



# North Dakota Department of Transportation

Grant Levi, P.E.  
Director

Jack Dalrymple  
Governor

January 21, 2016

## ADDENDUM 1 – JOB 20

TO: All prospective bidders on project SS-9-999(340) & ITS-9-999(350), Job No. 20, scheduled for the February 5, 2016 bid opening.

The following plan and request for proposal revisions shall be made:

### Plan Revisions:

**Remove and replace sheet 160-10 with the enclosed sheet revised 1/12/2016.**

#### Sheet 160-10:

Quantities (F) table has been revised. The item "Kistler Lineas Quartz Sensor" has been changed to add the words "No 8 ground wire".

Note (J) has been added.

### Request for Proposal Revisions:

**Remove and replace SP 240(14) AUTOMATIC TRAFFIC RECORDED SYSTEM AND SP 241(14) VIRTUAL WEIGH-IN-MOTION SYSTEM with the enclosed Special Provisions revised 1/19/2016.**

#### SP 240(14):

Page 3: Changed the power supply for the Ethernet Switch to 12-48V.

Page 6: Moved the first sentence in the last paragraph of section E to page 9 and deleted the next three sentences.

Page 9: Added the sentence moved from Page 6 to Section N.

#### SP 241(14):

Page 4: Changed the power supply for the Ethernet Switch to 12-48V.

Page 7: Deleted the first four sentences of the last paragraph of section E.

Page 9: Removed the requirement to obtain a meeting room in Bismarck.

Page 10: Changed the testing requirement in the last paragraph to 90%.

Removed the first bulleted item requiring classifying 90% of the vehicles correctly.

This addendum is to be incorporated into the bidder's proposal for this project.

CAL J. GENDREAU – CONSTRUCTION SERVICES ENGINEER

80:dch

Enclosure

## NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

### SPECIAL PROVISION

#### AUTOMATIC TRAFFIC RECORDER SYSTEM

#### PROJECT SS-9-999(340) – PCN 20899

##### DESCRIPTION

Furnish and install a complete operational Automatic Traffic Recorder (ATR) system as required in these documents. Supply any additional items that may be unique to the design of the system or needed to meet the contract requirements. Furnish these additional items even though they are not individually specified.

##### MATERIALS

###### A. General.

Verify that the systems and components are new and have been tested.

Use stainless steel hardware (e.g. mounting bolts, nuts, washers, and external hinges, etc.) on outdoor components.

Use only components designed for 10 or more years of industrial use.

Contact the Utility Company and work with them to obtain all necessary permits, pay any assessed fees for hookup, and establish metered service to the system cabinet. Work with the Information Technology Division (ITD) within the Department to establish communications from the NDDOT to the site. The ITD contact for the Department is:

Robert Steckler  
216 Airport Road  
Bismarck, ND 58504  
Telephone: (701) 328-6935

###### B. Work Drawings.

Furnish work drawings to the Engineer within 50 days after the date of contract execution. Provide the dimensions, type of material, and the functional characteristics of the equipment to be installed within the work drawings.

Submit the following work drawings:

- Loop Conductor
- Loop Lead-in Conductor
- Pull Box
- Cabinet
- Conduit Plugs
- Modem
- Remote Power Control
- Surge Protection Devices
- AC Line Protector Unit

- Ethernet Switch
- Data Collector
- Power Conductor

### **C. Ground-Mounted Cabinet.**

Provide a cabinet that is large enough to house all equipment specified and accommodate future expansion. Design the cabinet top to be waterproof with a 0.5 inch crown or slanted to the rear. Secure the cabinet to a concrete foundation. Provide the cabinet opening with a full-sized door with a gasket made of natural sponge rubber. Cover the keyhole of the lock with a swing away cover made of stainless steel. Supply 2 keys for each cabinet.

Size copper conductors according to the National Electrical Code (NEC) and Section 10 of the National Electrical Manufacturers Association (NEMA) Standards Publication TS-1. Finish all cabinet wiring in a neat and organized fashion. Furnish all assemblies and panels to be easily accessible for maintenance purposes. Label live wires inside the cabinet.

Provide a light socket that is fused ahead of the main circuit breaker. Install the light socket and lamp in a location where they do not interfere with the installation and removal of equipment from the cabinet. Energize the lamp by a switch operated by the cabinet door.

Equip the cabinet with a main circuit breaker used to disconnect the incoming AC service entrance. Provide a duplex Ground Fault Circuit Interrupt (GFCI) and a duplex non-GFCI in the control cabinet.

Construct a 4 foot by 4 foot concrete working slab, 4 inches thick, next to the cabinet foundation on the door side of the cabinet.

The Contractor is responsible for all conductor termination. Crimp and solder all lug terminals for conductor termination. Provide conductors that meet the requirements of Section 896.02 A, "Feeder".

### **D. 4G Cellular Modem.**

Supply a 4G cellular modem including all necessary equipment and mounting hardware required for operation. Provide a modem that meets the following requirements:

1. LTE standards with fallback to:
  - a. EV-DO Rev. A,
  - b. CDMA EV-DO (Rev.0), and
  - c. CDMA 1xRTT
2. Supports the following bands:
  - a. LTE 700MHz,
  - b. CDMA/EV-DO 800, 1900,
  - c. HSPA/HSPA+ 900/2100, and
  - d. GPRS 900/1800/1900
3. Has the following Security Features:
  - a. IPsec VPN,
  - b. GRE Tunneling,
  - c. MAC Address Filtering,
  - d. IP Filtering,

- e. Port Filtering, and
  - f. SSH and HTTPS
4. Works in the following Atmospheric Conditions:
    - a. Operating Temperature: -30°C to +70°C (-22°F to +158°F)
    - b. Storage Temperature: -40°C to +85°C (-40°F to +185°F)
  5. Uses an Ethernet Host interface that meets the following:
    - a. 10/100 Mbps RJ-45,
    - b. RS-232, and
    - c. DB9 DCE (300-230400 baud)
  6. Antenna Connections:
    - a. Cellular – 50 Ohm SMA, and
    - b. Receive Diversity – 50 Ohm SMA
  7. Application Interfaces:
    - a. TCP/IP,
    - b. UDP/IP,
    - c. DHCP,
    - d. HTTP,
    - e. SNMP,
    - f. SMTP,
    - g. SMS,
    - h. MSCI,
    - i. Modbus, and
    - j. Binary
  8. Has LED indicator lights for the following:
    - a. Network,
    - b. Signal,
    - c. Activity,
    - d. Service, and
    - e. Power

#### **E. Ethernet Switch.**

Supply an Ethernet switch with the necessary hardware required for operation. Provide the Ethernet Switch, enclosure, mount, and cables with standard accessories.

Provide an Ethernet Switch that meets the following:

- Ruggedized construction,
- Powered by 12V-48V DC,
- Has 4-10/100TX Ports, and
- Has an operating temperature of -40°C to 49°C (-40°F to 120°F)

#### **F. Ethernet Lightning Suppressor.**

Provide an Ethernet Lightning Suppressor that meets the following:

- Ensure this unit is in a cast metal box with shielded connections,
- Clamping voltage of 65 Volts,
- Cat 6 outdoor direct burial cabling at 10/100/1000 speed,

- Ensure the unit is compatible with Power over Ethernet cable, and
- Has an operating temperature of -40°C to 49°C (-40°F to 120°F)

**G. Remote Power Control Rack Mounted Outlet Strip.**

Supply a Remote Power Control that meets the following:

- Web-accessible IP-based power controller for minimum eight independently controlled outlets.
- Enables minimum 15 users to remotely power control outlets using any web browser, Telnet client or SNMP manager.
- 10/100 Ethernet, Web, Telnet, SNMP, Port assignable for Web and Telnet, SSL Security on Web control.
- Monitors network devices and auto reboots whenever network response fails. 16 auto Pings can be assigned to any outlet.
- Current sensing and Alarms (determined by adjustable high and low current thresholds) when critical power conditions occur, notifications are sent by email.

**H. ADR 6000 Traffic Counter/Classifier.**

The NDDOT has obtained sole source approval for the purchase of the PEEK brand electronics. Provide an ADR 6000 for this ATR site. Protect all AC power feeds, data lines, and loops with approved surge protectors.

Provide any updates to the current version of the Department ADR 6000 TOPS Enterprise system and include software user manuals.

The field unit of the ADR 6000 system shall instantaneously calculate and temporarily store "bin" data on an electronic storage medium at the site. Data stored prior to power loss and after restoration of power shall remain in the event of a power loss at the site. The data shall be configured in TOPS to auto poll daily. The ADR 6000 system shall be able to collect 14 days of BIN file data storage before having to be downloaded into TOPS. TOPS database software shall be capable of holding 2GB of data before needing to be archived and the database cleared.

**I. Surge Protection Devices.**

Protection against lightning, electrostatic discharge and other transient high voltage surges shall be provided by the Contractor. The surge protection equipment shall meet all applicable surge test requirements of the latest IEEE Test Standard, and will operate under the specified environmental conditions and meet PEEK's specifications.

**J. AC-Line Protector Unit.**

A 6-outlet AC-Line Protector Unit shall be provided for the 120-volt, 60-Hz power source. The protector unit shall include a thermal circuit breaker, and EMI/RFI noise suppression for diverting and clamping high voltage surges so as to limit the maximum voltage reaching the sensitive electronic equipment during a transient pulse. The unit shall be approved by Underwriter Laboratories (UL).

The AC-Line Protector shall provide protection against transients which may enter electronic equipment through line Neutral paths (Differential Mode) or through line or Neutral to Ground paths (Common Mode).

The AC-Line Protector shall be contained in a single enclosure with appropriate terminations for interconnecting cables to those assemblies requiring 120-volt, 60-Hz protected power.

**K. Pull Box.**

Provide a round PCV pull box as shown on the detail. Provide a pull box cover that is watertight using a gasket around the opening and each of the screw holes.

Compact the soil around the pull boxes. Provide a drainable base to protect against water infiltration. Install pull boxes of sufficient size as to accommodate all wiring and conduit without crimping or bending the wires.

Plug and seal all holes in the pull box.

**CONSTRUCTION REQUIREMENTS**

**A. General.**

Materials and equipment conform to these special provisions, the National Electrical Manufacturers Association (NEMA); the Electronics Industries Association (EIA), National Electrical Code (NEC), and the Telecommunications Industries Association (TIA).

The Contractor shall be responsible for all wire termination.

Mount the modem antenna on the roof of the cabinet.

**B. Removal of Equipment.**

Where pull box removal is specified in the plans; remove the pull box and disconnect the wires.

Where cabinet removal is specified in the plans; remove the cabinet, the entire foundation and working slab, and disconnect the wires.

Where removal of feed point is specified in the plans; remove the perforated tube supports, switch box, and meter trim. The local utility company will remove the meter.

All conduit and conductor shall be terminated 2 feet below ground level.

**C. Earthwork.**

Excess excavation obtained from construction activities shall become property of the Contractor. Use the excavated material to fill areas of pull box and cabinet foundation removal.

Restore the ground to match adjacent areas.

**D. Seeding.**

Restore ground disturbed by construction activities to the original grade. Reseed these areas with Class II Seed. This includes areas disturbed by trenching, boring, pull boxes, cabinet foundations, and feed points.

**E. Qualified Technician.**

Ensure that a PEEK qualified technician is on site to assist and supervise the installation of the PEEK ADR 6000 system and all work. Ensure the qualified technician is certified in all

aspects of the PEEK ADR 6000 equipment installation and operation. The contact information is:

ACT Traffic Solutions Inc.  
7975 Stone Creek Drive  
Suite 30  
Chanhassen, MN 55317  
Business Phone (952) 288-4828  
Business Fax (952) 960-8002

The PEEK qualified technician will provide documentation, training, calibration, and testing. The PEEK qualified technician will be providing installation oversight. The Contractor shall be responsible for installing all components of the ADR 6000 system. The Contractor will indicate the Manufacturer of all necessary equipment.

All testing results both manual and ADR 6000 will be compiled, bound and provided in a neat and orderly file. Electronic versions of all results may also be provided so long as the information is compatible with Microsoft Excel software.

**F. Manuals.**

Provide one paper copy and one electronic copy of the operational and maintenance manuals. Include the following documentation in the manuals: equipment, software operation, troubleshooting, service procedures, module descriptions, circuit diagrams, replacement parts lists, installation procedures, mechanical details, and termination points for the equipment furnished. Provide technical support telephone numbers, fax numbers, and email addresses.

The paper copy manual shall be bound. Provide test criteria and results in a spreadsheet format that is compatible with Department spreadsheet software.

**G. Labeling Cables and Components.**

Secure permanent identifying labels to each cable and component. This includes any required cross connects to communications equipment, according to these contract documents and information provided by the Engineer. Use self-laminating vinyl labels at least 1 inch wide and long enough that the translucent portion of the label completely covers the white area bearing the legend. Use vinyl with a layer of pressure sensitive acrylic adhesive. Use labels that resist oil, water, and solvents and are self-extinguishing. Use a machine to print the legend in letters at least 1/8 inch high.

**H. External Grounding System.**

Provide bonding and grounding in accordance with NEC and IRD's instructions. Provide ground conductor that is No. 2/0 AWG copper conductor. Each ground rod must be 5/8 inch diameter and 10 feet long.

Clean each grounding component with 300-grit emery cloth before applying a mineral oil based oxide inhibitor to the bonding area.

Connect all electrical service grounds to the grounding ring.

Route each ground conductor to the ground buss via the straightest route that does not hinder maintenance or installation activities.

Place ground rods at all 4 corners of the cabinet foundation. Bond the ground conductor to the cabinet using a ground ring. Ensure the total length of the ground ring is less than 20 feet in circumference.

Bury the ground ring a minimum of 20 inches below ground level. Provide the ground ring in a trench around the cabinet, attached to all the ground rods. Route the ground cable from the buss bar inside the cabinet through  $\frac{3}{4}$  inch flex conduit to the first ground rod next to the cabinet foundation. Seal conduit ends using conduit plugs.

Inspection of all underground work will be completed by the Engineer before it is covered. Connect all underground site connections using the exothermic weld process.

Test the earth ground resistance to 25 ohms or less, using an earth-ground resistance tester. Install additional ground rods to achieve the 25 ohms or less earth ground resistance. Document all results and furnish to the Engineer in a clean organized format.

**I. Loop Wire and Loop Lead-in Wire.**

Provide loop conductor that meets Section 896.02 B.1 "Copper Loop Conductor". Provide loop lead-in conductor that meets Section 896.03 B.3 "Copper Loop Lead-in Conductor". Splicing is only allowed at the pull box where loop conductor and loop lead-in conductor are joined. Solder splices using a 3M splice kit, CK 137 Shake-N-Seal from Uraseal, or approved equal. Provide loop splices according to IRD's recommendation.

**J. Sawing and Sealing Joints.**

Follow Section 772.04 E.4 "Saw Cut, and 772.04 E.7 "Saw Cut Seal" when sawing and sealing any saw cuts. Provide loop saw slots 2 inches deep or as recommended by PEEK. Using hot pour joint seal is not allowed for any saw cuts. Approved joint seals include 3M Bondo P-606V Loop Sealant, VersaFLEX SL/75 Joint Filler, BASF MasterSeal SL 180, or approved equal for sealing all saw cuts. Follow minimum curing specifications. Allow the sealant to cure until it does not track or has set sufficiently where it is not damaged by traffic. Damaged sealant will be repaired at the Contractor's expense.

**K. Conduit.**

Install 2 inch rigid conduit a minimum depth of 24 inches below finished grade. Provide conduit that meets Section 896.01 B.2, "HDPE". Splicing conduit is not allowed from the pull box from the recorder cabinet. Provide a continuous run of conduit.

Seal conduit ends with steel wool immediately after installation and reinstall after each phase of construction.

Install conduit plugs in each conduit end after the conductor is installed. Provide conduit plugs which create an air and water tight seal, and are removable and reusable. Provide plugs that can be split to permit installation or removal of the plugs without removing the conductor. Provide conduit plugs that seal using an adjustable filler of neoprene or silicone rubber compressed with stainless steel hardware.

**L. Cabinet Foundation and Installation.**

Construct the ATR cabinet foundation and working slab according to the detail sheet.



Construct the cabinet foundation so there is a minimum of 3 Inches of clearance from the outside edge of the cabinet to the outside edge of the foundations on all sides.

Caulk saw cuts between the cabinet and foundation except where the V-groove is. Install copper or stainless mesh rodent protection in the V-groove where the cabinet meets the foundation.

Securely fasten the cabinet flange to the cabinet foundation on all four sides. Use washer of a sufficient size to prevent pull through of the nuts through the cabinet flange.

Mount the modem antenna on the roof of the cabinet.

#### **M. Training.**

PEEK shall conduct 2 training sessions. Provide the first training session at the project site. Instruct and demonstrate to Department personnel the following items:

- Detailed ADR 6000 operation and functionality,
- Troubleshoot procedures of the ADR 6000 including all tests/modes available, and
- Federal Highway Administration (FHWA) classification schemes available in the software.

Conduct this training session after the ADR 6000 has been installed and is functioning properly. Utilize the live traffic stream for demonstrations.

The second training session should be held in a classroom setting, to include the following items:

- All information from first training session,
- Maintenance,
- Discussion on how the algorithms and established processes are used by the ADR 6000 to perform all aspects of traffic data collection that meets or exceeds the Manufacturer's statement of accuracy,
- Discussion on how the roadway loops capture and classify the traffic stream in bumper to bumper, stopped, and weaving traffic flows,
- Discussion on all maintenance requirements,
- Life expectancy of all equipment including all loops, and
- Contact information for technical support.

All training session materials shall be made available in a neat organized hard copy, bound and distributed to all participants.

Provide training locations and agenda to the Engineer 3 weeks prior to training. PEEK is responsible for scheduling a training facility in Bismarck, ND for the second training session.

#### **N. Testing.**

Test all new loops prior to and after installation. Loops must test to Manufacturer's specifications or be replaced. If the loops meet Manufacturer's specifications after installation, but do not perform traffic count or classification correctly, the Contractor will be responsible for any corrections up to and including replacing the defective part or parts. This may include loops and electronic equipment.

Verify vehicle classification by comparing ATR results with base line traffic counts and classification obtained by videotaping and manually counting and classifying vehicles for a period of 2 hours.

The PEEK qualified technician will provide sufficient acceptance testing using live traffic stream data and demonstrate that 95% accuracy is based on the number of axles per vehicle for a standard vehicle stream.

The ADR system shall be able to accommodate vehicles and/or vehicle combinations with a maximum of 14 axles. The system shall provide set parameters for a minimum of 14 vehicle classifications. Classes 1 through 13 shall be used according to the Federal Highway Administration (FHWA) 13 Vehicle Category Classification (identified in the FHWA Traffic Monitoring Guide). Class 15 shall identify any vehicle not identified by Classes 1 through 14.

**O. Initial Acceptance.**

PEEK shall install all electronics, software, hardware, and initialize the system. After PEEK determines the system to be operational, they shall provide a test to establish a ground truth based on methodology supplied by PEEK for volume and axle classification, which demonstrates to the Department the accuracy of the system.

**P. Final Acceptance.**

PEEK shall install all electronics, software, hardware, and initialize the system.

A site commissioning checklist shall be provided by PEEK that includes but not limited to all installation acceptance and final acceptance, trials, re-calibration, and results. Final acceptance test criteria and results shall be provided to the Department in a spreadsheet format both in hard copy and electronic form. The Department uses Microsoft Excel spreadsheet software.

The system shall undergo a 30 day final acceptance period after the following items are completed:

- The site meets the initial acceptance thresholds,
- PEEK determines the system is operational, and
- Written notification sent by PEEK to the Engineer

This constitutes a period of 30 consecutive days whereby no remedial action or interpretation is required by PEEK or Department personnel to view or obtain data and tables which are being accumulated. Monitor the calibration of the system on a continuing basis. PEEK shall monitor the site and download data from the site to verify to the Engineer and ensure conformance and proper operation. Provide results to the Department in a neat, clean, and orderly fashion in a separate binder. PEEK shall contact the Engineer prior to making any adjustments. After each adjustment or re-calibration, at PEEK's expense, the 30 consecutive day final acceptance shall begin again.

Upon completion of 30 consecutive days of data collecting, beginning with the start of the most recent 30 day test period, the individual system is considered accepted. The Department reserves the option to check the performance of the system at any time during the life of this contract. Major malfunctions shall be taken into consideration as acceptance or rejection of the system.

Final payment will be made after final acceptance is complete and the site meets all Department requirements.

**Q. Stand-Alone Test.**

Conduct an approved Stand-Alone Test of the equipment installed at the field site. Submit the Stand-Alone Test Plan to the Engineer for approval. Receive approval prior to starting this test. The test demonstrates all stand-alone functional operations of the field equipment. Submit the test results to the Engineer for approval.

Complete state form SFN 60717 which can be downloaded at <https://www.dot.nd.gov/dotnet/forms/forms.aspx>. Submit the form to the NDDOT ITS Engineer when completed.

**R. Central Test.**

A Central Test will be completed by the Department after the Stand-Alone Test is completed. This test consists of testing the system remote control functionality from the NDDOT central office.

**S. Warranty.**

All documents and information necessary for installation, maintenance, troubleshooting, and general operation of the system shall be bound and provided in a neat, clean, and orderly file.

PEEK shall warranty and provide a statement to the Engineer for all equipment supplied, including equipment from other Manufacturers, against defective materials and workmanship or damage incurred during shipping or installation. The minimum warranty for the ADR 6000 unit shall be as follows:

During the first 2 years following final acceptance by the Department, all repairs, including all parts, labor, materials, and shipping necessary to correct any failures/problems with any of the components within the cabinet shall be made at PEEK's sole cost, including any calibration and traffic control. Any failures associated with the installation of the loop sensors shall be evaluated by the PEEK qualified technician to determine the cause of the problem and a suggested course of action. All necessary repairs for any failures/problems with the sensors in the road, including all parts, labor, materials, and traffic control shall be made at the Contractor's expense. The Department, at its discretion, may require that complete replacement modules be supplied. PEEK shall perform diagnostics and inform the Department contact person (to be named) of a plan of action to repair the system within 48 hours of being notified by the Department of ADR 6000 problems at this location.

**METHOD OF MEASUREMENT**

The Engineer will measure each AUTOMATIC TRAFFIC RECORDER SYSTEM installed at each location.

**BASIS OF PAYMENT**

<b>Pay Item</b>	<b>Pay Unit</b>
Automatic Traffic Recorder System	Each

Such payment is full compensation for furnishing all materials, equipment, labor, and incidentals to complete the work as specified, including providing a qualified technician.

## **NORTH DAKOTA DEPARTMENT OF TRANSPORTATION**

### **SPECIAL PROVISION**

#### **VIRTUAL WEIGH-IN-MOTION SYSTEM**

#### **PROJECT SS-9-999(340) – PCN 20899**

##### **DESCRIPTION**

Furnish and install a complete operational Virtual Weigh in Motion (WIM) system as required in these documents, and any additional items that may be unique to the design of the system or needed to meet the contract requirements. Furnish these additional items even though they are not individually specified.

Install a WIM System, which includes Kistler Quartz Lineas Piezo Sensors, International Road Dynamics (IRD) brand iSINC Lite WIM electronics and all hardware, software, and Internet Protocol (IP) communications for the North Dakota Highway Patrol (NDHP) wireless in-car communications, North Dakota Department of Transportation (NDDOT) office locations and in-car communications.

##### **MATERIALS**

###### **A. General.**

Verify that the systems and components are new and have been tested.

Use stainless steel hardware (for example mounting bolts, nuts, washers, and external hinges) on outdoor components.

Use only components designed for 10 or more years of industrial use.

Contact the Utility Company and work with them to obtain all necessary permits, pay any assessed fees for hookup, and establish metered service to the system cabinet. Work with the Information Technology Division (ITD) within the Department to establish communications from the NDDOT to the site. The ITD contact for the Department is:

Robert Steckler  
216 Airport Road  
Bismarck, ND 58504  
Telephone: (701) 328-6935

###### **B. Work Drawings.**

Furnish work drawings to the Engineer within 50 days after the date of contract execution. Provide the dimensions, type of material, and the functional characteristics of the equipment to be installed within the work drawings.

Submit the following work drawings:

- Road Sensors
- Loop Conductor
- Loop Lead-in Conductor

- Pull Box
- Cabinet
- Conduit Plugs
- Modem
- Remote Power Control
- Surge Protection Devices
- AC Line Protector Unit
- Detector Amplifier Input Protector Unit
- Data Collector
- Power Conductor

**C. Ground-Mounted Cabinet.**

Provide a cabinet that is large enough to house all equipment specified and accommodate future expansion. Design the cabinet top to be waterproof with a 0.5 inch crown or slanted to the rear. Secure the cabinet to a concrete foundation. Provide the cabinet opening with a full-sized door with a gasket made of natural sponge rubber. Cover the keyhole of the lock with a swing away cover made of stainless steel. Supply 2 keys for each cabinet.

Size copper conductors according to the National Electrical Code (NEC) and Section 10 of the National Electrical Manufacturers Association (NEMA) Standards Publication TS-1. Finish all cabinet wiring in a neat and organized fashion. Furnish all assemblies and panels to be easily accessible for maintenance purposes. Label live wires inside the cabinet.

Provide a light socket that is fused ahead of the main circuit breaker. Install the light socket and lamp in a location where they do not interfere with the installation and removal of equipment from the cabinet. Energize the lamp by an switch operated by the cabinet door.

Equip the cabinet with a main circuit breaker used to disconnect the incoming AC service entrance. Provide a duplex Ground Fault Circuit Interrupt (GFCI) and a duplex non-GFCI in the control cabinet.

Construct a 4 foot by 4 foot concrete working slab, 4 inches thick, next to the cabinet foundation on the door side of the cabinet.

The Contractor is responsible for all conductor termination. Crimp and solder all lug terminals for conductor termination. Provide conductors that meet the requirements of Section 896.02 A, "Feeder".

**D. 4G Cellular Modem.**

Supply a 4G cellular modem including all necessary equipment and mounting hardware required for operation. Provide a modem that meets the following requirements:

1. LTE standards with fallback to:
  - a. EV-DO Rev. A,
  - b. CDMA EV-DO (Rev.0), and
  - c. CDMA 1xRTT
2. Supports the following bands:
  - a. LTE 700MHz,
  - b. CDMA/EV-DO 800, 1900,

- c. HSPA/HSPA+ 900/2100, and
  - d. GPRS 900/1800/1900
3. Has the following Security Features:
    - a. IPsec VPN,
    - b. GRE Tunneling,
    - c. MAC Address Filtering,
    - d. IP Filtering,
    - e. Port Filtering, and
    - f. SSH and HTTPS
  4. Works in the following Atmospheric Conditions:
    - a. Operating Temperature: -30°C to +70°C (-22°F to +158°F)
    - b. Storage Temperature: -40°C to +85°C (-40°F to +185°F)
  5. Uses an Ethernet Host interface that meets the following:
    - a. 10/100 Mbps RJ-45,
    - b. RS-232, and
    - c. DB9 DCE (300-230400 baud)
  6. Antenna Connections:
    - a. Cellular – 50 Ohm SMA, and
    - b. Receive Diversity – 50 Ohm SMA
  7. Application Interfaces:
    - a. TCP/IP,
    - b. UDP/IP,
    - c. DHCP,
    - d. HTTP,
    - e. SNMP,
    - f. SMTP,
    - g. SMS,
    - h. MSCI,
    - i. Modbus, and
    - j. Binary
  8. Has LED indicator lights for the following:
    - a. Network,
    - b. Signal,
    - c. Activity,
    - d. Service, and
    - e. Power

**E. AC-Line Protector Unit.**

Provide a 6-outlet AC-Line Protector Unit for the 120 Volt, 60 Hz power source. Include in the unit a thermal circuit breaker and EMI/RFI noise suppression. Approval for the unit shall be provided by Underwriter Laboratories (UL).

Provide protection against transients which may enter electronic equipment through line Neutral paths (Differential Mode) or through line or Neutral to Ground paths (Common

Mode). Contain the unit in a single enclosure with appropriate terminations for interconnecting cables to those assemblies requiring 120-volt, 60-Hz protected power.

**F. Ethernet Switch.**

Supply an Ethernet Switch with the necessary hardware required for operation. Provide the Ethernet Switch, enclosure, mount and cables with standard accessories.

Provide an Ethernet Switch that meets the following:

- Ruggedized construction,
- Powered by 12V-48V DC,
- Has 4-10/100TX Ports, and
- Has an operating temperature of -40°C to 49°C (-40°F to 120°F)

**G. Ethernet Lightning Suppressor.**

Provide an Ethernet Lightning Suppressor that meets the following:

- Ensure this unit is in a cast metal box with shielded connections,
- Clamping voltage of 65 Volts,
- Cat 6 outdoor direct burial cabling at 10/100/1000 speed,
- Ensure the unit is compatible with Power over Ethernet cable, and
- Has an operating temperature of -40°C to 49°C (-40°F to 120°F)

**H. Remote Power Control rack mounted outlet strip.**

The requirements for the Remote Power Control are:

- Web-accessible IP-based power controller for minimum eight independently controlled outlets.
- Enables minimum 15 users to remotely power control outlets using any web browser, Telnet client or SNMP manager.
- 10/100 Ethernet, Web, Telnet, SNMP, Port assignable for Web and Telnet, SSL Security on Web control.
- Monitors network devices and auto reboots whenever network response fails. 16 auto Pings can be assigned to any outlet.
- Current sensing and Alarms (determined by adjustable high and low current thresholds) when critical power conditions occur, notifications are sent by email.

**I. Detector Amplified Input Protector Unit.**

Provide a Detector Amplifier Input Protector unit as recommended by IRD. Provide this unit at the input of each loop detector amplifier unit.

**J. Virtual WIM Communications.**

The NDDOT has obtained sole source approval for the purchase of the IRD brand electronics. Supply IRD brand iSINC Lite electronics, all cabling, power supplies, communication devices and all necessary peripherals to provide a functional WIM system. Provide a DC power supply with sufficient battery capacity to operate the WIM electronics for 15 minutes without AC power. Contact IRD for all necessary equipment, materials, drawings, specifications, and installation guidance for the WIM site before starting work. The WIM Manufacturer contact information is:

IRD Inc.  
1002 S. Main Street  
Chambersburg, PA 17201  
Phone: (717) 264-2077  
Fax: (717) 264-4941  
Contact Person: Bruce Myers

Provide testing between the WIM site, NDHP, and NDDOT central office and any field computers provided by NDDOT.

Establish communications from the WIM site to NDDOT central office computers that allows off-site personnel to remotely monitor the operation and provides the ability to adjust the calibration or modify any user definable parameter of the WIM software at the site. Provide a system that allows users to transfer data between the site and the polling computer

**K. Pull Boxes.**

Provide a round PVC pull box as shown on the detail. Provide a pull box cover that is watertight using a gasket around the opening and each of the screw holes.

Compact the soil around the pull boxes. Provide a drainable base to protect against water infiltration. Install pull boxes of sufficient size as to accommodate all wiring and conduit without crimping or bending the wires.

Plug and seal all holes in the pull box.

**L. In-Road Sensors.**

The NDDOT has obtained sole source approval for the purchase of the Kistler Quartz Lineas Piezo sensors. Supply the sensors, inductive loops, sealant and any other materials necessary for the Virtual WIM System.

Ensure the sensors cover the number of lanes at each site and each axle sensor conductor extends from the sensor location in the pavement to the WIM cabinet. Provide the grouting compound or sealant, conduit, and electrical connectors as recommended by IRD.

Install the sensors when ambient air temperature is above 40°F. The Engineer may approve a method of heating to allow the sensor grout to cure. Heating the pavement with a propane torch heater is not allowed.

Follow Section 772.04 E.7, "Saw Cut Seal", when sealing any joints. Sealing joints with hot pour seal is not allowed.

Ensure the in-pavement axle sensors are 5.75 feet, ½ lane, 1 piece in each wheel path. Ensure the axle sensor in-road configuration meets IRD's sensor array layout and installation requirements. Provide sensor cables of sufficient length to extend from the sensors to the WIM cabinet.

Install the axle sensors as a continuous run from the roadway through the pull box and into the cabinet as specified in Section 770.04 E, "Conductors". Store and label cables in the pull boxes and cabinet for the appropriate sensor, lane, and position of sensor within each lane.



Install the axle sensors and inductance loops to detect and classify vehicles according to the NDDOT decision tree that is installed in the iSINC unit.

Ensure the system provides for each vehicle processed:

- Number of Axles,
- Axle Weight,
- Gross Vehicle Weight,
- Speed,
- Center-to-Center Spacing Between Axles,
- Overall Length,
- Vehicle Class,
- Lane and Direction of Travel (the right-most lane eastbound or northbound shall be designated as lane 1),
- Date and Time of Passage, and
- Sequential Vehicle Record Number

## **CONSTRUCTION REQUIREMENTS**

### **A. General.**

Materials and equipment conform to these special provisions, the NDDOT Standard Specifications for Construction, local codes and ordinances, the National Electrical Manufacturers Association (NEMA), the Electronics Industries Association (EIA), National Electrical Code (NEC), and the Telecommunications Industries Association (TIA).

The Contractor is responsible for all wire termination.

### **B. Removal of Equipment.**

Where pull box removal is specified in the plans; remove the pull box and disconnect the wires.

Where cabinet removal is specified in the plans; remove the cabinet, the entire foundation and working slab, and disconnect the wires.

Where removal of feed point is specified in the plans; remove the perforated tube supports, switch box, and meter trim. The local utility company will remove the meter.

All conduit and conductor shall be terminated 2 feet below ground level.

### **C. Earthwork.**

Excess excavation obtained from construction activities shall become property of the Contractor. Use the excavated material to fill areas of pull box and cabinet foundation removal.

Restore the ground to match adjacent areas.

### **D. Seeding.**

Restore ground disturbed by construction activities to the original grade. Reseed these areas with Class II Seed. This includes areas disturbed by trenching, boring, pull boxes, cabinet foundations, and feed points.

**E. Qualified Technician.**

Provide an IRD WIM qualified technician on site to assist and supervise the system installation at each location. Ensure the technician is certified for the WIM equipment, sensor installation and operation, in-car NDHP system operation, calibration and vehicle verification processes.

The IRD qualified technician will be providing documentation, training, calibration, and testing. The Contractor shall be responsible for installing all components of the WIM system. The IRD qualified technician will be providing installation oversight. Indicate the Manufacturer of all WIM components, system sensors and other necessary equipment.

Ensure all testing results both manual and WIM are compiled, bound and provided in a neat, clean and orderly file. Electronic versions of all results may also be provided so long as the information is compatible with Department available software.

**F. Manuals.**

Provide one paper copy and one electronic copy of the operational and maintenance manuals. Include the following documentation in the manuals: equipment, software operation, troubleshooting, service procedures, module descriptions, circuit diagrams, replacement parts lists, installation procedures, mechanical details, and termination points for the equipment furnished. Provide technical support telephone numbers, fax numbers, and email addresses.

The paper copy manual shall be bound. Provide test criteria and results in a spreadsheet format that is compatible with Department spreadsheet software.

**G. Labeling Cables and Components.**

Secure permanent identifying labels to each cable and component. This includes any required cross connects to communications equipment, according to these contract documents and information provided by the Engineer. Use self-laminating vinyl labels at least 1 inch wide and long enough that the translucent portion of the label completely covers the white area bearing the legend. Use vinyl with a layer of pressure sensitive acrylic adhesive. Use labels that resist oil, water, and solvents and are self-extinguishing. Use a machine to print the legend in letters at least 1/8 inch high.

**H. External Grounding System.**

Provide bonding and grounding in accordance with NEC and IRD's instructions. Provide ground conductor that is No. 2/0 AWG copper conductor. Each ground rod must be 5/8 inch diameter and 10 feet long.

Clean each grounding component with 300-grit emery cloth before applying a mineral oil based oxide inhibitor to the bonding area.

Connect all electrical service grounds to the grounding ring.

Route each ground conductor to the ground buss via the straightest route that does not hinder maintenance or installation activities.

Place ground rods at all 4 corners of the cabinet foundation. Bond the ground conductor to the cabinet using a ground ring. Ensure the total length of the ground ring is less than 20 feet in circumference.

Bury the ground ring a minimum of 20 inches below ground level. Provide the ground ring in a trench around the cabinet, attached to all the ground rods. Route the ground cable from the buss bar inside the cabinet through  $\frac{3}{4}$  inch flex conduit to the first ground rod next to the cabinet foundation. Seal conduit ends using conduit plugs.

Inspection of all underground work will be completed by the Engineer before it is covered. Connect all underground site connections using the exothermic weld process.

Test the earth ground resistance to 25 ohms or less, using an earth-ground resistance tester. Install additional ground rods to achieve the 25 ohms or less earth ground resistance. Document all results and furnish to the Engineer in a clean organized format.

**I. Loop Wire and Loop Lead-in Wire.**

Provide loop conductor that meets Section 896.02 B.1 "Copper Loop Conductor". Provide loop lead-in conductor that meets Section 896.03 B.3 "Copper Loop Lead-in Conductor". Splicing is only allowed at the pull box where loop conductor and loop lead-in conductor are joined. Solder splices using a 3M splice kit, CK 137 Shake-N-Seal from Uraseal, or approved equal. Provide loop splices according to IRD's recommendation.

Loop sealant shall be in accordance with IRD's recommendations.

**J. Sawing and Sealing Joints.**

Follow Section 772.04 E.4 "Saw Cut, and 772.04 E.7 "Saw Cut Seal" when sawing and sealing any saw cuts. Provide loop saw slots 2 inches deep or as recommended by IRD. Using hot pour joint seal is not allowed for any saw cuts. Approved joint seals include 3M Bondo P-606V Loop Sealant, VersaFLEX SL/75 Joint Filler, BASF MasterSeal SL 180, or approved equal for sealing all saw cuts. Follow minimum curing specifications. Allow the sealant to cure until it does not track or has set sufficiently where it is not damaged by traffic. Damaged sealant will be repaired at the Contractor's expense.

**K. Conduit.**

Install 2 inch rigid conduit a minimum depth of 24 inches below finished grade. Provide conduit that meets Section 896.01 B.2, "HDPE". Splicing conduit is not allowed from the pull box from the recorder cabinet. Provide a continuous run of conduit.

Seal conduit ends with steel wool immediately after installation and reinstall after each phase of construction.

Install conduit plugs in each conduit end after the conductor is installed. Provide conduit plugs which create an air and water tight seal, and are removable and reusable. Provide plugs that can be split to permit installation or removal of the plugs without removing the conductor. Provide conduit plugs that seal using an adjustable filler of neoprene or silicone rubber compressed with stainless steel hardware.

**L. Ride Quality.**

Ensure the pavement meets ASTM E1318 6.1.5 "Surface Smoothness" ride quality specification. Provide grinding of the pavement if this specification is not met. Consult the Engineer before any grinding begins.

**M. Cabinet Foundations and Installation.**

Construct the WIM cabinet foundation and working slab according to the detail sheet.

Construct the cabinet foundations so there is a minimum of 3 inches of clearance from the outside edge of the cabinet to the outside edge of the foundation on all sides.

Caulk saw cuts between the cabinet and foundation except where the V-groove is. Install mesh rodent protection in the V-groove where the cabinet meets the foundation.

Securely fasten the cabinet flange to the cabinet foundation on all four corners. Use washer of a sufficient size to prevent pull through of the nuts through the cabinet flange.

Mount the modem antenna on the roof of the cabinet.

## **N. Training.**

IRD shall conduct comprehensive 2 day training including all aspects of the iSINC Lite WIM System. The Contractor is responsible for obtaining a meeting room, making all arrangements, providing an iSINC Lite System for demonstration purposes to supplement the training of NDDOT technicians and NDHP troopers. Provide classroom style training for both days.

Day 1 for NDHP personnel to include the following:

1. Discussion of WIM accuracy,
2. Methodology between the interaction of the sensors and vehicles and how that translates into all the different WIM metrics, interpretation of WIM results, proper operation of the NDHP software, video displays of test vehicles and explanation of all WIM data as it will appear on NDHP laptops in the field.

Day 2 for Department Technicians to include the following:

1. All information from Day 1
2. More technically based and offer troubleshooting techniques
3. Field demonstration of the WIM electronics, communications, and NDHP trooper laptop computer display.
4. Interpretation of vehicle data held at the classroom location and WIM location for both groups.

Provide training location and agenda to the Engineer, 3 weeks prior to training. Demonstrate that the NDHP WIM equipped cruisers have correct communications established with the WIM site.

## **O. Testing.**

### **a. General.**

Ensure the vehicle classification and verification consists of developing a base line vehicle count and classification. Verify by manually counting, classifying, and documenting all vehicles in all lanes and directions for a minimum of 100 vehicles. Video recordings may be allowed by the Engineer to verify the traffic stream.

Compare base line count and classification by lane and direction with the electronic identification of the traffic stream by the WIM electronics.

Ensure the manual and electronic count start and end times are coordinated and all information is provided to the Engineer.

Provide to the Engineer with the approved counting and classifying method used.

Use the normal traffic stream during the vehicle classification and verification testing.

Ensure the system properly counts, weighs, and classifies a minimum of 90% of all vehicles. The Contractor is responsible for all costs to make any changes/adjustments to ensure the Virtual WIM System is classifying, counting, and weighing vehicles properly.

**b. Weight Testing.**

Secure and pay for the test truck used for calibrating the WIM system. Ensure the test truck is:

- 5 axle, Class 9 semi-trailer and truck
- 5 years old or newer
- Length: 48 to 53 feet
- Equipped with: full air ride suspension and tie downs
- Current DOT Inspection Certification
- Capable of 80,000 lbs gross vehicle weight (GVW)
- A flatbed trailer, no Lowboys will be accepted
- The load shall be non-shifting and secure
- Tires must not be cupped, worn, of different tread type or tire size or be out of round. If it is determined that calibration or weight readings are being affected by tire performance, the tires shall be replaced immediately at the Contractor's expense.
- The tractor and trailer rear tandem axle spacing must not be spaced more than 55 inches apart, no spread axles will be allowed.

The Contractor shall ensure the sensitivity of each axle sensor is recorded. For each instrumented lane, the test truck will be driven over the WIM sensors at safe speeds recommended by IRD.

Ensure the deviation from the static weight is calculated as a percent, and the new overall sensitivity is calculated.

Take an additional 5 runs at the posted speed limit, at 5 mph above and at 5 mph below the posted speed limit to obtain the speed calibration factors for each lane. The Engineer may require additional runs if the measured weight deviates by more than 10% from the mean within a speed range.

Using a single test vehicle, ensure the accuracy of the system to be within:

- $\pm 6\%$  gross,  $\pm 10\%$  Axle Group Load and  $\pm 15\%$  Axle load 95% of the time

Weigh the test truck at an independent certified scale. Provide the weight ticket from the scale, to the Engineer. Obtain gross vehicle weight and individual axle weights. Record

and properly identify test truck length and axle spacing measurements by the WIM system. The NDHP will be available to provide an individual axle weight (both left and right side) of the calibration vehicle if required.

**c. Speed Testing.**

The Engineer or NDHP may check the speed recorded by the system to verify that 90% of the vehicle speeds collected are within  $\pm 1$  mph of the actual speed.

**d. Axle Spacing Testing.**

Conduct the test runs concurrently with the weight testing. Ensure the spacing between axles, recorded by the WIM equipment, will be within  $\pm 0.5$  ft.

**P. Initial Acceptance.**

IRD shall install all electronics, software, and hardware, and initialize the system. After IRD determines the system is operational, they shall provide a test to establish a base line based on methodology supplied by IRD for volume and axle classification, which demonstrates to the Department the accuracy of the system.

**Q. Final Acceptance.**

Upon successful completion of the above listed procedures as determined by the Engineer, and after written notification by the Contractor to the Engineer, the system will be considered complete and accepted.

The system will then undergo a 30 day acceptance period. This constitutes a period of 30 consecutive days whereby no remedial action or interpretation is required by the Contractor or the Department to view or obtain data, tables or reports which are accumulated or can be generated by the system. Monitor the performance of the WIM system during this time and provide a summary of the information collected. Prove the system is functioning as designed and is operating within calibration specifications as defined during calibration testing.

Contact the Engineer prior to making any adjustments. After each adjustment or recalibration the 30 consecutive day final acceptance will begin again. Any costs to recalibrate the site or make adjustments will be the responsibility of the Contractor. Upon completion of 30 consecutive days of successful data collection beginning with the start of the most recent 30 day test period, the individual system's warranty period shall begin.

A site commissioning checklist shall be provided by IRD. The checklist includes:

- All installation acceptance,
- All final acceptance,
- Trials,
- Re-calibration,
- Results of Trials and Re-calibration documented and kept in a clean, orderly file. The file will become the property of the Department at contract completion.
- Final acceptance test criteria and results shall be provided to the Department in a spreadsheet format both in hard copy and electronic form that is compatible with the Department's excel spreadsheet software. Provide final acceptance test criteria and results to the Department in a spreadsheet format both in hard copy and electronic. The Department uses Microsoft Excel spreadsheet software.

**R. Stand-Alone Test.**

Conduct an approved Stand-Alone Test of the equipment installed at the field site. Submit the Stand-Alone Test Plan to the Engineer for approval. Receive approval prior to starting this test. The test demonstrates all stand-alone functional operations of the field equipment. Submit test results to the Engineer for approval.

Complete state form SFN 60717, which can be downloaded at <https://www.dot.nd.gov/dotnet/forms/forms.aspx>. Submit the form to the NDDOT ITS Engineer when completed.

**S. Central Test.**

A Central Test will be completed by the Department after the Stand-Alone Test is completed. This test consists of testing the system remote control functionality from the NDDOT central office.

**T. Warranty.**

Warranty all equipment supplied, including equipment from other Manufacturers, against defective materials and workmanship. Provide the warranty certifications to the Engineer.

The first 365 calendar days following system acceptance by the Department, the warranty will include all repairs at no cost to the Department. This work includes vehicle and weight verification, labor and materials needed to correct any failures, and traffic control..

During the following 365 calendar days, the warranty will be limited to the replacement of any materials including shipping charges. Any labor costs during this time will be the responsibility of Department.

If the Contractor's or Manufacturer's standard warranty exceeds the warranty terms specified in this section, the standard warranty will apply.

**METHOD OF MEASUREMENT**

The Engineer will measure each VIRTUAL WEIGH IN MOTION SYSTEM installed at each location.

**BASIS OF PAYMENT**

<b>Pay Item</b>	<b>Pay Unit</b>
Virtual Weigh In Motion System	Each

Such payment is full compensation for furnishing all materials, equipment, labor, and incidentals to complete the work as specified, including providing a qualified technician.

Quantities (A)		
PVC Pull Box	EA	4
Underground Conductor No 4 Type RHW (B)	LF	644
Underground Conductor No 6 Type THW (B)	LF	322
Shielded Twisted Pair Loop Lead-In Wire 14 AWG XHHW	LF	2896
Conductor Loop Wire 14 AWG XHHW (C)	LF	2080
Saw Slot and Sealant for Loops	LF	465
3/4 Inch Diameter Rigid HDPE Conduit	LF	96
2 Inch Diameter Rigid HDPE Conduit (D)	LF	1054
NEMA Type 3R Ground Mounted Cabinet with AC Power Panel and Sensor Surge Boards with Switch Box	EA	1
Concrete Cabinet Foundation with working slab and grounding system	EA	1
PEEK ADR 6000 Traffic Counter/Classifier with all necessary cabling plus IDRIS License	EA	1
Ethernet Lightning Suppressor	EA	1
Remote Power Control Rack Mounted Outlet Strip	EA	1
GFCI/Duplex Receptacles (3), Thermostatically Controlled Fan	EA	1
Telephone with Surge Protection	EA	1
OSP Cat 6 Cable (E)	LF	132
PEEK Representative Oversight	EA	1
Video Verification and Validation	EA	1
30 Day Monitoring Period	EA	1
Excavation	CY	1.93
Fill required	CY	0.76
Seeding Class II	SF	2300
Remove ATR cabinet, foundation, and pull boxes (F)	EA	1

Automatic Traffic Recorder System	EA	1
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- (A) These quantities shall be included in the price bid for the item "Automatic Traffic Recorder System".
- (B) 1 No 6 and 2 No 4 conductors are provided to extend from the ATR cabinet to the meter. Northern Plains Electric will provide the service connection to the existing meter.
- (C) The Entrance and Exit Loops shall be 6'x6' with 4 turns of conductor per loop. The Inner Axle Loops shall be 1.5'x5' Quadrapol with 3 turns of conductor.
- (D) This quantity includes an extra 20' conduit stub out for future use. Both ends shall be capped.
- (E) This cable will extend from the ATR cabinet to the ESS cabinet.
- (F) Refer to the notes for more details.

Quantities (F)		
PVC Pull Box	EA	2
Underground Conductor No 4 Type RHW (G)	LF	324
Underground Conductor No 6 Type THW (G)	LF	162
Shielded Twisted Pair Loop Lead-In Wire 14 AWG XHHW	LF	1096
Conductor Loop Wire 14 AWG XHHW (H)	LF	648
Saw Slot and Sealant for Loops	LF	264
3/4 Inch Diameter Rigid HDPE Conduit	LF	72
2 Inch Diameter Rigid HDPE Conduit (I)	LF	582
Kistler Lineas Quartz Sensor including cable, No 8 ground wire, epoxy, and mounting accessories (J)	EA	4
NEMA Type 3R Ground Mounted Cabinet with AC Power Panel, 6 unit Power Strip, Surge Protector, & Switch Box	EA	1
Concrete Cabinet Foundation with working slab and grounding system	EA	1
IRD brand iSINC Lite Electronics data collection equipment	EA	1
Ethernet Lightning Suppressor	EA	1
Remote Power Control Rack Mounted Outlet Strip	EA	1
Detector Amplifier Input Unit	EA	1
OSP Cat 6 Cable (K)	LF	132
IRD Technician Oversight	EA	1
Calibration and Testing	EA	1
30 Day Monitoring Period	EA	1
Excavation	CY	1.23
Fill required	CY	0.22
Seeding Class II	SF	960
Remove pull box and antenna (L)	EA	1

Virtual Weigh in Motion System	EA	1
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- (F) These quantities shall be included in the price bid for the item "Virtual Weigh in Motion System".
- (G) 1 No 6 and 2 No 4 conductors are provided to extend from the WIM cabinet to the meter. Northern Plains Electric provides the service to the existing meter.
- (H) The Entrance and Exit Loops shall be 6'x6' with 4 turns of conductor per loop.
- (I) This quantity includes an extra 20' conduit stub out for future use. Both ends shall be capped.
- (J) The sensor ground wire shall be insulated and shall extend from the sensor to the cabinet without splices. It shall be connected to the cabinet ground buss bar.
- (K) This cable will extend from the WIM cabinet to the ESS cabinet.
- (L) Refer to the notes for more details.

This document was originally issued and sealed by Douglas A. Schumaker, Registration Number PE- 5047, on 1/12/16 and the original document is stored at the North Dakota Department of Transportation

ATR & WIM Quantities  
I-94  
Belfield