

**Proposal to Provide
Engineering Services for
WRF – Development of Functional Control Descriptions
Work Order No. 16**

Services to be provided by: Hazen and Sawyer (Hazen)
Services provided to (“Village”): Village of Wellington (Village)
Proposal date: July 10, 2019

Proposal Terms

PROJECT DESCRIPTION

The Village of Wellington Water Reclamation Facility (Wellington WRF) is preparing to undergo programmable logic controller (PLC) upgrades. To complete a PLC upgrade, it will be required to reprogram the new PLCs to continue to perform the monitoring and control functions throughout the plant upon replacement. However, limited process and instrumentation diagrams (P&IDs) or functional control descriptions (FCDs) exist to provide information to a contractor/system integrator who will perform the work. Therefore, it is necessary to create FCDs for each process for current and future work outsourced to third party professional contractors/system integrators that adequately describe the existing instrumentation and control of the Wellington WRF.

CONSULTANT shall prepare detailed FCDs for existing processes at the Wellington WRF with a written description of the control strategies. The resulting documentation shall be suitable for being provided in a bid package, so that the successful third party bidding contractor/system integrator may then use the documents for reprogramming of the new PLCs. The resulting documentation shall also provide an outline of process, mechanical and related control operations at the plant that can be used as a detailed reference to support plant operations and training, and also preserve institutional knowledge for future personnel and third party contractors/system integrators who maintain the plant supervisory control and data acquisition (SCADA) system.

SCOPE OF SERVICES

Task 1 – Development of Functional Control Descriptions (FCDs)

Hazen will organize and lead a kick-off meeting with the Village staff and key members of the project team. During this meeting, the overall work plan, project goals, and schedule will be discussed, lines of communication will be established, and data needs will be assessed. Key elements will be discussed during the kick-off meeting. Kick-off meeting minutes will be prepared and distributed by the Hazen.

CONSULTANT shall collect and review existing P&ID documentation, process control system databases, SCADA Human Machine Interface (HMI) screens, I/O schedules and instrument lists. CONSULTANT shall also perform site visits and interview operators regarding operation of each process. Based upon existing documentation and information collected during site visits, CONSULTANT shall prepare draft FCDs of existing process areas.

A written narrative of process control strategies, local interface (touch panel) requirements and human machine interface (operator workstation) requirements shall be prepared to describe operational protocol and programming work required to implement the described plant automation functions.

A list of the existing PLCs at the Wellington WRF are provided in **Table 1** below. The table includes identification of which deliverable package that FCDs associated with each PLC are included.

Table 1 – List of Existing PLCs at Wellington WRF

Location	PLC Name	Deliverable Package
Headworks	PLC-1	1
Blower Building	Alka-Pro PLC	1
Aeration Basin #3	CP-2000	1
Filter Dosing Building	PLC-5000	1
Sludge Dryer Facility	CP9005-2	1
Belt Filter Press Building	Belt Filter Press PLC	1
Belt Filter Press Building	Cake PLC	1
Generator Building	MCP-2	2
Gravity Filter Building	Main Control Panel	2
Belt Filter Press Building	Lime PLC	2

The estimated amount of FCDs required for this contract are provided in attached **Table 2** on the following pages.

Review and validation of FCDs by Village staff who are familiar with the operation of the plant is very important. Therefore, it is assumed that key Village staff will review each document and be prepared to discuss and provide comments. A DRAFT of the FCDs will be prepared and submitted to the Village for review. Comments will be documented and incorporated as

applicable in the FINAL FCDs. FCDs will be developed in a similar style and level of detail as the attached example provided as **Attachment B**.

Deliverables of FCDs will be broken into two packages. An earlier Package 1, comprising FCDs that are required under PLC upgrades currently under design, and a later Package 2, comprising FCDs required under future work.

Deliverable(s):

1.1 – Minutes from project kick-off meeting

1.2 – Early Package 1 - DRAFT FCDs

1.3 – Early Package 1 - FINAL FCDs

1.4 – Package 2 – DRAFT FCDs

1.5 – Package 2 – FINAL FCDs

Village of Wellington WRF
Development of Functional Control Descriptions
Table 2 - Estimated Amount of FCDs

Area ID	Process Area	Package	Process Component	Func. Control Desc. (Amount)
1	Headworks	1	Bar Screens	1
			Screening Compactor	1
			Grit Classifier	1
			Grit Pumps	1
			Pista Grit Paddle	1
2	Aeration Basin No. 1/2	1	Aerators	1
4	Aeration Basin No. 3	1	Aerators	1
6	Clarifier No. 1 - 4	1	Mechanisms	1
			RAS Pumps	1
			Scum Pumps	1
			WAS Pumps	1
			Gates	1
5	Mixed Liquor Splitter Box	-	Gates	-
10	Filter Dosing Pump Station	1	Filter Dosing Pumps	1
11	Basic-Level CCT No. 1	-	Gates	-
12	Process Water Pumps	-	Process Water Pumps	-
13	Basic-Level CCT No. 2	-	Gates	-
14a	High-Level CCT North	2	Gates	1
14b	High-Level CCTs South	-	Gates	-
15	Reuse Wetwell No. 1	1	Reuse Pumps	1
			Levels	1
16	Reuse Wetwell No. 2	1	Reuse Pumps	1
			Levels	1
17	Effluent Filters	2	Various Equipment	4
18	Filter Backwash Waste Basin	2	Mudwell Pumps	1
			Levels	1
19	Aerobic Digesters 1-5	2	PD Blowers	1
			BFP Feed Pumps	1
			Levels	1
21	Sludge Dewatering Facility	1	Belt Filter Presses	1
			Polymer Makeup Units	1
			Cake Conveyors	1
			Cake Pumps	1
22	Truck Loading Building	2	Truck Load Conveyor	1
23	Sludge Drying Building	1	Dryer	4
			Dryer Condensate - Pumps	1
24	MCC & Generator Building	2	Generator (2 MW)	1
			2 MW Gen Fuel Storage Tank	1
25	Odor Control - Headworks	2	Various Equipment	1
26	Odor Control - Aeration	2	Various Equipment	1
27	Odor Control - Digesters	1	Various Equipment	1
28	Odor Control - Biosolids	1	Various Equipment	1
			Biofilters	-

(continued on next page)

Village of Wellington WRF
Development of Functional Control Descriptions
Table 2 - Estimated Amount of FCDs

Area ID	Process Area	Package	Process Component	Func. Control Desc. (Amount)
33	Diesel Fuel Tank - Parks	-	Fuel Storage Tank	-
34	NaOH Bulk Storage Containment	1	Tanks	1
			NaOH pumps	1
35	NaOCl Bulk Storage Containment	1	Tanks	1
			NaOCl Pumps	1
36	Lift Station - Main	2	Press/Filtrate - Pumps	1
38	Lift Station - Filtrate	1	Press/Filtrate - Pumps	1
39	Lift Station - Wetlands	1	Wetland - Pumps	1
			Wetlands - Valves	1
40	Septage Receiving Station	-	Structure	-
			injection Well	1
41	Injection Well	2	Hydropneumatic Tank	1
			Dual Zone Monitor Well	1
			Sample Pump	1
42	Drum storage area	-		-
43	Building - Operator's	2	Generator (0.75 MW)	1
			.75 MW Gen Fuel Storage Tank	1
			.75 mW Gen Day Tank	-
44	Building - Maintenance	-		-
45	Building - Sludge Stabilization	-		-
46	Building - Truck Canopy	-		-
47	Lime Silo	-	To be demolished	-
48	Building - Covered Storage	-	To be demolished	-
49	Building - Reuse	-	To be demolished	-
50	Building - Old Chemical/Storage	-	To be demolished	-
Future	(New) Aerobic Digester 6-7	2		1
	(New) Lift Station - Headworks	2		1
Future	(New) Building - Blower	-		-
Future	(New) Building - Filter Control	-		-
	Reuse Distribution Sites	1		1
	Misc Instrumentation	1, 2		5
				Func. Control Desc. (Amount)
Plantwide Total				65
Early Package 1				40
Package 2				25

ASSUMPTIONS

1. It is assumed that key Village staff will review each document and provide comments.
2. FCDs will be developed in a similar style and level of detail as the attached examples provided as **Attachment B**.
3. It is anticipated that the Village will provide Hazen with required data within the first four weeks following receipt of a Project Notice-to-Proceed. Data that are expected to be required include, but are not limited to, the following:
 - PLC input/output (I/O) lists and other relevant information
 - Record drawings
 - Interviews with key Village staff and outside consultants knowledgeable about operation and maintenance of instrumentation and controls at the Wellington WRF
4. P&ID drawings reflecting the configuration of the monitoring and control system, showing existing instrumentation, controls, valves and process piping and equipment numbering/tagging scheme for the plant, will not be provided. Detailed input/output schedules, including: discrete state, analog span, tag, description and cabinet location, will also not be provided. If any of this information is required, it is assumed that it will be provided under another future contract.

SCHEDULE

Task	Description	Time of Completion from NTP
1	DRAFT Deliverables – Early Package 1	14 weeks
1	FINAL Deliverables – Early Package 1	20 weeks
1	DRAFT Deliverables – Package 2	30 weeks
1	FINAL Deliverables – Package 2	36 weeks

COMPENSATION

Compensation for all tasks, unless specifically noted below, will be billed on a lump sum basis based on percent of work complete and total project fees presented in **Attachment A**.

AUTHORIZATION

Work described in this proposal will commence upon authorization to proceed and receipt of a signed agreement.

Hazen and Sawyer

Signed: Albert Muniz

Name: Albert Muniz, PE

Title: Vice President

Date: July 9, 2019

Village of Wellington

Signed: _____

Name: _____

Title: _____

Date: _____

(Please return one original to Hazen and Sawyer)

ATTACHMENT A**BUDGET SUMMARY - Lump Sum**

Task No.	Description	BUDGET SUMMARY for Work Order No. 16						
		Vice President	Senior Associate	Associate	Engineer/ Asst Engr	Office	Total Labor	Sub-Consultant
1	Development of P&IDs							
	Kickoff Meeting	2	4	4	0	0	10	\$0
	Site Visits	0	24	80	80	0	184	\$0
	Development of FCDs	2	68	128	520	28	746	\$0
	SUB-TOTAL	4	96	212	600	28	940	0
	Labor Raw Costs	\$218	\$196	\$165	\$105	\$73		
	Labor Sub-Total	\$872	\$18,816	\$34,980	\$63,000	\$2,044		
	Labor Total						\$119,712	
	Subconsultant Labor Total							\$0
	Subconsultant Multiplier							1.0
	Subconsultant Total							\$0
	Reimbursable Expenses							\$0
	Project Total							\$119,712

Attachment B

Example Functional Control Description

PART 3 -- FUNCTIONAL CONTROL DESCRIPTIONS

3.01 CLARIFIERS

A. Process Overview

Mixed liquor from each biological treatment unit flows into a clarifier. Clarified effluent water flows to the chlorine contact tank while return activated sludge (RAS) is pumped back to the biological treatment units and waste activated sludge (WAS) is pumped to the sludge holding tanks. Settled sludge is withdrawn from the clarifiers by a rotating mechanism that moves along the bottom of the clarifier. Scum is skimmed from the water surface within the clarifiers and is pumped to the sludge holding tanks.

B. Control Operation

1. Local controls shall be provided by the clarifier system supplier as specified in section 11460 including but not limited to the following:
 - a. Clarifier drive high and high-high torque switches
 - b. Clarifier drive local control panels
2. Remote controls shall be provided by the electrical subcontractor and the instrumentation subcontractor included but not limited to the following:
 - a. Manual control of the clarifier drive at MCC-1.
 - b. Automatic shutdown of the clarifier drive upon high-high torque at MCC-1.
 - c. Remote monitoring of clarifier drive status at the plant control room HMI via PLC-1. PLC-1 shall acquire clarifier status signals via DeviceNet communication link to MCC-1.

3.02 RAS PUMP STATION

A. Process Overview

Three RAS pumps shall be provided in the RAS Pump Station as specified in Section 11131. All three pumps withdraw sludge from a common wet well. Pump No. 1 shall pump RAS to Biological Treatment Unit No. 1. Pump No. 3 shall pump RAS to Biological Treatment Unit No. 2. Pump No. 2 shall be a standby and shall pump RAS to Biological Treatment Unit No. 1 or No. 2 depending on the position of manually operated valves on the discharge header of the pump station. The flow rate of RAS shall be controlled to maintain a ratio of RAS flow to influent flow for each biological treatment unit.

WAS is withdrawn from each RAS pipeline prior to the RAS flow meter. A motorized valve is provided to control the flow rate of WAS.

B. Control Operations

1. RAS Pump Control
 - a. When a Pump HAND-OFF-REMOTE selector switch is in REMOTE, the pump

shall be controlled by the PLC. The operator shall select automatic or manual mode on the HMI. In manual mode, the operator is to start, stop and control the speed of the pump on the HMI.

- b. When in automatic mode, RAS pump speed shall be controlled to maintain a ratio of RAS flow rate and biological treatment unit influent flow rate. The ratio shall be entered on the HMI. Each biological treatment unit shall have an independent ratio controller and setpoint.
- c. The pump speeds shall be controlled by PID feedback flow controllers (FIC-621y, y=1, 2) to achieve the flow rate (FIT-621y, y=1, 2) setpoints established by the ratio controllers described above.

2. WAS Valve Control

- a. When a WAS valve LOCAL-STOP-REMOTE selector switch is in REMOTE, the valve shall be controlled by the PLC. The operator shall select automatic or manual mode on the HMI. In manual mode, the operator is to control the position of the valve on the HMI.
- b. When in automatic mode, WAS valve position shall be controlled to maintain a constant flow rate of WAS. Each WAS valve shall have an independent flow rate setpoint.
- c. The valve positions shall be controlled by PID feedback flow controllers (FC-630y, y=1, 2) to achieve the flow rate (FIT-630y, y=1, 2) setpoints.

PART 4 – EXECUTION

(NOT USED)

- END OF SECTION -