommended by the supplier and documented in installation materials provided by the supplier. Proof of factory certification shall be provided.***

8. Warranty

8.1 ***The supplier shall provide a limited three-year warranty on the MSDS.***

8.2 *During the warranty period, technical support shall be available from the supplier via telephone within 4 hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.*

8.3 *During the warranty period, updates to DP software shall be available from the supplier without charge.*

9. Maintenance and Support

9.1 *The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the video detection system. These parts shall be available for delivery within 30 days of placement of an acceptable order at the supplier's then current pricing and terms of sale for said parts.*

9.2 *The supplier shall maintain an ongoing program of technical support for the video detection system. This technical support shall be available via telephone, or via personnel sent to the installation site upon placement of an acceptable order at the supplier's then current pricing and terms of sale for on-site technical support services.*

9.3 *Installation or training support shall be provided by a factory-authorized representative and shall be a minimum IMSA-Level II Traffic Signal Technician certified.*

9.4 *All product documentation shall be written in the English language.*