

ADDENDUM NO. 1

CONTRACT NO. 2018-4023

Grading, Granular Base, Drainage, Hot Mix Paving, Structural Replacement and Electrical - PART
A: Highway 401 Underpass at County Road 31 Interchange (Site No. 31X-0204/B0 / Exit 750)
PART B: Highway 401 Underpass at Flagg Road (Site No. 31X-0203/B0) - 5.6km West of
Morrisburg/Winchester I/C (Exit 750)

1.5 km

Eastern Region

The following will now form part of the Special Provisions of the contract and amends the applicable information contained in the original contract tendering documents.

TENDER

ITEM NO. 3 - Earth Excavation, Grading

The quantity for this item is revised to read 15,739.

ITEM NO. 9 - Granular A

The quantity for this item is revised to read 8,393.

ITEM NO. 16 - Pipe Subdrains

The quantity for this item is revised to read 228.

ITEM NO. 20 - Removal of Asphalt Pavement

The quantity for this item is revised to read 15,937.

ITEM NO. 128 - Granular B, Type II

The quantity for this item is revised to read 3,840.

ITEM NO. 131 - Pipe Subdrains

The quantity for this item is revised to read 126.

ITEM NO. 166 - Earth Excavation for Structure

The quantity for this item is revised to read 2,460.

ITEM NO. 191 - Embedded Work in Structure (Ministry)

This item is added to the tender.

The quantity for this item is 100 %.

The Spec Code is 0913-0010.

ITEM NO. 192 - Deck Drains

This item is added to the tender.
The quantity for this item is 2.
The Spec Code is 0999-9310.

ITEM NO. 193 - Steel Pile Corrosion Assessment

This item is added to the tender.
The quantity for this item is 100 %.
The Spec Code is 9999-9168.

ITEM NO. 194 - Pile Instrumentation and Monitoring System

This item is added to the tender.
The quantity for this item is 100 %.
The Spec Code is 9999-9169.

ITEM NO. 195 - Pile Instrumentation and Monitoring System

This item is added to the tender.
The quantity for this item is 100 %.
The Spec Code is 9999-9169.

The Contractor shall substitute the attached copies of the tender item list in the tender documents when submitting his bid.

SCHEDULE OF PROVISIONS, PLANS, STANDARD DRAWINGS, SPECIFICATIONS AND GENERAL CONDITIONS

C. STANDARD DRAWINGS

OPSD

Dwg. No.	Rev. No.
2102.0100	1
2102.0200	0
2300.0100	1
2302.0450	0

The above OPSD's have been added.

F. STANDARD SPECIFICATIONS

Provincial

No.	Date
0913	Nov 2017

The above OPSS has been added.

SPECIAL PROVISIONS (NEW)

STEEL PILE CORROSION ASSESSMENT - Item No. 193

Special Provision

1.0 SCOPE

This special provision covers the requirements for the laboratory testing of existing steel piles. Work under this tender item shall include corrosion assessment of three (3) piles, including visual inspection and ultrasonic thickness (UT) measurements.

All testing for existing piles shall be carried out on piles located at the abutments of the existing structure as shown on the Contract Documents. Historical contract drawings indicate that the existing abutment piles are 324mm diameter steel tube piles filled with concrete.

In addition to the corrosion assessment, all labour, Equipment, and Material, including but not limited to, transportation, concrete removal, and disposal shall be included in this item.

Cutting and removal of the existing pile tops and pile extraction, are covered elsewhere in the Contract Documents.

2.0 REFERENCES

Ontario Provincial Standard Specifications, General

OPSS 180 General Specification for the Management of Excess Materials

3.0 DEFINITIONS

For the purposes of this specification, the following definitions apply:

NACE means the National Association of Corrosion Engineers

Ultrasonic Thickness Measurement means measurement of the thickness of the steel section by direct contact, measurement of time-of-flight of ultrasonic pulses.

4.0 DESIGN AND SUBMISSION REQUIREMENTS

4.01 Qualifications

The corrosion assessment, shall be carried out by a NACE certified Corrosion Specialist or an Engineer licensed to practice in the Province of Ontario who has a minimum of ten (10) years of experience in the field of corrosion assessment.

4.02 Methodology and Working Drawings

The Contractor shall submit details of the proposed testing to the Contract Administrator a minimum of fourteen (14) days prior to the start of the testing work. The submission shall include, as a minimum, the following:

- a) The proposed testing schedule.
- b) Details regarding the methods to be used for demolition of the existing abutment footings and to expose the tops of the existing piles.
- c) A detailed description of the methods, equipment and materials to be used to carry out the testing including specifications and calibration certificates for loading apparatus and measuring devices.

The submission shall be signed by the NACE certified Corrosion Specialist and/or Engineers(s) who will supervise the testing and prepare the reports for each type of testing.

4.03 Reporting of Results

The results of all pile testing shall be submitted to the Contract Administrator within 30 days of completion of the testing.

The report shall include as a minimum, the following:

- a) A plan showing the locations of the piles extracted/tested within the pile group.
- b) A detailed description of the test methodology
- c) Test results in tabulated and graphical format
- d) Interpretation of the data and conclusions regarding the structural integrity, condition and/or available resistance of the pile(s) tested.
- e) A detailed description of the pile extraction methods including equipment used and date of extraction, if applicable.
- f) A description of the pile condition, with reference to depth below pile cap, based on the visual inspection (e.g. corrosion, pitting, perforation) along with a photographic record of the pile conditions.
- g) Tabulated results of the ultrasonic thickness measurements and an assessment of section loss and historical corrosion rate(s).

All reports shall be signed by the qualified individual identified for that type of testing (NACE certified Corrosion Specialist and/or Licensed Professional Engineers).

5.0 MATERIALS – not used

6.0 EQUIPMENT – not used

7.0 CONSTRUCTION

7.01 General

The Contractor shall select three (3) piles for testing and corrosion assessment. If pile extraction is required, as specified elsewhere, all extracted piles to a maximum of three piles shall be tested. If pile extraction is not required, or if less than three piles are extracted, piles shall be selected for testing from the pile tops that are cut-off following removal of the bridge footings such that a total of 3 piles are selected for testing.

The following shall be measured and documented for all piles tested:

- a) The length of pile or segment of pile;

- b) The presence and type of pile tip protection, if visible; and
- c) Physical damage to the pile and pile tip.

The Contractor shall notify the Contract Administrator of the proposed testing schedule a minimum of ten (10) days in advance of the testing. Ministry representatives shall be permitted to observe all testing work.

7.02 Steel Pile Corrosion Assessment

A corrosion assessment shall be carried out on three (3) piles following removal or extraction of the piles.

The pile corrosion assessment for each pile shall include:

- a) Removal of concrete inside the pile, as required.
- b) A visual inspection of the pile surface by a NACE certified corrosion specialist with documentation of evidence of corrosion along the length of the pile including a photographic record.
- c) Cleaning of the pile surface using abrasive blasting techniques or grinding being careful not to grind non-corroded base metal.
- d) Ultrasonic Thickness (UT) Measurement of the pile with a minimum of 40 readings within the upper 4 m of the pile, spaced equally around the pile circumference and along the pile length.

Disposal of piles, concrete, and debris after testing shall be in accordance with OPSS 180.

8.0 QUALITY ASSURANCE – Not Used

9.0 MEASUREMENT FOR PAYMENT – Not Used

10.0 BASIS OF PAYMENT

10.01 Steel Pile Corrosion Assessment - Item

Payment at the contract price for the above tender item shall include full compensation for all labour, Equipment, and Material to do the work.

PILE INSTRUMENTATION AND MONITORING SYSTEM - Item No. 194, 195

Special Provision

1.0 SCOPE

W.P. #4415-01-01 County Road 31 Underpass

Work under this tender item shall include all requirements for the design, supply, installation, and maintenance of a pile instrumentation and monitoring system on the driven steel H-piles at one abutment. All labour, Equipment, and Material required by the Contractor's design shall be included in this item.

At minimum, the pile instrumentation and monitoring system shall be capable of accurately measuring and reporting the following at any given time on three piles at the same abutment:

- a) The deflected shape of three piles, at 0.5m intervals extending from the underside of the abutment stem to a depth of 5m below the underside of the abutment stem.
- b) The strains on at the extreme tension and compression fibres of three piles, for strong-axis bending, at 0.5m intervals extending from the underside of the abutment stem to a depth of 5m below the underside of the abutment stem.
- c) The soil pressure acting on both flanges of two piles at three evenly spaced intervals extending from 0.5 m below the underside of the abutment stem to 2.5 m below the underside of the abutment stem.
- d) The soil pressure acting on the abutment stem at the bottom the abutment and at mid-height of the abutment at the centerline of the structure and adjacent to the wingwall cleats.

If additional excavation and backfill outside of the pay limits shown in the Contract Drawings is required as part of the Contractor's design it shall be included in the bid price for this tender item.

The Contractor shall supply and install the instruments and data acquisition system in accordance with the Contract Documents. All instrumentations are to be connected to the data logger(s) with data collection fully automated and retrievable by WEB-based access. All subscription fees for web-based access for a period of five years shall be included in this item.

The design, installation and setup for monitoring shall be carried out by a Geotechnical Engineering Consultant retained by the Contractor and registered in the Ministry of Transportation, Ontario (MTO) Registry, Appraisals and Qualification System (RAQS).

W.P. #4445-02-01 Flagg Road Underpass

This Special Provision contains the requirements for the supply, installation, and maintenance of pile instrumentation and monitoring equipment, including but not limited to the following:

- a) Supply and installation of vertical Shape Accelerometer Arrays (SAA).
- b) Supply and installation of arc weldable Vibrating Wire Strain Gauges (VWSG) and mounting blocks.
- c) Supply and installation of embedded Vibrating Wire Strain Gauges (VWSG).
- d) Supply and installation of vibrating wire pressure cells (VWPC) and mounting plates and blocks.
- e) Supply and installation of compatible automated data acquisition systems (ADAMS), including a Vibrating Wire Readout Unit, Shape Accelerometer Array Field Power Unit, and data loggers, complete with all accessories as required for automated real-time remote monitoring of each SAA, VWSG, and VWPC.
- f) Supply and installation of a laptop computer, including all hardware and software, web-based monitoring subscriptions for five years, cellular modems, cables to connect the laptop to the field power unit and various data loggers, an extra laptop battery, and a cigarette lighter adaptor.
- g) Supply and installation of all cables, conduits, ducts, fittings, junction boxes, and accessories required for installation and operation of the instrumentation and monitoring equipment.
- h) Design, supply and installation of a steel support system for supporting the SAAs and VWSGs within the tube piles, at the locations shown in the Contract Drawings.
- i) Design, supply and installation of a walk-in monitoring shed.

j) Design, supply, and installation of a power supply, including all materials and equipment required by the design.

The purpose of the instrumentation is to monitor the long-term behaviour of the drilled in tube piles following construction of the two-span, integral abutment bridge structure.

The Contractor shall supply and install the instruments and data acquisition system in accordance with the Contract Documents. The installation and setup for monitoring shall be carried out by a Geotechnical Engineering Consultant retained by the Contractor and registered in the Ministry of Transportation, Ontario (MTO) Registry, Appraisals and Qualification System (RAQS).

All instruments, equipment, and accessories will become property of the MTO and shall be handed to the Contract Administrator after the installation of the instruments for the Monitoring Program.

Payment for excavation and granular materials required for construction of the granular pad for the monitoring shed shall be made with the grading items associated with the work.

2.0 REFERENCES

This Special Provision refers to the following standards, specifications or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 603	Installation of Ducts
OPSS 906	Structural Steel for Bridges
OPSS 913	Embedded Work in Structures for Electrical Systems

CSA Standards

G40.20-04/G40.21-04 (R2009)	General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
W47.1-09	Certification of Companies for Fusion Welding of Steel
W59-03(R2008)	Welded Steel Construction (Metal Arc Welding)
S6-14	Canadian Highway Bridge Design Code

3.0 DEFINITIONS

Geotechnical Engineering Consultant means a consultant with MTO classification of “Geotechnical (Structures and Embankments) - Medium Complexity”, to undertake the supply and installation of the monitoring instruments.

Or Equivalent shall be understood to indicate that the equivalent product is the same or better than the specified product in function, performance, reliability, quality and general configuration.

4.0 DESIGN AND SUBMISSION REQUIREMENTS

4.01 Design Requirements

W.P. #4415-01-01 County Road 31 Underpass

The Contractor shall retain the services of a Geotechnical Engineering Consultant to design and install the Pile Instrumentation Monitoring System in accordance with the requirements of the Contract Documents. The system may consist of Shape Accelerometer Arrays (SAA), Vibrating Wire Strain Gauges (VWSG), Vibrating Wire Pressure Cells (VWPC), data cables, data loggers, laptop computers, or any additional equipment, instruments, and materials required by the design.

The Contractor shall demonstrate that all instruments and equipment meet the requirements of Contract Documents and are capable of measuring the required pile behaviour to the satisfaction of the Contract Administrator.

4.01.01 Underground Utilities

The Contractor shall be responsible for locating and protecting all underground utilities prior to commencing construction activities. Any damage to underground utilities caused by the Contractor's work shall be repaired by the Contractor at no cost to the Owner or Contract Administrator.

4.01.02 Marking and Labelling

The location of any above-ground monitoring fixtures shall be made visible before, during and after construction.

Instruments and their data cables shall be clearly labelled in the field, each instrument having a unique identifier. The labelling shall be permanently affixed to the instruments and remain legible for at least 5 years after construction.

4.01.03 Protection of Instruments

The Contractor shall adequately protect all instruments such that they are not damaged during construction. Any instrument damaged by the Contractor's work shall be immediately replaced at no additional cost to the Ministry.

Instruments and data loggers should also be adequately protected by the Contractor from natural effects such as lightning strikes. This can be achieved by using appropriate grounding and transient protection systems; such as Geokon DL Series grounding kit, lightning diversion systems and/or equipotential grounding systems, or equivalent.

The data loggers shall be installed in a walk-in monitoring shed to prevent vandalism and minimize exposure of the data loggers to extreme conditions. The monitoring shed shall be designed by the Contractor and shall be lockable and weather resistant. The monitoring shed shall be seated on a 500mm thick compacted granular pad that extends 300mm above the surrounding grade and shall be securely fastened to the ground.

The Contractor shall propose a location for the monitoring shed for approval to the Contract Administrator to suit construction activities. The location of the monitoring shed shall not be susceptible to ground settlement and shall at minimum be located 10m from the structure and roadways.

The Contractor shall ensure access is provided to the monitoring shed at all times, including but not limited to snow clearing in winter.

4.02 Submission Requirements

4.02.01 Pile Instrumentation Plan

At least fifteen (15) working days prior to proceeding with the work, the Contractor shall submit a copy of the Pile Instrumentation Plan to the Contract Administrator. The Contractor shall retain a copy of the pile instrumentation plan at the site until the completion of all construction activities.

The Pile Instrumentation Plan shall satisfy the requirements of the Contract Documents and at minimum shall contain the following:

- a) Qualifications of the Geotechnical Engineering Consultant;
- b) Details of the entire instrumentation and monitoring system, including proposed instruments, equipment, data acquisition system(s), support frame, and monitoring enclosure(s);
- c) Proposed locations for all instruments, support frames, data acquisition system(s), monitoring enclosure(s), cables, conduits, and accessories;
- d) Installation methods for all instruments, support frames, data acquisition system(s), and monitoring enclosure(s); and
- e) An installation schedule, including coordination with other construction activities.

The Pile Instrumentation Plan shall bear the signature and seal of a Geotechnical Engineering Consultant and shall state that the installation procedures are in conformance with the requirements of the Contract Documents.

A Request to Proceed shall be submitted to the Contract Administrator with the Pile Monitoring Plan and prior to installation of any instruments.

Installation of instruments shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

5.0 MATERIALS

5.01 General

The Contractor shall supply all materials required for the installation of the Vibrating Wire Pressure Cells, Vibrating Wire Strain Gauges (embedded), Vibrating Wire Strain Gauges (surface), Vertical Shape Accelerometer Arrays, power supply, conduits, monitoring shed and automated data acquisition management system(s) (ADAMS) unless noted otherwise. Only one supplier should be selected for the supply of all vibrating wire instrumentation and data acquisition systems.

All instruments and associated materials shall be capable of withstanding the range of temperatures possible for their locations within the pile, abutment stem or on surface. The instruments shall be capable of operating within the manufacturer's stated accuracy throughout the temperature range.

5.02 Shape Accelerometer Array

The SAA system shall be model "SAAV" as manufactured by Measurand Inc., or equivalent, with contact information as follows:

Measurand Inc.
2111 Hanwell Road, Fredericton, New Brunswick, Canada E3C 1M7
Telephone: +1 506-462-9119

The SAAs shall have individual segment lengths of 500 mm. The SAA lengths shall be confirmed on site based on careful measurement. The Contractor shall supply sufficient cable to route from the reference end of each SAA to the ADAMS. The cable shall be long enough to provide adequate strain relief. Only SAA splice kits, manufactured by Measurand, or "ScotchCast Signal and Control Cable Inline Splicing Kit 72-N1" manufactured by 3M may be used for splicing SAA cables if required. Other splicing kits shall only be used with the SAA Manufacturer's approval. The contractor shall provide a five-year warranty for each SAA system.

5.03 Vibrating Wire Strain Gauge

The Contractor shall supply arc weldable VWSGs (eg. Geokon Model 4000, or equivalent) and concrete embedment VWSGs (eg. Geokon Model 4200, or equivalent) compatible with the ADAMS (data-logger systems and accessories to automatically collect data from each VWSG). All VWSGs and data logger(s) shall be from the same manufacturer.

The VWSG shall have a nominal range of 3000 microstrain. The gauges shall have a minimum resolution of 1 microstrain and an accuracy of $\pm 0.5\%$ full scale (or $\pm 0.1\%$ full scale with individual calibrations. The gauges shall have an active gage length of 150 mm. Each strain gauge shall have an integral thermistor to allow for temperature readings.

The strain gauges shall be fitted with factory attached cables long enough to allow completed installations without field splices. Cables shall be of the same source as the strain gauges. Acceptable cables shall be Geokon 02-187V3 or equivalent.

Each strain gauge shall be uniquely identified with a serial number (or other identifying number) and shall be provided with a factory calibration made with equipment traceable to the National Institute of Standards and Technology (NIST) ANSI/NCSL Z540-1-1994. Calibrations shall include a minimum of two cycles of applied displacement, each cycle with a minimum of five increments. The calibration sheet shall show the linear and polynomial gage factors and temperature at time of calibration.

All VWSGs shall be calibrated prior to installation and the calibration data for each VWSG shall be provided to the Contract Administrator.

5.04 Vibrating Wire Pressure Cell

Vibrating wire pressure cells (VWPCs) shall be compatible with the data logger(s) (e.g. Geokon Model 4810 or equivalent). All vibrating wire pressure cells and the data logger(s) shall be from the same manufacturer.

The vibrating wire pressure transducers used in the earth pressure cell shall have a nominal pressure range of 700 kPa. All instruments shall have an over-range capacity of 1.5x the nominal range, an accuracy of $\pm 0.1\%$ full scale, a resolution of $\pm 0.025\%$ full scale and shall have the capability to measure temperature. A tripolar plasma surge arrestor shall be built into the body of the piezometer to protect against voltage spikes across the input leads.

The VWPCs shall be fitted with factory attached cables long enough to allow completed installations to the data acquisition system without field splices. Cables shall be from the same manufacturer as the pressure cells. Acceptable cables shall be Geokon 02-250V6 or equivalent.

Each VWPC shall be uniquely identified with a serial number (or other identifying number) and shall be provided with a factory calibration made with equipment that is traceable to the National Institute of Standards and Technology (NIST) ANSI/NCSL Z540-1-1994. Calibrations shall include a minimum of two cycles of applied pressure over the full operating range of the sensor, each cycle with a minimum of five increments. A thermal factor shall be determined for the vibrating wire pressure transducers used in the earth pressure cell, in a controlled chamber at the following temperatures: +30C, +20C, +10C and 0C. The calibration sheet shall show the linear and polynomial gage factors, thermal factor, and the barometric pressure and temperature at time of calibration.

All VWPCs shall be calibrated prior to installation and the calibration data for each vibrating wire pressure cell shall be provided to the Contract Administrator.

5.05 Embedded Steel Support System

The embedded steel support system shall be designed by the Contractor to support the VWSGs (embedded) and SAA conduit for embedment within the concrete filled steel tube piles. The embedded steel support system shall allow for the instruments to be installed at the positions and orientations shown on the Contract Drawings.

Structural steel shall be according to CAN/CSA G40.21.

5.06 Conduits, ducts, junction boxes and fittings

Conduits, ducts, and fittings shall be in accordance with OPSS 603. Conduits, ducts, and fittings embedded in the structure and junction boxes shall be in accordance with OPSS 913.

Conduits shall not exceed 75mm in diameter unless approved by the Contract Administrator.

6.0 EQUIPMENT

6.01 Equipment Operation and Weather Conditions

All installation and monitoring equipment and associated materials shall be capable of withstanding the range of temperatures possible for their locations within the ground or on the surface. The instruments shall be capable of operating within the manufacturer's stated accuracy throughout the temperature range. Monitoring shall be conducted year-round.

6.02 Data Acquisition System

6.02.01 Vibrating Wire Readout Unit

The Contractor shall supply a vibrating wire data recorder (e.g. Geokon Model GK-404, or equivalent) compatible with the vibrating wire instruments. All vibrating wire equipment shall be of the same make. The vibrating wire readout unit in conjunction with the vibrating wire instrument shall provide the necessary excitation to pluck the wire and display the period of the resulting vibration directly.

6.02.02 Shape Accelerometer Array Field Power Unit

The SAA field power unit shall be manufactured by Measurand Inc. for the purposes of connecting a laptop computer to individual SAAs and shall enable manual readings throughout the installation process and prior to installation of the permanent data logger.

6.02.03 Data Logger

The signal cables for the VWPCs and VWSGs shall be connected to the nearest data logger. Data loggers such as Geokon Model DL6, or equivalent shall be used for the vibrating wire instrumentation. The data logger(s) shall include, but not be limited to, weather proof enclosures, interface modules, interface cables, data logger retrieval computer software, cellular modems, power supplies, solar panels, charge regulators and batteries that will allow for automated real-time remote monitoring throughout the full 5 year monitoring period. All data loggers for the vibrating wire instruments shall be from the same manufacturer and shall be compatible with the vibrating wire instruments.

The signal cables for the SAAs shall be connected to a Measurand Model DAS-5, or equivalent data logger. The data logger shall include, but not be limited to, weather proof enclosures, interface modules, interface cables, data logger retrieval computer software, cellular modems, power supplies, solar panels, charge regulators and batteries that will allow for automated real-time remote monitoring throughout the full 5 year monitoring period. The SAA data logger shall be from the same manufacturer as the SAA and shall be compatible with the SAAs.

The data loggers should also be protected against from natural effects such as lightning strikes by using a Geokon DL Series grounding kit or equivalent.

The Contractor shall submit a detailed proposal on the setup of the data-logging systems (i.e. numbers and locations of the data logging unit(s)) to the Contract Administrator for review and approval, prior to ordering the data logger(s). An effort should be made to minimize the quantity of data loggers to ease data retrieval. The Contractor shall program the data loggers according to the following:

- Recording software: VWPC, VWSG and SAA data shall be recorded four (4) times per day (i.e. one (1) reading every 6 hours), and
- Test software: Once this program is transferred to the data-logger, the system shall be able to be tested and data recorded manually on site.

The data shall be retrieved by WEB-based access.

6.02.04 Laptop Computer

The Contractor shall supply a new laptop computer with hardware and software compatible with the data acquisition systems and the SAA field power unit. The computer shall meet the following minimum specifications:

- Intel Core i5-8250U processor or equivalent
- 8 GB RAM
- 256 GB Solid State Drive
- 14.0" FHD (1920x1080) screen
- Windows 10 Professional operating system
- Microsoft Office Home and Business 2019
- 3 year warranty

Cables to connect the laptop to the field power unit and various data loggers, an extra laptop battery, and a cigarette lighter adaptor for the computer charger shall also be supplied by the Contractor.

The portable laptop computer and accessories will become property of the MTO and shall be handed to the Contract Administrator after the installation of the instruments for the Monitoring Program.

The calibration factors for the vibrating wire sensors and the SAAs shall be entered into the portable laptop computer by the Contractor for initialization of the instruments.

6.02.05 Power Supply

The power supply shall be designed by the Contractor to provide power to the data acquisition system(s) without interruptions throughout the five (5) year monitoring period. At minimum, the power supply shall include a solar panel with a charge controller and external battery(s).

7.0 CONSTRUCTION

7.01 Instrument Quantities and Locations

W.P. #4445-02-01 Flagg Road Underpass

The Contractor shall install the monitoring sensors at the locations shown in the Contract Drawings. Table 1 summarizes the quantities and locations of the instruments.

Table 1 – Instrument Quantities and Locations

Type	Location	Quantity
Shape Accel Array	Within select piles	3
Vibrating Wire Strain Gauges	Inside select piles	36
	Exterior of select piles	18
Vibrating Wire Pressure Cells	Back face of abutment stem	4
	Mounted to pile within CSP casing portion	12

7.02 Installation Schedule

W.P. #4445-02-01 Flagg Road Underpass

Installation of all monitoring instruments shall commence after installation of the steel tube pile casings, prior to filling with concrete, and shall be installed as per the manufacturer’s recommendations in addition to what is stated or emphasised herein. Table 2 gives a summary of the installation schedule requirements.

Table 2 – Installation Schedule

Type	Locations	Start Installation	Finish Installation
Shape Accel Arrays	Within select piles	After installation of drilled in tube pile and PVC conduit	Prior to construction of abutment
Vibrating Wire Strain Gauges (Embedded)	Within select piles	After installation of drilled in tube pile	Refer to Clause 7.03.04 for coordination with placement of concrete within tube piles
Vibrating Wire Strain Gauges (Surface)	Mounted to exterior of select piles	After filling tube piles with concrete	Prior to placing CSP surround around pile
Vibrating Wire Pressure Cells	Mounted to abutment stem	After the concrete of the abutment stem has cured	Prior to abutment backfill
	Mounted to pile	After installation of drilled in tube pile	Prior to placing CSP surround around pile

7.03 Installation Procedures

All instruments and equipment shall be installed in accordance with the manufacturer’s installation instructions.

All instruments and equipment shall be tested and demonstrated to be working properly, to the satisfaction of the Contract Administrator, prior to embedding in concrete, placement of backfill, or completion of other construction activities that would result in the instruments being inaccessible.

All cables shall be protected from construction equipment at all times and be clearly labelled.

The Contractor shall repair all damaged or defective monitoring instruments as required at no cost to the Ministry for the duration of the Contract.

7.03.01 Shape Accelerometer Array

The Vertical SAAs shall be carefully installed within a 27 mm inside diameter PVC conduit in accordance with the manufacturer's installation instructions. The SAA shall be installed such that the sensorized portion of the instrument extends up to the top of the pile.

An embedded steel support system, shall be used to position the SAA and PVC conduit within the pile prior to concrete placement. The Contractor shall ensure that the centroids of the PVC conduit and the pile are coincident during and after concrete placement.

7.03.02 Vibrating Wire Strain Gauge

Arc weldable VWSGs shall be securely connected to the steel surfaces with arc-weldable mounting blocks provided by the VWSG manufacturer (eg. Geokon).

All embedded VWSGs shall be placed in the concrete by pre-attaching the gauge to the steel embedment frame in accordance with recommendations provided by the VWSG manufacturer (e.g. Geokon). A minimum concrete cover of 55 mm shall be maintained around the sensor.

7.03.03 Vibrating Wire Pressure Cell

VWPCs mounted to concrete shall be placed after the concrete has cured.

The VWPCs should be protected by covering with backfill from which all pieces larger than 10 mm have been removed.

7.03.04 Embedded Steel Support System

Fabrication of the embedded steel support system shall be according to OPSS 906.

Welding procedures shall be according to CSA W47.1 and CSA W59, except where modified by CAN/CSA S6, Clause A10.1.5.

The Contractor shall propose a method for installing the embedded steel support system and attached instruments within the drilled-in tube piles. The installation method and sequence shall be coordinated with concrete placement and consolidation operations, as specified elsewhere in the Contract Documents.

7.03.05 Conduit and Trench Burial

All signal and/or hydraulic cables for installed instrumentation shall be routed within conduit(s) and taken out of the abutment stem and buried in a shallow trench in accordance with OPSS 603. The size and locations of conduits and trenches shall be determined by the Contractor based on the monitoring shed location, unless noted otherwise in the Contract Documents. If appropriate, several signal cables may be routed within a single conduit and laid in a common trench.

7.04 Coordination with Monitoring Program

7.04.01 Notification and Reporting

The Contractor shall notify the Contract Administrator no later than three (3) days after installing the monitoring instrumentation. At this time, the Contractor shall supply the following information to the Contract Administrator:

- Location of each monitoring instrument (easting, northing) in MTM NAD 83 coordinates
- Elevation of each monitoring instrument sensor
- Location of signal cables and conduit(s)
- Date(s) of installation
- Installation notes, grounding methods, sketches and photographs
- Make, model and serial number of each monitoring instrument, data logger and signal cable
- Calibration details for each monitoring instrument
- Confirmation that the instrument is functioning correctly

7.04.02 Monitoring

The instruments shall be connected to the datalogger(s) and setup for WEB-based monitoring to allow for five (5) years of automated real-time remote monitoring after completion of construction. Online access shall be provided to MTO Foundations, MTO Structural Section and MTO Bridge Office.

Monitoring shall be conducted during the instrument installation, bridge construction and abutment backfill. The Contractor shall provide installation information as specified above and provide access to the monitoring shed for data retrieval.

The Contractor shall transfer the portable laptop computer, vibrating wire readout unit and SAA field power unit to the Contract Administrator, including all of the data logging software and hardware, operation instructions, calibration constants and on-line access instructions. The Contractor shall also transfer the keys for the locks to the monitoring shed(s). The Contractor shall be available for one site meeting with the Contract Administrator to transfer the items and answer any questions the Contract Administrator may have regarding the data-logging system.

7.05 Decommissioning of Instruments

The Contractor shall not decommission any instruments at the end of the monitoring program unless advised by the Contract Administrator after discussion with and concurrence from MTO.

8.0 QUALITY ASSURANCE – Not Used

9.0 MEASUREMENT FOR PAYMENT– Not Used

10.0 BASIS OF PAYMENT

Payment at Lump Sum price for this tender item shall be full compensation for all labour, monitoring equipment and materials to do the work.

SPECIAL PROVISIONS (REVISIONS)

SUPPLY EQUIPMENT FOR DRIVING PILES - Item No. 93

H-PILES - HP 310X110 - Item No. 94

H-PILES - HP 310X132 - Item No. 115

SUPPLY EQUIPMENT FOR DRILLED-IN TUBE PILES - Item No. 189

DRILLED-IN TUBE PILES - Item No. 190

All information under the above special provision is deleted in its entirety and replaced with the following: OPSS 903 shall govern except as amended or extended herein.

903.01 SCOPE

Section 903.01 of OPSS 903 is amended by the addition of the following:

W.P. #4415-01-01 County Road 31 Underpass

The predominant soil deposit at this site is a water-bearing cohesionless till, which contains cobbles and boulders. The Contractor is advised that cohesionless soils are susceptible to disturbance under conditions of unbalanced hydrostatic head, and that appropriate equipment and construction procedures will be required for pre-augering into the till for installation of steel piles through the till deposit. The Contractor is also advised that appropriate equipment and construction procedures will be required to penetrate or remove obstructions, such as cobbles and boulders, to permit installation of deep foundation elements and shoring elements.

W.P. #4445-02-01 Flagg Road Underpass

In general, the stratigraphy in the area of the embankments is characterized by an asphaltic surface, overlying embankment fill over glacial till, containing frequent cobbles and boulders, underlain by limestone bedrock. The limestone bedrock is classified as poor to excellent quality and is typically strong to very strong.

The Contractor is advised that appropriate equipment and construction procedures will be required for installation of tube pile construction through the till deposit, including removal of obstructions such as cobbles and boulders and socketing into the bedrock. The drilling method must be capable of advancing the pile without disturbing or fracturing the bedrock at the base of the pile.

Work under the tender item “Drilled-in Tube Piles” includes all labour, material and equipment required to excavate and construct the tube piles including the supply and installation of the steel casing (356x16mm) with minimum 500mm embedment into bedrock and placement of concrete within them.

903.03 DEFINITIONS

Section 903.03 of OPSS 903 is amended by the addition of the following:

Drilled-in Tube Piles means a steel tube pile installed using a “down the hole drill”

Down the Hole Hammer / Drill means a reverse circulation concentric percussion / drilling mechanism located directly behind the drill bit with drill pipes to transmit the necessary feed force and rotation to hammer and bit plus compressed air or fluids for the hammer and flushing of cuttings.

903.04 DESIGN AND SUBMISSION REQUIREMENTS

903.04.02 Submission Requirements

903.04.02.01 General

Clause 903.04.02.01 of OPSS 903 is amended by the addition of the following:

The Contractor is hereby notified that the existing abutments are supported on piled foundations. The existing pile layout detailed in the Contract Documents is based on the original structure drawings. The Contractor shall anticipate minor adjustments to the proposed pile layout within the allowable tolerances specified in the Contract Documents.

W.P. #4415-01-01 County Road 31 Underpass

Should the proposed pile layout not be achievable within the allowable tolerances, extraction or overdriving of the existing piles at the locations of conflict shall be completed as specified elsewhere in the Contract.

903.04.02.02 Preconstruction Survey

Clause 903.04.02.02 of OPSS 903 is amended by the addition of the following:

Following removal of the existing footing at each abutment, the Contractor shall perform field measurements to verify the location and batter of the existing piles. Within 7 Days following removal of the existing footings, the Contractor shall submit Preconstruction Survey plans to the Contract Administrator that:

- a) Clearly show the existing pile layout and the new CSP and pile layout as shown in the Contract Drawings; and
- b) Identify any discrepancies or conflicts with the placement of the proposed piles and Corrugated Steel Pipe (CSP);

When conflicts are identified between the existing piles and the new CSP or pile the Contractor shall include a Pile Conflict Mitigation Plan in the Pile Preconstruction Survey Submission. The Pile Conflict Mitigation Plan shall:

- a) Include all proposed adjustments in accordance with Contract Drawings and Specifications;

A Request to Proceed shall be submitted to the Contract Administrator after submission of the Preconstruction Survey and Pile Conflict Mitigation Plan. The Contract Administrator shall review and forward to the Ministry for Review.

The next operation shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

W.P. #4415-01-01 County Road 31 Underpass

In addition to the requirements listed above, the Pile Conflict Mitigation Plan shall:

- b) Identify the piles requiring extraction/overdriving and the proposed extent of extraction/overdriving;
- c) Include all pile extraction and/or overdriving procedures as specified elsewhere in the Contract.

903.04.02.04 Installation

903.04.02.04.01 Driven Piles

Clause 903.04.02.04.01 of OPSS 903 is amended by the addition of the following:

- i) Working Drawings developed from the reviewed Preconstruction Survey detailing the location and batter of the existing piles, layout of proposed piles including location of reference points with respect to the centroid of each pile at the level of the bottom face of the new abutment stem and layout and elevations of the CSP's.
- j) Detailed construction sequence for the work, taking into consideration all activities required for construction of the deep foundations.
- k) Details of procedures to be used should a conflict with the existing piles be encountered, during installation of the H-Piles and/or CSP's.

903.04.02.04.05 Drilled-in Tube Piles

Clause 903.04.02.04 of OPSS 903 is amended by the addition of Clause 903.04.02.04.05 as follows:

The following shall be submitted to the Contract Administrator at least 14 Days prior to construction, for information purposes only:

- a) A schedule of work identifying time and sequence of activities.
- b) Equipment specifications and general operating methodology.
- c) Detailed procedures for setting the steel tube pile after the pile has been advanced the required depth into bedrock including details of filling the annular void around the end of the pile if present.
- d) Detailed procedures for containing and disposal of cuttings.
- e) Details of procedure to be used for monitoring installation.
- f) Working Drawings developed from the reviewed Preconstruction Survey detailing the location and batter of the existing piles, layout of proposed piles including location of reference points with respect to the centroid of each pile at the level of the bottom face of the new abutment stem and layout and elevations of the CSP's.
- g) Details of procedures to be used should a conflict with the existing piles be encountered, during installation of the tube piles and/or CSP's.

In addition to the submission requirements listed above, the Contractor shall submit detailed procedures for placing and consolidating concrete within the drilled-in tube piles at least 14 Days prior to construction to the Contract Administrator. A Request to Proceed shall be submitted to the Contract Administrator with the placing and consolidation procedures. The Contract Administrator shall review and forward to the Ministry for review. Concrete placement and installation of pile monitoring equipment shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

903.05 MATERIALS

903.05.02.02 Tube Piles

Clause 903.05.02.02 is deleted in its entirety and replaced with the following:

Steel tube piles shall be according to CAN/CSA G40.20/G40.21, Grade 350W.

903.06 EQUIPMENT

Section 903.06 of OPSS 903 is amended by the addition of the following:

W.P. #4445-02-01 Flagg Road Underpass

Reverse circulation down the hole hammer / drills and bits capable of advancing the steel tube piles (as the drilling proceeds) through any overburden material and into bedrock shall be used. The piles shall be automatically advanced as the drilling proceeds.

Equipment supplied to advance the pile into rock must be capable of penetrating the bedrock without disturbing or fracturing the bedrock adjacent to the pile.

903.07 CONSTRUCTION

903.07.02 Driven Piles

903.07.02.01 Pile Driving Requirements and Restrictions

Clause 903.07.02.01 of OPSS 903 is amended by the addition of the following:

W.P. #4415-01-01 County Road 31 Underpass

In the event of a conflict with the existing piles during installation of the H-Pile or CSP, the Contractor shall immediately notify the Contract Administrator. A revised Working Drawing detailing the proposed adjustments shall be prepared within the allowable tolerances and submitted to the Contract Administrator for review by the Design Engineer.

Should the required adjustment to avoid conflict with the existing piles be outside of the allowable tolerances, extraction or overdriving of the existing pile shall be considered for approval by the Contract Administrator, as specified elsewhere in the Contract.

903.07.02.04 Concrete in Steel Tube Piles

Clause 903.07.02.04 of OPSS 903 shall be deleted in its entirety and replaced with the following:

W.P. #4445-02-01 Flagg Road Underpass

Concrete in steel tube piles shall be placed and consolidated according to OPSS 904, except as noted herein.

During and subsequent to installation, the tube piles may be partially filled with water. The Contractor shall propose a method for placing concrete within the tube piles, as noted elsewhere. It may not be practical to dewater the tube piles prior to concrete placement and the use of tremie concreting may be required.

Concrete placement operations shall be coordinated with installation of pile instrumentation and monitoring equipment within the piles, including the embedded steel support system. The proposed placement method shall ensure that concrete is properly consolidated around all instruments and the embedded steel support system. The method shall ensure that all instruments are installed at the correct locations and orientations shown on the Contract Drawings.

Concrete shall be deposited within 3.0 m of its final position. Chutes shall have sufficient slope to deliver concrete of the approved consistency and shall have a maximum length of 15 m.

When concrete is to be dropped more than 3.0 m, fully enclosed vertical drop chutes extending to the point of deposit shall be used. Drop chutes are not required for placing concrete in empty steel tube piles that do not contain water, instruments, embedded support systems, or other equipment or materials during concrete placement operations. Concrete shall be placed at a steady rate such that a monolithic concrete is obtained without the formation of cold joints.

A consistent method shall be used for placing concrete in all piles, including piles with attached or embedded instruments.

903.07.05 Tolerances

903.07.05.01 Driven Piles

Clause 903.07.05.01 of OPSS 903 is amended by the addition of the following:

W.P. #4415-01-01 County Road 31 Underpass

The Contractor shall be permitted to adjust the positioning of the abutment piles perpendicular to the direction of the span along the centreline of the abutment bearings, to avoid conflicts with the existing abutment piles, within the following limitations:

- The centre-to-centre spacing of the piles measured at the base of the abutment shall be minimum 1.2 m and maximum 1.7 m;
- The end piles measured at the base of the abutment shall have a minimum and maximum edge distance of 0.5 m and 0.9 m, respectively from the centre of the pile to the outside face of the abutment; and
- There shall be no reduction in the number of piles per abutment.

The centre of the pile measured at the base of the abutment shall be within 75 mm measured horizontally of that specified in the direction of the span.

903.07.05.03 Drilled-in Tube Piles

Subsection 903.07.05 of OPSS 903 is amended by the addition of Clause 903.07.05.03 as follows:

W.P. #4445-02-01 Flagg Road Underpass

The Contractor shall be permitted to adjust the positioning of the abutment piles perpendicular to the direction of the span along the centreline of the abutment bearings, to avoid conflicts with the existing abutment piles, within the following limitations:

- The centre-to-centre spacing of the piles measured at the base of the abutment shall be minimum 1.1m and maximum 1.5m;
- The end piles measured at the base of the abutment shall have a minimum and maximum edge distance of 0.5m to 0.9m, respectively from the centre of the pile to the outside face of the abutments; and
- There shall be no reduction in the number of piles per abutment.

903.07.09 Drilled-in Tube Piles

Section 903.07 of OPSS 903 is amended by the addition of the following Subsection:

W.P. #4445-02-01 Flagg Road Underpass

All requirements for the item 'Caisson Piles' in Section 903.07 Construction and as amended herein shall also apply to the item 'Drilled-in Tube Piles'.

Top of bedrock elevations shown on the contract drawings are approximate. The Contractor shall provide an additional tube pile length and concrete volume allowance for potential fluctuation in rock elevations. No additional measurement or payment shall be made for the additional allowances or for excess material resulting from tube piles being shorter than anticipated.

Where sloping bedrock is encountered, the depth of the socket shall be as measured from the lowest top of sound bedrock elevation on the circumference of the socket.

The tube pile shall be embedded a minimum of 500mm below the top of sound bedrock elevation. The top of sound bedrock elevation shall be approved by the Contract Administrator.

Steel tube piles shall not be spliced without approval by the Contract Administrator.

The rock embedment length must be formed entirely within the bedrock below the level of any rubble or highly fractured material. Any length of pile above the bedrock surface will not be considered part of the specified length of rock embedment.

Blasting to facilitate the removal of bedrock is not permitted.

In the event of a conflict with the existing piles during installation of the drilled-in tube pile or CSP, the Contractor shall immediately notify the Contractor Administrator. A revised Working Drawing detailing the proposed adjustments shall be prepared within the allowable tolerances and submitted to the Contract Administrator.

903.09 MEASUREMENT FOR PAYMENT

903.09.01 Actual Measurement

Subsection 903.09.01 of OPSS 903 is amended by the addition of Clause 903.09.01.07 as follows:

903.09.01.07 Drilled-in Tube Piles

Measurement of drilled-in tube piles shall be by length in metres of the piling left in place after cut off. If the tube pile is embedded more than 500mm below the top of sound bedrock elevation, no payment shall be made for the additional tube pile length beyond the 500mm embedment specified in the Contract Documents.

903.10 BASIS FOR PAYMENT

Section 903.10 of OPSS 903 is amended by the addition of Subsections 903.10.04 and 903.10.05 as follows:

903.10.04 Supply Equipment for Drilled-in Tube Piles – Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and materials to do the work.

For payment purposes, 50% of the work under this item is completed when the satisfactory performance of the equipment has been demonstrated to the Contract Administrator by the installation of 10% of piles. The remaining 50% shall be paid on the satisfactory completion of the installation of piles.

903.10.05 Drilled-in Tube Piles – Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and materials to do the work.

CONTRACT DRAWINGS

The following drawing sheet(s) are cancelled and replaced as indicated:

Book 1 of 2 – W.P. 4415-01-01 County Road 31 Underpass

Cancelled	Replaced By
71	71A
72	72A
82	82A

Book 2 of 2 – W.P. 4445-02-01 Flagg Road Underpass

Cancelled	Replaced By
20	20A

The following drawing sheet(s) are added:

Book 2 of 2 – W.P. 4445-02-01 Flagg Road Underpass

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QUANTITY SHEETS

The following quantity sheet(s) are cancelled and replaced as indicated:

Book 1 of 2 – W.P. 4415-01-01 County Road 31 Underpass

Cancelled	Replaced By
3 to 4	3-1 to 3-3
6 to 8	6-1 to 6-3
10	10-1
12 to 13	12-1 to 12-2

Book 2 of 2 – W.P. 4445-02-01 Flagg Road Underpass

Cancelled	Replaced By
4 to 5	4-1 to 4-2
6	6-1
17	17-1

The following quantity sheet(s) are added:

Book 1 of 2 – W.P. 4415-01-01 County Road 31 Underpass

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Book 2 of 2 – W.P. 4445-02-01 Flagg Road Underpass

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TENDER ITEM LIST

Grading-Part A (County Road 31 - Site No. 31X-0204/B0)

Item	Spec. Code	Item Description	Unit	Quantity	Unit Price	Total
1	0201-0075	Grubbing	m2 (P)	3,150		
2	0201-0080	Grubbing	each (P)	20		
3	0206-0010 SP	Earth Excavation, Grading	m3 (P)	15,739		
4	0305-0015 SP	Granular Sealing (m2)	m2 (P)	1,498		
5	0308-0010 SP	Tack Coat	m2 (P)	31,549		
6	0312-0030	Asphalt Spillways	m (P)	8		
7	0313-1374	Superpave 12.5FC 1	t	2,309		
8	0313-1376	Superpave 19.0	t	3,348		
9	0314-0071	Granular A	t	8,393		
10	0314-0190	Granular B, Type II	t	4,101		
11	0314-0310	Select Subgrade Material, Compacted	t	76,541		
12	0314-0390	Granular B, Type III	t	12,085		
13	0353-0011 SP	Concrete Curb and Gutter	m (P)	105		
14	0353-0020	Concrete Gutter Outlets	each (P)	4		
15	0399-2020 SP	Temporary Hot Mix Pavement	t	66		
16	0405-0010 SP	Pipe Subdrains	m (P)	228		
17	0421-0905	900 mm Pipe Culvert	m (P)	45		
18	0421-6216	900 mm Pipe Culvert Extension	m (P)	25		
19	0499-4071 SP	Clean Out Catch Basins, Maintenance Holes and Ditch Inlets	each (P)	5		
20	0510-3133	Removal of Asphalt Pavement	m2 (P)	15,937		
21	0510-3137	Removal of Asphalt Pavement, Partial-Depth	m2 (P)	5,289		
22	0510-3139	Removal of Asphalt Pavement from Concrete Surfaces on Structures	m2 (P)	1,101		
23	0510-3532	Removal of Concrete Curb and Gutter	m (P)	448		
24	0510-4071	Removal of Maintenance Holes, Catch Basins, Ditch Inlets and Valve Chambers	each (P)	4		
25	0510-4072 SP	Abandonment of Maintenance Holes, Catch Basins, Ditch Inlets and Valve Chambers, Partial-Depth	each (P)	1		
26	0510-4076 SP	Abandonment of Pipes and Culverts	m (P)	25		
27	0510-4210	Removal of Pipes and Culverts	m (P)	50		
28	0510-5402 SP	Removal of Ramp Closure Gates	each (P)	1		
29	0510-5521	Removal of Delineator Posts	each (P)	36		
30	0510-5523	Removal of Cable Guide Rail	m (P)	928		
31	0510-5526	Removal of Anchor Blocks	each (P)	12		
32	0510-5528	Removal of Steel Beam Guide Rail	m (P)	656		
33	0511-0145	Rip-Rap	m2 (P)	85		
34	0511-0150	Geotextile	m2 (P)	142		
35	0539-0040	Protection System	lump sum	100 %		
36	0703-0020	Small Signs, Ground Mounted, New	each (P)	33		
37	0703-0021	Small Signs, Relocation	each (P)	5		
38	0703-0022 SP	Small Signs, Removal	each (P)	31		

**ADDENDUM NO. 1
CONTRACT NO. 2018-4023**

39	0704-0025	Post Mounted Delineators	each (P)	128		
40	0705-0025	Flexible Delineator Post - Temporary	each (P)	39		
41	0706-0013 SP	Portable Variable Message Sign (Temporary)	each (P)	2		
42	0706-0015 SP	Temporary Traffic Control Signs	lump sum	100 %		
43	0706-0045	Road Closing / Restriction Notice Signs (TC-64)	each (P)	14		
44	0710-0007 SP	Pavement Marking Obliterating - By Abrasive Blasting	m (P)	6,270		
45	0710-0010 SP	Pavement Marking	m (P)	6,506		
46	0710-0030 SP	Pavement Marking, Durable	m (P)	222		
47	0710-0040	Pavement Marking Symbols, Durable	each (P)	6		
48	0710-0050 SP	Pavement Marking, Temporary	m (P)	7,763		
49	0710-0060	Pavement Marking Symbols, Temporary	each (P)	2		
50	0721-0050 SP	Single Rail Steel Beam Guide Rail	m (P)	1,261		
51	0721-0060 SP	Single Rail Steel Beam Guide Rail with Channel	m (P)	118		
52	0723-4105 SP	Energy Attenuator - Temporary, Narrow	each (P)	4		
53	0723-4110 SP	Energy Attenuator - Relocation, Narrow	each (P)	4		
54	0732-0100 SP	Steel Beam Energy Attenuating Terminal System	each (P)	5		
55	0741-0020	Temporary Concrete Barrier	m (P)	732		
56	0741-0025	Temporary Concrete Barrier, Relocation	m (P)	640		
57	0741-5600 SP	Temporary Concrete Barrier Restraint System, Pinned	m (P)	280		
58	0741-5601 SP	Temporary Concrete Barrier Restraint System, Strapped	m (P)	84		
59	0799-5505 SP	Temporary Transition Connection	each (P)	2		
60	0799-6015 SP	Ramp Closure Gates	each (P)	2		
61	0799-6016 SP	Concrete in Ramp Closure Gate Support Footings	each (P)	2		
62	0802-0020	Topsoil from Stockpiles	m3	93		
63	0804-0051 SP	Seed and Mulch	m2 (P)	1,855		
64	0805-0030 SP	Light-Duty Silt Fence Barriers	m (P)	1,158		
65	0915-0051 SP	Wood Column Non-Breakaway Sign Support Structures	each (P)	1		
66	9999-5024 SP	Communication Plan for Traffic Management	lump sum	100 %		

Electrical-Part A (County Road 31 - Site No. 31X-0204/B0)

Item	Spec. Code	Item Description	Unit	Quantity	Unit Price	Total
67	0602-0045	Electrical Handholes	each (P)	4		
68	0603-0035	Rigid Ducts, Concrete Encased	m (P)	16		
69	0603-0045	Rigid Ducts, Direct Buried	m (P)	94		
70	0603-0046	Rigid Ducts, Direct Buried (Temporary)	m (P)	75		
71	0604-0045	Low Voltage Cables, in Ducts	m (P)	531		
72	0604-0046	Low Voltage Cables, in Ducts (Temporary)	m (P)	225		
73	0604-0076	Low Voltage Cables, Aerial on Messenger Cable (Temporary)	m (P)	405		

74	0604-0096	Steel Messenger Cables, Aerial (Temporary)	m (P)	135		
75	0609-0020	Ground Wires	m (P)	179		
76	0609-0021	Ground Wires (Temporary)	m (P)	77		
77	0609-0030	Ground Electrodes	each (P)	2		
78	0609-0031	Ground Electrodes (Temporary)	each (P)	2		
79	0610-0010	Removal of Electrical Equipment	lump sum	100 %		
80	0615-0041	Wood Poles, Direct Buried in Earth (Temporary)	each (P)	4		
81	0615-0110	Steel Poles, Base Mounted	each (P)	4		
82	0615-0141	Guy Anchors (Temporary)	each (P)	4		
83	0616-0020	Concrete Footings in Earth	each (P)	3		
84	0616-0030	Concrete Footings in Rock	each (P)	1		
85	0617-0021 SP	Roadway Lighting Luminaires and Bracket Assemblies (Temporary)	each (P)	4		
86	0617-0022 SP	LED Roadway Lighting Luminaires and Bracket Assemblies	each (P)	4		
87	0617-0041 SP	Replace LED Roadway Lighting Luminaires	each (P)	6		

Structural-Part A (County Road 31 - Site No. 31X-0204/B0)

Item	Spec. Code	Item Description	Unit	Quantity	Unit Price	Total
88	0510-9010 SP	Removal of Bridge Structure	lump sum	100 %		
89	0510-9015 SP	Removal of Bridge Footings	m3	80		
90	0899-0010 SP	Management and Disposal of Materials Containing Asbestos	lump sum	100 %		
91	0902-0010 SP	Earth Excavation for Structure	m3 (P)	1,670		
92	0902-0030 SP	Dewatering Structure Excavations	lump sum	100 %		
93	0903-0010 SP	Supply Equipment for Driving Piles	lump sum	100 %		
94	0903-0054 SP	H-Piles - HP 310X110	m	427.00		
95	0903-0130	Rock Points	each (P)	36		
96	0904-0055	Concrete in Footings	m3 (P)	50.0		
97	0904-0085 SP	Concrete in Substructure	lump sum	100 %		
98	0904-0105 SP	Concrete in Deck	lump sum	100 %		
99	0904-0125	Concrete in Parapet Walls	lump sum	100 %		
100	0904-0135 SP	Concrete in Approach Slabs	lump sum	100 %		
101	0904-0145 SP	Concrete in Slope Paving	lump sum	100 %		
102	0905-0010	Reinforcing Steel Bar	lump sum	100 %		
103	0905-0025	Stainless Steel Reinforcing Bar	lump sum	100 %		
104	0908-0030	Parapet Wall Railing	m (P)	159		
105	0909-0233 SP	Prestressed Concrete Girders NU 1600 Fabrication	lump sum	100 %		
106	0909-0243 SP	Prestressed Concrete Girders NU 1600 Delivery	lump sum	100 %		
107	0909-0253 SP	Prestressed Concrete Girders NU 1600 Installation	lump sum	100 %		
108	0914-0011 SP	Bridge Deck Waterproofing	lump sum	100 %		
109	0914-0031 SP	Form and Fill Grooves	m (P)	96.00		
110	0914-0040	Membrane Reinforcement	m (P)	24.00		

111	0920-0010 SP	Deck Joint Assemblies, Installation	lump sum	100 %		
112	0922-0010	Bearings	lump sum	100 %		
113	0928-0055 SP	Access to Work Area, Work Platform and Scaffolding	lump sum	100 %		
114	9999-0468 SP	CSP for Integral Abutment	lump sum	100 %		
115	9999-0903 SP	H-Piles - HP 310X132	m	517		
116	9999-9132 SP	Pile Extraction or Overdriving of Existing Piles	each	8		
117	9999-9137 SP	Vibration Monitoring	lump sum	100 %		

Grading-Part B (Flagg Road - Site No. 31X-0203/B0)

Item	Spec. Code	Item Description	Unit	Quantity	Unit Price	Total
118	0201-0015	Clearing	m2 (P)	891		
119	0201-0075	Grubbing	m2 (P)	891		
120	0206-0010 SP	Earth Excavation, Grading	m3 (P)	4,907		
121	0305-0015 SP	Granular Sealing (m2)	m2 (P)	835		
122	0308-0010 SP	Tack Coat	m2 (P)	1,276		
123	0312-0030	Asphalt Spillways	m (P)	8		
124	0313-1535	Superpave 12.5 - 40 mm Lift Thickness	m2 (P)	1,806		
125	0313-1536	Superpave 12.5 - 50 mm Lift Thickness	m2 (P)	7,003		
126	0314-0071	Granular A	t	5,682		
127	0314-0130	Granular B, Type I	t	19,885		
128	0314-0190	Granular B, Type II	t	3,840		
129	0353-0011 SP	Concrete Curb and Gutter	m (P)	52		
130	0353-0020	Concrete Gutter Outlets	each (P)	4		
131	0405-0010 SP	Pipe Subdrains	m (P)	126		
132	0421-0505	500 mm Pipe Culvert	m (P)	64		
133	0421-6212	500 mm Pipe Culvert Extension	m (P)	8		
134	0510-3133	Removal of Asphalt Pavement	m2 (P)	5,933		
135	0510-3137	Removal of Asphalt Pavement, Partial-Depth	m2 (P)	66		
136	0510-3139	Removal of Asphalt Pavement from Concrete Surfaces on Structures	m2 (P)	540		
137	0510-3532	Removal of Concrete Curb and Gutter	m (P)	290		
138	0510-4072 SP	Abandonment of Maintenance Holes, Catch Basins, Ditch Inlets and Valve Chambers, Partial-Depth	each (P)	4		
139	0510-4076 SP	Abandonment of Pipes and Culverts	m (P)	14		
140	0510-4210	Removal of Pipes and Culverts	m (P)	30		
141	0510-5523	Removal of Cable Guide Rail	m (P)	456		
142	0510-5526	Removal of Anchor Blocks	each (P)	8		
143	0510-5528	Removal of Steel Beam Guide Rail	m (P)	206		
144	0511-0145	Rip-Rap	m2 (P)	122		
145	0511-0150	Geotextile	m2 (P)	172		
146	0703-0020	Small Signs, Ground Mounted, New	each (P)	2		
147	0703-0022 SP	Small Signs, Removal	each (P)	2		
148	0706-0013 SP	Portable Variable Message Sign (Temporary)	each (P)	2		

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149	0706-0015 SP	Temporary Traffic Control Signs	lump sum	100 %		
150	0706-0045	Road Closing / Restriction Notice Signs (TC-64)	each (P)	23		
151	0710-0030 SP	Pavement Marking, Durable	m (P)	162		
152	0799-5505 SP	Temporary Transition Connection	each (P)	4		
153	9999-5024 SP	Communication Plan for Traffic Management	lump sum	100 %		
154	0721-0050 SP	Single Rail Steel Beam Guide Rail	m (P)	734		
155	0721-0060 SP	Single Rail Steel Beam Guide Rail with Channel	m (P)	84		
156	0732-0100 SP	Steel Beam Energy Attenuating Terminal System	each (P)	8		
157	0741-0020	Temporary Concrete Barrier	m (P)	385		
158	0802-0020	Topsoil from Stockpiles	m3	602		
159	0804-0052	Seed and Erosion Control Blanket	m2 (P)	12,033		
160	0805-0030 SP	Light-Duty Silt Fence Barriers	m (P)	1,446		
161	0805-0100 SP	Straw Bale Flow Check Dams	each (P)	5		

Structural-Part B (Flag Road - Site No. 31X-0203/B0)

Item	Spec. Code	Item Description	Unit	Quantity	Unit Price	Total
162	0510-9010 SP	Removal of Bridge Structure	lump sum	100 %		
163	0510-9015 SP	Removal of Bridge Footings	m3	67		
164	0539-0040	Protection System	lump sum	100 %		
165	0899-0010 SP	Management and Disposal of Materials Containing Asbestos	lump sum	100 %		
166	0902-0010 SP	Earth Excavation for Structure	m3 (P)	2,460		
167	0902-0030 SP	Dewatering Structure Excavations	lump sum	100 %		
168	0904-0055	Concrete in Footings	m3 (P)	80.5		
169	0904-0085 SP	Concrete in Substructure	lump sum	100 %		
170	0904-0105 SP	Concrete in Deck	lump sum	100 %		
171	0904-0125	Concrete in Parapet Walls	lump sum	100 %		
172	0904-0135 SP	Concrete in Approach Slabs	lump sum	100 %		
173	0904-0145 SP	Concrete in Slope Paving	lump sum	100 %		
174	0905-0010	Reinforcing Steel Bar	lump sum	100 %		
175	0905-0025	Stainless Steel Reinforcing Bar	lump sum	100 %		
176	0908-0030	Parapet Wall Railing	m (P)	140		
177	0909-0231 SP	Prestressed Concrete Girders NU 1200 Fabrication	lump sum	100 %		
178	0909-0241 SP	Prestressed Concrete Girders NU 1200 Delivery	lump sum	100 %		
179	0909-0251 SP	Prestressed Concrete Girders NU 1200 Installation	lump sum	100 %		
180	0914-0011 SP	Bridge Deck Waterproofing	lump sum	100 %		
181	0914-0031 SP	Form and Fill Grooves	m (P)	38.00		
182	0914-0040	Membrane Reinforcement	m (P)	19.00		
183	0920-0010 SP	Deck Joint Assemblies, Installation	lump sum	100 %		
184	0922-0010	Bearings	lump sum	100 %		
185	0928-0055 SP	Access to Work Area, Work Platform and Scaffolding	lump sum	100 %		

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186	9999-0352 SP	Working Slab	lump sum	100 %		
187	9999-0468 SP	CSP for Integral Abutment	lump sum	100 %		
188	9999-9065 SP	Bird Nesting Preventative Measures	lump sum	100 %		
189	9999-9145 SP	Supply Equipment for Drilled-In Tube Piles	lump sum	100 %		
190	9999-9146 SP	Drilled-In Tube Piles	m	408		

Addendum 1-Part A (County Road 31 - Site No. 31X-0204/B0)

Item	Spec. Code	Item Description	Unit	Quantity	Unit Price	Total
191	0913-0010	Embedded Work in Structure (Ministry)	lump sum	100 %		
192	0999-9310	Deck Drains	each (P)	2		
193	9999-9168 SP	Steel Pile Corrosion Assessment	lump sum	100 %		
194	9999-9169 SP	Pile Instrumentation and Monitoring System	lump sum	100 %		

Addendum 1-Part B (Flagg Road - Site No. 31X-0203/B0)

Item	Spec. Code	Item Description	Unit	Quantity	Unit Price	Total
195	9999-9169 SP	Pile Instrumentation and Monitoring System	lump sum	100 %		

		Grand Total:				
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