McKIM&CREED

1365 Hamlet Ave. Clearwater, Fl. 33756 (727) 442-7196

WORK ORDER INITIATION FORM
for the CITY OF CLEARWATER

Date: 5/10/2017

M&C Project Number: P-160356

City Project Number: 16-0022-UT

1.   PROJECT TITLE:

Northeast WRF SCADA System PLC Upgrades, Phase 2

2.   SCOPE OF SERVICES:

The City of Clearwater's Northeast WRF control system includes programmable logic controller equipment (PLCs) that is being phased out of standard production by the manufacturer (Allen Bradley PLC 5 and Micrologix series). The City has recognized the obsolescence of this PLC equipment and the importance it serves for the monitoring and control of the facilities.   A Capital Improvements Project has been created to handle the phased replacement and upgrade of this series PLC equipment in all plant locations.

For this Work Order, the City desires to complete the upgrades for the Northeast WRF, including PLC equipment, remote devices and network communications for the following systems:

- Control Room Console
- Belt Press Area Systems
- Disinfection Building
- Zimpro Sand Filter System
- Remote Reclaimed Water Storage Sites (Pinellas County Tank, Chi-Chi Driving Range, Chi-Chi Golf Course, Countryside Golf Course, Allen and Briar Creek)

The City has requested that McKim & Creed provide equipment selection assistance and software implementation and conversion services for upgrading the existing controller-related systems from the obsolete Allen Bradley platforms to current technology Allen Bradley ControlLogix and CompactLogix series units, with similar input/output and communication components. All upgrades, including related communications and monitoring equipment, will support the upgraded PLCs and communicate over an Ethernet network. A PLC programming device will be provided for the City's use in maintaining and troubleshooting the upgraded PLC operations.

McKim & Creed will assist the City in selecting components and provide drawing documentation indicating the communication connections, upgraded network diagrams and the field signal termination points. The City will procure all equipment and perform all equipment installation, communications cabling and field wiring/terminations. On completion of the City's installation work, McKim & Creed will test the PLC software programs and confirm the interface to the plant SCADA computer systems.

Upgrades will include the following locations and activities:
- Control Room PLC system
  - Convert PLC 5 to ControlLogix L7 PLC
  - Upgrade MDS serial radio to MDS Ethernet spread spectrum radio
  - Upgrade remote site radio communication links to wireless Ethernet
  - Decommission Parker operator interface
- Belt Press Building
  - Convert North and South Belt Press PLC 5s to ControlLogix L7 PLCs
  - Convert Sludge Blend PLC 5 to ControlLogix L7 PLC. Note, this installation will include additional spare slots with quantity coordinated to support future blend tank modifications
  - Convert Blower Building and Thickener Building DH+ remote I/O links for the Sludge Blend PLC to Ethernet communications and ControlLogix PLC hardware
  - Implement a SCADA VNC industrial computer client in the lab area using the existing operator interface cabinet
  - Convert communication systems to Ethernet hardwired and fiber optic systems
- Disinfection Building
  - Convert Disinfection PLC 5 to ControlLogix L7 PLC
  - Convert Parker operator interface to a SCADA VNC industrial computer client
  - Convert three (3) chlorine pump VFDs with DeviceNet communication links to Powerflex 525 VFDs with Ethernet communication links. Note this will require the replacement of the VFDs to the current manufacturer offering.
  - Upgrade communications to Ethernet fiber optic system
- ZimPro Sand Filter
  - Convert ZimPro PLC 5 to ControlLogix L7 PLC
  - Convert Allen Bradley PanelView operator interface to current technology unit including communications from DH+ to Ethernet
  - Upgrade operator interface software application to support upgraded PLC
  - Upgrade communications to Ethernet fiber optic system
- Remote Reclaimed Water Sites
  - Convert four (4) locations (Pinellas County Tank, Chi-Chi Driving Range, Chi-Chi Golf Course and Countryside Golf Course) from MicroLogix 1500 PLCs to CompactLogix L2 PLCs
  - Upgrade MDS serial radios at six (6) sites (Pinellas County Tank, Chi-Chi Driving Range, Chi-Chi Golf Course, Countryside Golf Course, Allen and Briar Creek) to MDS Ethernet spread spectrum radios
- PLC Programming Device
  - Provide the programming hardware and software to expand the City's ability to support this equipment. The programming equipment will have the programming and

application software for this project pre-loaded, with communications adapters configured.

The scope of work to be provided will include the following:

Task 1 – Northeast WRF SCADA System PLC Upgrades

1.1   Project administration, monthly status reports and invoicing.

1.2   Perform an onsite field investigation to review the physical components of the existing configurations including remote input/output modules, field signal connections, communication links and available fiber optic cable. Review any components from the existing system which are no longer required in the replacement implementation, such as Devicenet communication devices, remote I/O locations or operator interfaces.

1.3   Develop and provide a Bill of Material for components for direct purchase by the City. Bill of Material will be provided in Excel electronic file format.

1.4   Prepare and provide a set of drawings for the communications connections, input/output signals and system network diagram to document the new PLC configuration for the City's use in installation of the replacement components. Drawings will follow typical industry standards for PLC documentation and will be provided in electronic PDF format.

1.5   Perform a conversion of the existing PLC logic program from PLC 5 format to ControlLogix format. This conversion will make use of manufacturer-provided tools for initial conversion, estimated at 70% completion, with the balance of the program conversion completed through manual software coding. Modify the existing PLC logic programs for the new components and communication format, only. No functional software modifications are included.

1.6   Configure the existing software communications driver on the two (2) SCADA computers for the new ControlLogix PLCs.

1.7   On receipt of PLC hardware by the City, and utilizing a backup configuration of the SCADA software application, the system database will be updated for the new communications driver and a configuration bench test will be performed at the site between the SCADA system and each new controller as well as the new controller and the balance of the plant network to confirm operation prior to decommissioning of the existing system.

Note: This project will upgrade the communication links for the system processors from Data Highway Plus (DH+) to Ethernet over network components using City-provided network and fiber optic cable.

1.8   Perform updates to the SCADA system application software for direct communications to the upgraded PLCs from the SCADA system. Remove the software routine in the Control Room PLC for communications to the original PLCs.

1.9 Following completion of equipment and network installations by the City, download updated PLC application software, assist the City technicians in confirming the field signal terminations and verify PLC and SCADA network communications to confirm PLC operations.

1.10 Support the decommission and replacement of the Parker Monitor operator interfaces to SCADA industrial computer VNC client connections to the control room SCADA computers over City provided cable.

Note: No changes in the current SCADA functionality are intended. This update assumes that the existing SCADA application provides all the needed functionality provided by the Parker monitors. If SCADA software modifications are required, additional effort may be required.

1.11 Provide final As-Built drawings to reflect any modifications that occur during the start-up process. Drawings will be provided in electronic PDF and ACAD file formats.

1.12 Provide a PLC programming device including the following components and tasks
- PLC programming software: Rockwell Software AB 9324-RLD700NXENE Studio 5000 Professional Edition ESD software with electronic delivery.
- PLC programmer device: Lenovo Model 20FH002CUS T560 20FH ThinkPad with Intel Core i5-6300U, 2.40 GHz processor; 8 GB DDR3L SDRAM, 15.6-inch 1920 x 1080 resolution screen, 256 GB solid state drive and power cord
- Load and configure PLC programming and communication software for the new ControlLogix and CompactLogix PLCs implemented as part of the project.

Exclusions

This scope has been developed to address the anticipated project requirements. Task items not specifically identified in this scope of services are not included. If during the course of the work, it is determined that additional work or assistance is necessary to complete the project, the activities can be added via additional services. Some specific items not included in this scope of services are as follows:

- The project will not require any changes to the monitoring and control operations of the facility and is similar to previous upgrades at this and other City facilities. Therefore no training is included as part of this scope of work.

- No permitting is anticipated or included as part of these scope of services

- No functional change to the control software or plant operation is anticipated.

- No purchase or provision of any PLC components, networking equipment and/or software licensing, except as specifically noted above, is included.

- No installation of equipment, communication cables or signal wiring is included, with accuracy and/or troubleshooting to be the responsibility of the City.

3.   PROJECT GOALS:

- PLC Equipment Bill of Materials (electronic)
- PLC schematic and network design drawings (electronic)
- PLC, HMI and Operator Interface Application Software Development/Conversion
- System Startup and Testing
- As-Built Drawing Documentation (electronic)
- Electronic copy of PLC, HMI and Operator Interface application programs
- Deliver PLC programming device and PLC programming software
- Application software load and communication testing

4.   BUDGET:

See Attachment "B".

This price includes all labor and expenses anticipated to be incurred by McKim & Creed for the completion of these tasks, in accordance with Professional Services Method "B" – Lump Sum – Percentage of Completion by Task, **for a fee not to exceed One Hundred Fourteen Thousand, One Hundred Sixteen Dollars ($114,116.00)**

5.   SCHEDULE:

Equipment selection and drawing documentation work will be completed within 30 days of receipt of written notice to proceed.

Software implementation and testing/startup will be completed within 15 days of notification of the City's successful hardware installation and testing for each PLC location.

PLC programming device delivered with 60 days of written notice to proceed with application programs updated within 10 days of upgrade completions

6.   STAFF ASSIGNMENT:

McKim & Creed: Michael Tweedel, Flavio Velecela, Eric Brown, Tamer Aldamanhouri

City of Clearwater: Robert S. Fahey, PE, Rich Gardner, Kervin St. Amie, Kathryn McGrath, Randy Barnoski

7.   CORRESPONDENCE/REPORTING PROCEDURES:

Engineer's/Architect's project correspondence shall be directed to:
Michael Tweedel, PE

All City project correspondence shall be directed to:
Robert S. Fahey, PE with copies to Rich Gardner, Kervin St. Amie and Kathryn McGrath and copies to others as may be appropriate.

8. INVOICING/FUNDING PROCEDURES:

Invoices for work performed shall be submitted monthly to the City of Clearwater, Engineering Department, Attn.: Veronica Josef, Senior Staff Assistant, PO Box 4748, Clearwater, Florida 33758-4748.

City Invoicing Code: 315--96219-561300-535-000-0000

9. INVOICING PROCEDURES

At a minimum, in addition to the invoice amount(s) the following information shall be provided on all invoices submitted on the Work Order:

A. Purchase Order Number and Contract Amount.
B. The time period (begin and end date) covered by the invoice.
C. A short narrative summary of activities completed in the time period.
D. Contract billing method – Lump Sum or Cost Times Multiplier.
E. If Lump Sum, the percent completion, amount due, previous amount earned and total earned to date for all tasks (direct costs, if any, shall be included in lump sum amount).
F. If Cost Times Multiplier, hours, hourly rates, names of individuals being billed, amount due, previous amount earned, total earned to date for each task and other direct costs (receipts will be required for any single item with a cost of $50 or greater or cumulative monthly expenses greater than $100).
G. If the Work Order is funded by multiple funding codes, an itemization of tasks and invoice amounts by funding code.

10. SPECIAL CONSIDERATIONS:

The consultant named above is required to comply with Section 119.0701, Florida Statutes (2013) where applicable.

PREPARED BY: **APPROVED BY:**

_____   **_____**

Michael Tweedel, PE   **Michael D. Quillen, PE**
Senior Project Manager   **City Engineer**
McKim & Creed, Inc.   **City of Clearwater**

_____   **_____**

Date   **Date**

CITY OF CLEARWATER
ENGINEERING DEPARTMENT

WORK ORDER INITIATION FORM
CITY DELIVERABLES

11.   FORMAT

The design plans shall be compiled utilizing the following methods:

City of Clearwater CAD standards.
Datum: Horizontal and Vertical datum shall be referenced to North American Vertical Datum of 1988 (vertical) and North American Datum of 1983/90 (horizontal). The unit of measurement shall be the United States Foot. Any deviation from this datum will not be accepted unless reviewed by City of Clearwater Engineering/Geographic Technology Division.

12.   DELIVERABLES

The design plans shall be produced on bond material, 24" x 36" at a scale of 1" = 20' unless approved otherwise. Upon completion the consultant shall deliver all drawing files in digital format with all project data in Autodesk Civil 3D file format. If not available Land Desktop files are still acceptable, however the City or Clearwater is currently phasing out Land Desktop.

NOTE: If approved deviation from Clearwater CAD standards are used the Consultant shall include all necessary information to aid in manipulating the drawings including either PCP, CTB file or pen schedule for plotting. The drawing file shall include only authorized fonts, shapes, line types or other attributes contained in the standard release of Autodesk, Inc. software. All block references and references contained within the drawing file shall be included. Please address any questions regarding format to Mr. Tom Mahony, at (727) 562 4762 or email address Tom.Mahony@myClearwater.com.

All electronic files (CAD and Specification files) must be delivered upon completion of project or with 100% plan submittal to City of Clearwater.

Northeast WRF SCADA System PLC Upgrades, Phase 2

McKIM&CREED
ENGINEERS SURVEYORS PLANNERS

WORK ORDER INITIATION FORM
PROJECT BUDGET

Task	Description	Subconsultant Services	Labor	Total
1.0	**Northeast WRF SCADA System PLC Upgrades, Phase 2**			
1.1	Project Administration			$2,977
1.2	Field Investigation and Backups			$13,455
1.3	Bill of Material Preparation			$2,845
1.4	PLC Drawing Preparation			$10,453
1.5	PLC/OIT Software Conversion			$34,562
1.6	SCADA Driver Configurations			$2,342
1.7	System Pre-Testing			$6,512
1.8	SCADA Software Updates			$3,005
1.9	Program Install and System Testing			$21,402
1.10	Parker Monitor Replacement			$1,250
1.11	As Built Drawing Preparation			$2,255
1.12	PLC Programming Device			$13,058
Grand Total				**$114,116**