

ADDENDUM NO. 1
CONTRACT 18-04 WATER TREATMENT PLANT RENOVATION
SRF DW6 2019-213, DW7 2019-214 & DWF 2019-215
HUMBOLDT, TENNESSEE
WAUFORD PROJECT NO. 3638

Date of Addendum: Friday, March 15, 2019
Construction Bid Date: 10:00 AM Local Time, Tuesday, April 16, 2019

1. Davis-Bacon Wage Rates

Replaced wage rate determinations with the attached current Heavy and Building wage rates.

2. Bid Form

Replace Bid Form with attached revised Bid Form. Added pre-negotiated prices for SCADA System.

3. Detailed Specifications, Sub-Section 6D, Control and Metering System

Add the attached Sub-Section 6D for the required changes to the existing SCADA system to incorporate the new equipment.



J. R. WAUFORD & COMPANY,
CONSULTING ENGINEERS, INC.

A handwritten signature in blue ink, appearing to read "Scott Daniel", written over a horizontal line.

W. Scott Daniel, P.E.
Tennessee License No. 104425

General Decision Number: TN190041 01/18/2019 TN41

Superseded General Decision Number: TN20180042

State: Tennessee

Construction Type: Building

County: Gibson County in Tennessee.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.60 for calendar year 2019 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.60 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2019. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/04/2019
1	01/18/2019

ENGI0369-006 05/01/2013

	Rates	Fringes
OPERATOR: Bulldozer.....	\$ 24.47	10.85
OPERATOR: Forklift.....	\$ 24.47	10.85

PAIN0049-004 06/01/2006

Rates	Fringes
-------	---------

PAINTER: Brush and Roller,
 Excludes Drywall
 Finishing/Taping.....\$ 15.07 5.42

 * PLUM0614-003 07/01/2018

Rates Fringes

PIPEFITTER.....\$ 31.72 15.50

 SUTN2009-040 09/21/2009

Rates Fringes

BRICKLAYER.....\$ 23.03 0.00

CARPENTER, Includes Form Work
 (Excludes Drywall Hanging).....\$ 15.70 0.00

CEMENT MASON/CONCRETE FINISHER...\$ 11.14 1.51

DRYWALL FINISHER/TAPER.....\$ 13.88 0.00

DRYWALL HANGER.....\$ 14.00 0.00

ELECTRICIAN, Includes
 Installtion of Alarms and
 Sound Systems.....\$ 15.92 3.20

GLAZIER.....\$ 12.28 2.52

LABORER: Common or General.....\$ 8.00 0.00

LABORER: Mason Tender - Brick...\$ 12.00 0.00

MECHANICAL INSULATOR,
 Including Duct and Pipe
 Insulation.....\$ 15.00 1.21

OPERATOR:
 Backhoe/Excavator/Trackhoe.....\$ 15.93 0.00

OPERATOR: Crane.....\$ 18.42 2.02

OPERATOR: Grader/Blade.....\$ 15.05 1.42

OPERATOR: Roller.....\$ 12.00 0.00

PAINTER: Spray (Excludes
 Drywall Finishing/Taping).....\$ 12.00 0.00

PLUMBER.....\$ 14.31 0.89

ROOFER, Includes Rubber, and Shake & Shingle Roofs.....	\$ 15.38	0.00
SHEET METAL WORKER, Includes HVAC Duct Installation.....	\$ 15.60	0.89
TRUCK DRIVER: Dump Truck.....	\$ 11.37	1.50

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or

"UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.

Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.



END OF GENERAL DECISION

General Decision Number: TN190123 01/04/2019 TN123

Superseded General Decision Number: TN20180124

State: Tennessee

Construction Type: Heavy
Including Water and Sewer Line Construction

Counties: Decatur, Dyer, Gibson, Hardeman, Hardin, Haywood,
Henderson, Henry, Lake, Lauderdale, McNairy, Obion and Weakley
Counties in Tennessee.

HEAVY CONSTRUCTION PROJECTS (including sewer/water
construction).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.60 for calendar year 2019 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.60 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2019. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/04/2019

ENGI0369-011 05/01/2013

Rates	Fringes
-------	---------

Operating Engineers:
 Bulldozer and Crane.....\$ 24.47 10.85

* SUTN2009-122 12/02/2009

	Rates	Fringes
ELECTRICIAN.....	\$ 20.06	0.00
LABORER: Common or General.....	\$ 9.05	1.57
LABORER: Flagger.....	\$ 10.50	0.00
LABORER: Pipelayer.....	\$ 12.59	0.00
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 16.76	0.00
TRUCK DRIVER: Dump Truck.....	\$ 11.61	0.81

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification

and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010

08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

BID FORM

- An Individual ()
- A Partnership ()
- A Corporation ()
- A Limited Liability Company ()

Date _____

1. BID for the construction of Contract 18-04 – Water Treatment Plant Renovation.

TO HUMBOLDT UTILITIES:

I / WE

Name of Bidder

Address of Bidder

The undersigned, as Bidder, proposes to furnish all necessary labor, machinery, tools, apparatus, materials, equipment, service and other necessary supplies, in strict accordance with the terms and conditions of the Detailed Specifications and Contract Documents bound into the PROJECT MANUAL hereto attached and the Plans referred to herein for the construction of Contract 18-04 – Water Treatment Plant Renovation, and to do such other work incidental thereto as may be ordered by the Engineer, at the lump sum or unit prices listed herein.

2. The Bidder declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the places where the work is to be done; that he has examined the Plans, Detailed Specifications and Contract Documents for the work and has read all addenda furnished prior to the opening of bids; and that he has satisfied himself relative to the work to be performed.
3. The Bidder is required to fill in all blank spaces in the BID FORM for all Schedules. Failure to fill in all blank spaces for lump sum or unit prices in both words and figures may be grounds for declaring a bid irregular.
4. The Bidder agrees that his Bid shall not be withdrawn for a period of 90 calendar days after the scheduled closing time for receiving bids.
5. Bids shall include sales tax and all other applicable taxes, fees or licenses.

BID FORM
3638 - May 2018

6. The lump sum or unit prices shall include all labor, materials, shoring, overhead, profit, insurance, *etc.*, to cover the finished work of the several kinds called for.
7. The Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

8. BID FORM - CONTRACT 18-04 – WATER TREATMENT PLANT
RENOVATION

A. BASE BID - Lump Sum Price

For performing all labor and furnishing all materials and equipment necessary for constructing the water treatment plant renovations shown on the plans and described in the specifications Contract 18-04 – Water Treatment Plant Renovation including all equipment, labor, materials, SCADA system improvements (Pre-Negotiated Price below), incidentals and all other work and appurtenances necessary for completion of work under this Contract as shown on the Plans and/or as specified for the lump sum total bid amount of:

SCADA System Improvements \$59,318.00

TOTAL BASE BID, (\$ _____)

_____ Dollars

_____ Cents

B. ADDITIVE ALTERNATE BID - Lump Sum Price

For performing all labor and furnishing all materials and equipment necessary for demolition of the existing aerator structure including all incidentals and all other work and appurtenances necessary for completion of work under this Contract as shown on the Plans and/or as specified for the lump sum total bid amount of:

TOTAL ALTERNATE BID, (\$ _____)

_____ Dollars

_____ Cents

9. Time of Commencement and Completion

The Bidder further proposes and agrees hereby to commence the work with adequate force and equipment on a date to be specified in a written order of the Engineer, and complete all work within the calendar days shown:

Within 180 consecutive calendar days

10. Liquidated Damages

The Bidder further understands that if the work is not completed within the time specified, that any additional engineering and resident construction observation costs incurred by the Owner due to the Contractor exceeding the time allowed for completion plus other damages, including the Owner's administrative cost, will be deducted on a per calendar day basis from the compensation otherwise due him in accordance with the General Conditions for each day thereafter, Sundays and holidays included, that work remains uncompleted.

Five Hundred (\$500.00) Dollars per calendar day

11. Time Limit for Execution of Documents

The undersigned further agrees that, in case of failure on his part to execute the said Contract and the Bond(s) within fourteen (14) consecutive calendar days after written notice being given of the award of the Contract, the check or bid bond accompanying this bid and the monies payable thereon shall be paid into the funds of Humboldt Utilities as liquidated damages for such failure; otherwise the check or bid bond accompanying this BID FORM shall be returned to the undersigned.

12. Bid Guaranty

Attached hereto is a certified check on the _____
Bank of _____ or a Bid Bond on the form
provided for the sum of _____ Dollars (\$_____) made
payable to Humboldt Utilities to insure that the Contractor will execute the
Construction Contract and the Contract Bonds.

13. Interested Parties

The undersigned, as Bidder, hereby declares that the only person or persons interested in the BID FORM as principal or principals is or are named herein, and that no other person herein mentioned has any interest in this BID FORM or in the Contract to be entered into; that this BID FORM is made without connection with any other person, company, or parties making a bid or proposal and that it is in all respects fair and in good faith without collusion or fraud.

BID FORM
3638 - May 2018

NAME

ADDRESS

14. Addenda

I hereby certify that I have received, read and examined the following numbered Addenda: _____, _____, _____, _____, _____, _____, _____,

15. Drug-Free Workplace Affidavit

The Drug-Free Workplace Affidavit on the following page must be satisfactorily completed in order for the bid to be considered.

16. Illegal Immigrants

The Compliance Certificate relative to Illegal Immigrants which follows must be satisfactorily completed in order for the bid to be considered.

BY: _____
Name of Bidder

Address of Bidder

Signature of Authorized Representative

Title

ATTEST (For Corporations)

(Name)

Title

SUB-SECTION 6-D

PART I – CONTROL AND METERING SYSTEM

GENERAL REQUIREMENTS

**ALL EQUIPMENT LISTED IN THIS SPECIFICATION SECTION IS INCLUDED IN
THE PRE-NEGOTIATED PRICE LISTED ON THE BID FORM**

1. System Integrator - Contractor Relationship

The control and monitoring system, also referred to as Supervisory Control And Data Acquisition system (SCADA), shall be an integrated system and shall be furnished by a single approved System Integrator who shall provide all of the instruments, equipment, coordination, and appurtenances regardless of manufacture, and who shall be responsible to the Contractor who, in turn, is responsible to the Owner for the complete and satisfactory operation of the entire system. The System Integrator shall supply all devices and appurtenances necessary to provide a complete, operable and satisfactory system as indicated or specified.

The Contractor shall be responsible for completeness and coordination, particularly between the Electrical Subcontractor and the Systems Integrator. All conduits and wiring between panels, field mounted devices, instrumentation and power sources shall be furnished and installed under Section 7. Electrical Work or as shown on the Plans.

The Systems Integrator shall design and furnish a complete, integrated and functionally operating system; warranted to perform the intended functions as herein specified. **Any services required for design shall be part of the Systems Integrator's scope of work.**

The Systems Integrator shall examine the Electrical Plans and Section 7. Electrical Work of these specifications, and shall report any deficiencies or additional requirements with the Pre-Bid submittal.

The Systems Integrator shall provide or supply all hardware and software specified herein or required and shall provide all required and specified collateral services in connection with the system such as testing, calibration, start-up, operation and maintenance manuals, troubleshooting guide, and extensive operator training as a part of this contract.

2. Pre-Approved System Integrators

Humboldt Utilities currently utilizes a SCADA system by Instrument & Supply on their water and wastewater systems. With staff that is cross trained between the

Detailed Specifications
3638 – May 2018

water and sewer systems, for continuity, the SCADA system modifications for the water plant will be provided by:

- Instrument & Supply

Hot Springs, AR 71902
(501)-321-5562

3. Scope of Work

The System Integrator shall examine the electrical plans and Section 7, Electrical Work, and shall report any deficiencies or additional requirements.

The work to be performed under this Sub-Section of these Detailed Specifications consists of removing, modifying, and/or interfacing to the existing system at remote locations; and furnishing and installing, testing, start-up, security usernames and passcodes for each operator to “log-in”, training all operators, adjusting the existing Personal Computer (PC)-based Supervisory Control and Data Acquisition (SCADA) System for operation, control, monitoring, and data retrieval of information at the existing and proposed systems; furnishing operation and maintenance manuals, troubleshooting guide; together with the necessary appurtenances thereto as specified herein and as indicated on the Plans. These items shall be installed as a complete and operable system in the true intent of these Detailed Specifications and depicted on the Plans.

The SCADA system will communicate by hard wire or fiber. RTU’s will collect local data and communicate with the SCADA system.

The work to be performed under this Sub-Section shall include the complete monitoring of the Humboldt Water Treatment Plant (WTP) and generally consists of the following items to be located and/or furnished as follows:

a. Primary Control and Monitoring Work Station (Water Plant Building)

Modify the existing computer system as needed to incorporate the data from the new equipment and RTU’s, with ancillary hardware and software required, a username and passcode to log-in, pre-installed and tested as necessary to furnish a complete and operable system.

b. Main PLC Control Panel

Modify the existing Main Control Panel as required to incorporate the new equipment being installed within the water treatment plant.

c. Water Booster Station Remote I/O Panel

Supply a remote I/O panel in a stand-alone NEMA 4X stainless steel enclosure to house: one remote I/O device, power supplies, Operator

Interface Terminal (OIT) device, fiber optic breakout box, fiber optic Ethernet switch, and other ancillary items necessary to furnish a complete and operable system.

This remote I/O panel shall be provisioned to monitor and control discrete inputs, relay outputs, and analog 4-20 mA inputs and outputs as shown in the I/O list.

d. Elevated Water Storage Tank Remote I/O Panel

Supply a remote I/O panel in a stand-alone NEMA 4X stainless steel enclosure to house: one remote I/O device, power supplies, Operator Interface Terminal (OIT) device, fiber optic breakout box, fiber optic Ethernet switch, and other ancillary items necessary to furnish a complete and operable system.

This remote I/O panel shall be provisioned to monitor and control discrete inputs, relay outputs, and analog 4-20 mA inputs and outputs as shown in the I/O list.

e. Industrial Park Pumping Station Remote I/O Panel

Supply a remote I/O panel in a stand-alone NEMA 4X stainless steel enclosure to house: one remote I/O device, power supplies, fiber optic breakout box, fiber optic Ethernet switch, and other ancillary items necessary to furnish a complete and operable system.

This remote I/O panel shall be provisioned to monitor and control discrete inputs, relay outputs, and analog 4-20 mA inputs and outputs as shown in the I/O list.

g. Field Mounted Instrumentation and Controls

(1) Main PLC Control Panel

- Interface with the new Water Booster Station remote I/O panel.
- Interface with the new Elevated Water Storage Tank remote I/O panel
- Interface with new raw water well
- Interface with new aerators (2)
- Interface with new chemical feed pumps (5)
- Interfacing with new variable frequency drives for two high service pumps
- Interfacing with new chlorine analyzer
- Interfacing with new effluent flowmeter

(2) Water Booster Station Remote I/O Panel

- One (1) Temperature Sensor
- Interface with the Elevated Storage Tank Remote I/O Panel
- Interface with the Water Booster Station control panel
- Interface with flowmeter

(3) Elevated Water Storage Tank Remote I/O Panel

- Interface with new pressure sensor
- Interface with new Water Booster Station Remote I/O Panel

(4) Industrial Park Pumping Station Remote I/O Panel

- Interface with new pumping station control panel
- Interface with new Water Booster Station Remote I/O Panel

4. General Plant Operation Description

a. General

The purpose of this paragraph is to generally describe the proposed operation of the Humboldt Water Treatment Plant. It is not intended to cover every detail and device required to operate the water treatment plant. It is the Contractor's and Systems Integrator's responsibility to provide a complete and functioning system including furnishing, installing, monitoring, and controlling all devices which are required.

b. Raw Water Supply Wells

The raw water wells will be automatically called when the clearwell reaches an operator set level. The raw water wells pump raw water from the aquifer into the water treatment plant.

c. Aerators

The induced draft aerators are the first step of water treatment. When a well is on the aerators will be turned on energizing the fan to create the required up draft in the aerators.

d. Chemical Feed Systems

The chemical feed pumps dose the required liquid chemicals for treatment. There are three chemicals used at the water treatment plant. These will be flow paced based on the existing parshall flume flow meter.

e. High Service Pumps

As the existing elevated tanks reach an operator set level, the system calls for high service pumps to supply water to the distribution system and fill the elevated tanks. The high service pumps are controlled by variable frequency drives.

f. Industrial Park Elevated Water Storage Tank

This tank will provide water to the industrial park. This tank will also control the water booster station based on operator set levels.

g. Water Booster Station

The water booster station will pump water from the distribution system to the new elevated water storage tank. The pumps will be driven by variable frequency drives based on data from the elevated water storage tank.

5. Completeness and Responsibility

The work includes, but is not necessarily limited to, the following:

- a. All personal computer hardware, programmable logic controllers (PLCs), instruments, and other appurtenances as indicated and specified herein and as required by the process flow and instrumentation descriptions.
- b. All technical design, hardware and software development, installation, start-up, calibration services and supervision necessary to provide a complete operable system.
- c. Testing and operational demonstrations.
- d. Training programs as specified.
- e. Preparation of instruction manuals.
- f. Preparation of record prints.

All instrument components and control devices incorporated in this project shall be the product of and furnished by manufacturers who are regularly engaged in

the production of such equipment for wastewater treatment plant service. The entire control system shall be furnished by the System-Integrator who shall perform all systems design, prepare all necessary internal and external SCADA control wiring and assume full responsibility for the successful functional operation of the equipment and the system in accordance with the performance requirements of the Specifications.

Functional requirements of the various aspects of the control system are described hereinafter. It is the intent of these Specifications that the system be complete in every detail and fully operable.

The Contractor shall refer to other Sections of these Detailed Specifications, particularly the general requirements of Section 6 to avoid duplication or omission. All electrical wiring shall be in accordance with approved detailed diagrams and drawings which shall be furnished as part of the shop drawings and in accordance with Section 7. Electrical Work.

6. General Requirements

- a. The Contractor shall be responsible for completeness and coordination, particularly between the Electrical Subcontractor and the System-Integrator. All conduits and wiring between panels, field mounted devices, instrumentation and power sources shall be furnished and installed under Section 7. Electrical Work or as shown on the Plans.

The Contractor shall assume the responsibility for acquiring the continuity of satisfactory field service representative(s) from the System Integrator and the Electrical Subcontractor.

- b. The Contractor shall coordinate the work of the System-Integrator's service personnel during construction, testing, calibration and acceptance of the instruments.
- c. The supervisory service by the System-Integrator of specially trained service person(s) who is specifically trained on the type of system and equipment herein specified shall be provided intermittently during construction to assist the Contractor. Upon completion of the installation, the services of the above serviceman shall be provided for calibration and start up of the equipment and instructing the Owner's operating personnel.
- d. All equipment shall be checked and recalibrated during the first year of operation by the System-Integrator at intervals of three (3) months for a period of not less than one (1) day or as may be required to correct any defects to the satisfaction of the Owner; total of three recalibrations required.

Detailed Specifications
3638 – May 2018

All services described above shall be included in the Contractor's bid.

- e. Submissions of shop drawings for approval shall include (1) component manufacturer's data sheet indicating pertinent data and identifying each component by item number and nomenclature, (2) component drawing showing dimensions, mounting and external connection details, and (3) a system piping schematic and/or wiring schematic on a single drawing with full description of operation. Component identification on the schematic shall be as indicated herein.
- f. Following approval of shop drawings, the System-Integrator shall be responsible for preparation of a minimum of five (5) conformed sets of shop drawings for distribution.
- g. All material submitted for approval should be contained in one (1) submission.
- h. After completion and testing the System-Integrator's Operating Instructions shall incorporate a functional description of the entire system including the system schematics which reflect "as-built" modifications. Special maintenance and/or trouble-shooting requirements peculiar to the system shall be clearly defined along with special calibration and test procedures.
- i. The System-Integrator shall furnish a kit containing any special sizes and types of tools, which are necessary for assembling, disassembling, aligning and calibrating the equipment.
- j. All components of the equipment shall be the latest proven designs. Specifications and drawings call attention to certain features, but do not propose to cover all details entering into the design of the system. The completed system shall be compatible with other equipment furnished by the Contractor.
- k. All electrical components of the system shall operate on 120 volt, single-phase, 60 hertz current, except as otherwise noted on the Plans or in the Specifications.
- l. All controls for remote electrically operated or motor-driven equipment shall be complete, including all necessary auxiliary relays so as to require only wiring and connections to the equipment control circuit. All contacts for control of remote motor-operated or electrically-operated equipment shall be rated not less than 10 amperes on 120 volts unless otherwise specified herein.

Detailed Specifications
3638 – May 2018

- m. Control wiring for remote-operated motors shall be as shown on the Plans. The System Integrator shall check the Electrical Plans for completeness and advise of any conflicts.
- n. Signal wiring shall consist of a twisted pair, shielded cable, in separate conduit.
- o. All necessary fuses or switches required shall be provided. All instruments requiring an internal power supply shall have an internal ON-OFF switch.
- p. The drawings and Specifications indicate the energy sources that will be provided. Any other devices necessary to obtain proper operation of the system from these energy sources shall be furnished with the instrumentation.
- q. All differential sensing devices, such as flow transmitters, shall have a brass or bronze bypass valve and manifold with the device or other approved method of zeroing the instrument.
- r. All components shall be tagged with the same number and nomenclature given in the Specifications, such tags shall be of permanent materials, such as clearly engraved heavy plastic, clearly identifying the component.
- s. The System Integrator shall supply all relays and auxiliary contacts necessary for connection to new or existing equipment.

7. Quality Standards

a. General

All electronic control equipment shall be the product of designs and manufacturing techniques consistent with standards prevalent in the electronics and instrument industries. Reference to industry standards are for the purpose of establishing a level of quality acceptable to the Engineer and as a guide for equipment manufacturers in meeting that level.

b. Computer Programs

The Owner shall be furnished all passwords and two (2) paper sets and one digital PDF set of an Operating Manual which shall include troubleshooting and correction measures for routine problems.

c. Circuitry and Circuit Modules

Electronic equipment shall employ solid-state circuitry, modularized, and with a minimum of mechanical and electro-mechanical components

involved in the generation, conversion, transmission, and reception of data acquisition and control signals or in the development of mathematical functions.

Printed circuits shall be glass-epoxy base materials meeting or exceeding the requirements designated G-10 by the Institute of Printed Circuits. Layout of circuitry shall be in accordance with the guidelines and specifications of the Institute of Printed Circuits. Circuit board contact fingers and contacts in mating connectors shall be gold-plated. A moisture and fungus proofing material shall be applied to all printed circuit sub-assemblies. Circuitry subjected to mechanical shock and vibration shall be encapsulated.

d. Access

Panel board instrument cases shall be constructed to permit all normal inspection and adjustment functions by access from the front, utilizing a slide-out chassis where applicable. A positive latch to prevent unintentional complete removal of the chassis is required.

All circuitry shall be enclosed in a manner designed to prevent electric shock while the chassis is partially removed for normal inspection and adjustment.

e. Materials and Finishes

Panel instrument cases shall be designed and constructed to rely only on the panel for mounting and support and shall not require structural support at the rear.

Materials and finishes shall not be affected by normal ambient temperatures and humidity conditions encountered in service, and shall afford adequate protection against corrosion, dust and admission of foreign matter.

All screws, fasteners and bolts shall be 316 stainless steel. All cases shall be 316 stainless steel; finish as specified under the equipment or in the approved shop drawings.

Each item shall be identified by a machine-engraved lamicoïd nameplate with white letters and/or figures on black background, fastened with two round-head stainless steel or brass screws.

f. One Year Warranty Inspection

Any items rusting or showing fading or deterioration shall be replaced at no cost to the Owner.

g. Colors

Unless specified, colors shall be selected by the Engineer/Owner.

8. Signals

All signals for control and metering systems from transmitters to receiving instruments shall be direct current 4-20 mA. All signal wire shall be in separate conduit and shall be separated from power conduit sufficiently to eliminate induced currents.

9. Field Calibration

All instrumentation shall be calibrated in the presence of the Engineer in accordance with the range and accuracy specified herein. Certified test reports shall be filed with the Contractor and the Engineer.

Process calibration, such as volumetric drawdown tests on flows and level measurements, shall be conducted on all measuring systems as requested by the Engineer.

Note the recalibration intervals required under Paragraph 6.d hereinbefore.

10. Substantial Completion, Quarterly Adjustments and One-Year Warranty

When the Contractor and the System Integrator have all required functions performing as specified, a written request for substantial completion will be entertained by the Engineer. The substantial completion of work under this Section will be considered independent of the general construction work.

The System Integrator shall guarantee the work hereunder for a period of one year after the Engineer approved substantial completion date.

The System Integrator shall make three approximately quarterly calls as set forth in Paragraph 6.d to adjust or repair the equipment and/or programs supplied under this Section and shall be responsible for replacement parts unless said parts are damaged or destroyed by negligence or Acts of God.

In addition to quarterly scheduled visits, the System Integrator shall respond to emergency failures during the warranty period on a two-day response time.

Detailed Specifications
3638 – May 2018

For any service visit during this period, the Contractor and Engineer shall be provided with a written report stating the reason for system or equipment failure and also providing a recommendation to prevent recurrence of similar problems.

At the end of the warranty period, the System Integrator shall offer the Owner, in writing, a maintenance contract for annual maintenance and calibration of the system and for on-demand or emergency services.

NOTE: Part II - CONTROL AND METERING SYSTEM EQUIPMENT beginning on Page DS 6D - 12 delineates the specific items and function of equipment.

SUB-SECTION 11-I

PART II - CONTROL AND METERING SYSTEM
EQUIPMENT

1. General

The Systems Integrator is responsible for supplying the equipment in this section and ensuring its proper operation and functionality.

2. Field Mounted Instrumentation

The following field-mounted instrument shall be supplied. Instruments omitted from this list but specified in other locations, shown on the Plans, or required for a complete and functional system shall be included. All remote outdoor instrument transmitters shall be enclosed in white stainless steel enclosures with aluminum sun shields.

a. Industrial Park Pumping Station

- One (1) Temperature Sensor

b. Water Booster Station

- One (1) Temperature Sensor

3. Temperature Transmitter

A wall-mounted room temperature transmitter shall be provided and mounted in the locations previously mentioned. The transmitter shall be wall-mounted, contain a self-enclosed thin film platinum sensor, and loop-powered 4-20 mA transmitter ranged to accurately transmit room temperature from 20 degrees to 120 degrees F. Unit accuracy shall be 0.2% of span range. The room temperature transmitter shall be Kele Model ST-191E-EMC-XR1 or approved equal.

4. Interconnecting Cables

The System Integrator shall furnish all cables required for interconnections between the computer system and the Touch Screens. The cables shall be installed by the Contractor.

The System Integrator shall furnish all Ethernet cables, associated hubs, or networking equipment. The cables shall be installed by the Contractor. The System Integrator shall provide onsite terminations of all specialty cable.

5. Alarm Notification System

Modify the existing alarm notification system as necessary to incorporate the new equipment and remote I/O panels.

6. Human-Machine Interface (HMI) Software Package

Modify the existing control and instrumentation system human-machine-interface (HMI) software as necessary to incorporate the new equipment and remote I/O panels. As a minimum, the following graphics shall be required:

- a. One (1) screen for each process being monitored or controlled.
- b. Historical trends, capable of viewing each process variable.
- c. Real Time Trend Screens for each process analog signal.
- d. A "Plant Overview" screen
- e. A "System Overview" screen
- f. Utilities screen for system functions such as backup, access to windows file explorer, security configuration etc.
- g. Menu system to allow easy movement between the various graphic displays.
- h. An "Alarm Screen" which shows all signals which are presently in alarm and the status of each (i.e. "Acknowledged" or "Unacknowledged").

7. Human-Machine Interface (HMI) Application Development

It is recognized that the specified HMI package does not inherently contain the functionality required to form a complete control and instrumentation system. It shall be the responsibility of the System Integrator to develop the required functionality of a control and instrumentation system by using the tools provided by the HMI package in conjunction with the tools provided in other specified software such as Microsoft's Excel spreadsheet, Microsoft's Access database, and Microsoft's "Word" word processor, etc.

The developed functionality shall include but not be limited to:

- a. Database entry and all system configuration required for a complete, proper, and operating, monitoring and control system, including control strategy configuration where applicable.

- b. Formatting regular shift, daily, monthly and annual operating performance reports required for system operation.
- c. Configuring a minimum of 25 process full screen graphic displays to depict operational parts of the system. Fully rendered, 3D views shall be created specifically for this project. These renderings shall be created in a 3D modeling and animation package such as 3DS Max by Autodesk or engineer pre-approved equal. All necessary lighting and texture shall be done from within the 3D package in order to provide clear depth of field and shadows to all elements. The 3DS Max source files used to create the 3D rendered HMI screens for this specific project shall be archived on the HMI computer in a clearly marked directory to facilitate future modifications.
- d. Configuring a special multi-page monthly report designed to present monthly operating data in the general format as required by state regulatory agencies.

8. Operator Interface Terminals

- a. An Operator Interface Terminal (OIT) shall be provided at the locations listed below. The programmable Operator Interface Terminals shall be Allen-Bradley 2711P PanelView Plus 7 Performance Series, Full Touch Color Terminals with Ethernet IP communications. OITs shall be 10.4 Inch screen size minimum.
- b. The panel mounted OIT shall be installed at the following locations.
 - 1) Elevated Water Storage Tank remote I/O Panel
 - 2) Water Booster Station remote I/O panel
 - 3) Industrial Park Pumping Station remote I/O panel

9. Fiber-Optic Network and Appurtenances

- a. Each remote I/O panel shall contain a suitable fiber-optic breakout box. The breakout box or enclosure shall be wall or panel mountable and specifically designed to provide protection and strain relief for fibers terminated within the enclosure. Terminations shall be made with ST or LC type connectors. Suitable fiber-optic enclosures shall be supplied by Corning.
- b. Each remote I/O panel on the fiber-optic network shall contain a fiber-optic industrial Ethernet switch. Panel mounted fiber-optic Ethernet switches shall be of the industrial type rugged design suitable for harsh environments. Switches shall be in one panel mountable enclosure. An

RS-232 port shall be integrally provided with switch to facilitate configuration and management of the switch. Each fiber-optic switch shall provide IGMP snooping capability that will allow forward and filtering of UDP multicast traffic intelligently. Fiber-optic industrial Ethernet switches shall be N-Tron, Stratix or approved equal.

10. Programmable Logic Controllers (PLC's)

This Section specifies the requirements for furnishing, installing, connecting, and testing the Programmable Logic Controller (PLC) System. All PLC's shall be Allen Bradley.

a. General

The programmable logic controller (PLC) shall include but not to be limited to: a processor module (CPU), power supply, software for applications programming, operator interface system diagnostics, communications, data acquisition, and module racks. The PLC shall collect data, process control functions, communicate with other PLCs, distribute process information along the data highway, and may have their program downloaded from programmer's terminal, and be locally programmed from a portable programmer. The PLC shall have provisions for communicating unsolicited messages (report by exception) to an operator interface to reduce network traffic.

The PLC system shall be furnished by a single vendor who has actively been manufacturing programmable logic controllers of the required specified capabilities and whose products have operated successfully for a period of at least eight years. All PLC equipment shall be UL listed.

b. Construction

The programmable logic controller and operator workstation shall be designed, manufactured and tested to the latest applicable NEMA, IEC, ANSI, and IEEE standards.

1) The programmable logic controller shall meet or exceed the following industry standard specifications:

(a) RFI/EMI Susceptibility: MIL STD 461B CS02

(b) Showering Arc Test: NEMA Pub No ICS2-230.42

(c) Surge Withstand: ANSI C37.90a-1974 and IEEE C37.90.1-2012

2) The PLC and operator workstation shall be solid state, modular, and field expandable design allowing the system to be tailored to meet the application- The design shall have the capacity to allow

for the expansion of the system by the addition of hardware and/or software.

- 3) Modules shall be plugged into a chassis, which restricts installation in only one direction and prohibits upside down insertion of the modules as well. The chassis and modules shall be keyed to safeguard against the insertion of a module into the wrong slot. The chassis shall be mounted on a rack or panel.
- 4) The PLC and all of its components shall be capable of operating in an ambient temperature of 0 to 60 degrees Celsius (32 to 140 degrees Fahrenheit) and shall function continuously in the relative humidity range of 0-95 percent non-condensing.
- 5) Each PLC system shall include, but not be limited to, the following:
 - (a) I/O chassis
 - (b) Local I/O modules
 - (c) Power Supply
 - (d) Cables
- 6) The PLC system shall be designed with local I/O Modules, located in the same enclosure of PLC's, to perform all the functions as outlined in this Section Alternatively, a Ethernet communication port with a minimum of 10/100 Megabit data rate shall be provided in each PLC and/or remote I/O rack in each auxiliary cubicle. Each unit shall be capable of handling the required number of process inputs and outputs as tabulated on the Loop Diagrams, plus 15 percent active spares, plus capacity to accommodate 20 percent future inputs and outputs by the addition of the required circuit cards. Each PLC shall have one dedicated serial port built in to the CPU that supports RS-232-C, RS-422, and RS-485 signals. The PLC shall be capable of stand-alone operation in the event of a communication link failure.
- 7) All system modules, main and-expansion chassis shall be designed to provide for free airflow convection cooling. No internal fans or other means of cooling, except heat sinks, shall be permitted.
- 8) All wiring shall be neatly installed and wire ways shall be used wherever possible. All wiring shall be identified at both ends by wire markers. Nameplates shall be provided for each module, device and equipment with appropriate data such as equipment number, rating, serial number, and manufacturer.

c. Central Processing Unit (CPU)

- 1) The CPU shall be RISC class microprocessor based with a minimum of 1.5M bytes RAM memory, or approved equal. The CPU shall read the inputs, perform all system logic, conduct on-line diagnostics, and control the outputs. Diagnostics shall include memory checks, communications monitoring, I/O bus monitoring, watchdog timing, and user program validation. If an I/O module fault is detected, the processor shall turn off the affected module. The CPU shall be available with conformal coating for harsh environment applications. The CPU shall be a self-contained unit, and shall provide ladder rung program execution and support remote or local programming. The CPU shall provide I/O scanning and inter-processor and peripheral communication functions. The CPU shall give visual indication by illuminating an indicator when no fault is detected and an indicator when a fault is detected.
- 2) The main CPU front panel shall include a connector that provides inter-processor communication to other PLCs in the system and to peripheral support devices.
- 3) The main CPU front panel shall include a connector that provides communications to remote I/O locations. The connector shall support communication to as many as 31 remote I/O locations, up to 15,000 cable feet away, and at no less than 1 Mbaud.
- 4) The main chassis front panel shall include, but not be limited to the following:
 - (a) Program or Run mode of the CPU
 - (b) The run/fault status of the CPU
 - (c) State of the I/O adapters
 - (d) Battery Condition
 - (e) If a remote device is communicating via the inter-processor communications link.
- 5) A minimum of 1536 Kbytes words (16 bit) of internal, solid-state RAM memory shall be provided for storage of the control program. The full memory of the CPU shall be usable for program or data storage. Program back up shall be battery backed RAM or non-volatile 64 Mbyte compact flash memory card.
- 6) Program functions shall include standard functions: contacts, coils, timers, counters, math functions, (add, subtract, multiply, divide) shift registers, bit, and word operations; and advanced functions: floating point math calculations including integer to floating point

conversion; floating point to integer conversion, add, subtract, multiply, divide, square root, compare, and trigonometric functions.

- 7) Program functions shall include PID closed loop and cascaded PID loop control. The PID loop shall perform:
 - (a) Output tracking for bumpless transfer between auto and manual mode.
 - (b) Reset windup limiting.
 - (c) Process variable alarming
 - (d) Output preloading or bias.
 - (e) Adjustable rate filtering.
 - (f) Adjustable solution time base of 0.1 to 20.0 seconds.
- 8) The CPU shall include an integral real-time clock, backed up by an internal lithium or long term type battery, which can be accessed from the control program. The clock shall include functions for time of day (year, month, day, hour, minute, second, and day of the week), alarm, and operation hours counter. The CPU shall permit changing ladder program and data values while running. The CPU shall permit the addition of application specific instructions, created in a high level language, to augment the standard instruction set.

d. Power Supply

The programmable controller shall operate in compliance with a nominal electrical service of 100 to 276 VAC, single phase, and in the frequency range from 47 to 63 Hz. The manufacturer shall provide a PLC power supply capable of converting 120 volts ac line power, or 24 vdc, to the dc power required to operate the programmable controller system.

e. Input and Output Modules

- 1) Provide 25 percent spare modules of each type.
- 2) All field wiring shall be to a removable terminal block which will permit prewiring of the module, or removal and replacement of a module without disturbing the field wiring or any other I/O modules. All I/O modules shall be firmly attached to the I/O chassis. All I/O modules shall be available with conformal coating for harsh environment applications.

Detailed Specifications
3638 – May 2018

- 3) All discrete I/O wiring shall be minimum No 14 AWG, RHW-2, 600 volt.
- 4) All modules shall be enclosed in rugged plastic or metallic housings.
- 5) All modules shall conform to ANSI C37.90a-1974 and IEEE C37.90.1-2012 Standard surge withstand capability.
- 6) Input and output modules shall have faceplates that shall be marked or labeled in accordance with the Contract Drawings.
- 7) All digital input and output modules shall be 24 volts DC have 16 or 32 circuits per module.
- 8) Inputs shall be optically isolated to protect bus circuits from transients and surges. Light emitting diodes, one adjacent to each pair of input terminals shall be provided to indicate a closed contact, conducting transistor switch; a low positive logic level, or AC line voltage on conditions.
- 9) All DC output circuits shall incorporate reverse voltage protection and AC output circuits shall include fuses. Dry contact output contacts shall be rated for 2 amperes at 120 volts AC minimum. Isolation resistance shall be 1000 ohms minimum at 300 volts DC between any set of field terminals and any other set or earth ground. Isolation voltage shall be 1500 VAC rms. minimum between any set field terminals and any other set or earth ground. Light emitting diodes shall be provided adjacent to each pair of output terminals for on status indication.
- 10) The analog input modules shall have a maximum of eight isolated differential channels per module and shall accept 4-20 mADC, 1-5 volts DC, Thermocouple, RTD, 0-10 volts DC, and pulse frequency inputs from field mounted transmitters. Common mode input protection of 30 volts DC minimum shall be provided. Input signal conversion shall be a minimum of 14-bit resolution.
- 11) Analog output modules shall have a maximum of eight isolated differential channels per module and shall convert 12-bit (11-data bits plus one-sign bit) data words into proportional, isolated 4-20 mA DC analog output signal. Output load drive capability shall be 750 ohms minimum for each output. Accuracy shall be 0.1 percent of full-scale output span. Analog output modules shall be

Detailed Specifications
3638 – May 2018

selectable on a point per point basis to either hold the last state or to return to zero upon reset or stop of the programmable controller.

11. Input and Output List

Only the new points are listed below.

Humboldt Water Treatment Plant				
I/O list	DI	DO	AI	AO
Water Plant Main PLC Control Panel (Existing)				
New Raw Water Well – Running	1			
New Raw Water Well – Fault	1			
New Raw Water Well – Start/Stop		1		
Aerator No. 1 - Operating	1			
Aerator No. 1 - Start/Stop		1		
Aerator No. 1 - Fault	1			
Aerator No. 2 - Operating	1			
Aerator No. 2 - Start/Stop		1		
Aerator No. 2 -Fault	1			
Hypochlorite Chemical Feed Pump No. 1 Operating	1			
Hypochlorite Chemical Feed Pump No. 1 Start / Stop		1		
Hypochlorite Chemical Feed Pump No. 1 Speed Input			1	
Hypochlorite Chemical Feed Pump No. 1 Speed Output				1
Hypochlorite Chemical Feed Pump No. 1 Fault	1			
Hypochlorite Chemical Feed Pump No. 2 Operating	1			
Hypochlorite Chemical Feed Pump No. 2 Start / Stop		1		
Hypochlorite Chemical Feed Pump No. 2 Speed Input			1	
Hypochlorite Chemical Feed Pump No. 2 Speed Output				1
Hypochlorite Chemical Feed Pump No. 2 Fault	1			
Caustic Chemical Feed Pump No. 1 Operating	1			
Caustic Chemical Feed Pump No. 1 Start / Stop		1		
Caustic Chemical Feed Pump No. 1 Speed Input			1	
Caustic Chemical Feed Pump No. 1 Speed Output				1
Caustic Chemical Feed Pump No. 1 Fault	1			
Caustic Chemical Feed Pump No. 2 Operating	1			
Caustic Chemical Feed Pump No. 2 Start / Stop		1		
Caustic Chemical Feed Pump No. 2 Speed Input			1	
Caustic Chemical Feed Pump No. 2 Speed Output				1
Caustic Chemical Feed Pump No. 2 Fault	1			

Detailed Specifications
3638 – May 2018

Humboldt Water Treatment Plant				
I/O list	DI	DO	AI	AO
Fluoride Chemical Feed Pump No. 1 Operating	1			
Fluoride Chemical Feed Pump No. 1 Start / Stop		1		
Fluoride Chemical Feed Pump No. 1 Speed Input			1	
Fluoride Chemical Feed Pump No. 1 Speed Output				1
Fluoride Chemical Feed Pump No. 1 Fault	1			
High Service Pump No. 3 – Running	1			
High Service Pump No. 3 – Start / Stop		1		
High Service Pump No. 3 – Speed Input			1	
High Service Pump No. 3 – Speed Output				1
High Service Pump No. 3 – Fault	1			
High Service Pump No. 4 – Running	1			
High Service Pump No. 4 – Start / Stop		1		
High Service Pump No. 4 – Speed Input			1	
High Service Pump No. 4 – Speed Output				1
High Service Pump No. 4 – Fault	1			
Effluent Flowmeter			1	
Chlorine Analyzer			1	
Water Booster Station Remote I/O Panel (Integrator)				
Integrate with Water Booster Station Control Panel (by Manufacturer)				
Influent Pressure			1	
Effluent Pressure			1	
Temperature Sensor			1	
Flow Meter			1	
Elevated Tank Level (from remote I/O)			1	
Pump No. 1 – Running	1			
Pump No. 1 – Start/Stop		1		
Pump No. 1 – Speed Input			1	
Pump No. 1 – Speed Output				1
Pump No. 1 - Fault	1			
Pump No. 2 – Running	1			
Pump No. 2 – Start/Stop		1		
Pump No. 2 – Speed Input			1	
Pump No. 2 – Speed Output				1
Pump No. 2 - Fault	1			

Detailed Specifications
3638 – May 2018

Humboldt Water Treatment Plant I/O list	<u>DI</u>	<u>DO</u>	<u>AI</u>	<u>AO</u>
Elevated Water Storage Tank Remote I/O Panel (Integrator)				
Tank Level			1	
Industrial Park Pumping Station Remote I/O Panel (Integrator)				
Temperature Sensor			1	
Wetwell Level			1	
Pump No. 1 – Running	1			
Pump No. 1 – Start/Stop		1		
Pump No. 1 – Speed Input			1	
Pump No. 1 – Speed Output				1
Pump No. 1 - Fault	1			
Pump No. 2 – Running	1			
Pump No. 2 – Start/Stop		1		
Pump No. 2 – Speed Input			1	
Pump No. 2 – Speed Output				1
Pump No. 2 - Fault	1			

12. PLC Programming

- A. The programming format shall be traditional relay ladder diagram.
- B. It shall be possible to program a maximum instruction matrix of eleven wide by seven deep containing as many as 70 examine instructions.
- C. The capability shall exist to change a contact from normally open to normally closed, add instructions, change addresses, etc. It shall not be necessary to delete and re-program the entire rung.
- D. It shall be possible to insert relay ladder diagram rungs anywhere in the program, even between existing rungs, in so far as there is accommodated these additions.
- E. Timer instructions shall include selectable time bases in increments of 1.0 second and 10 milliseconds. The timing range of each timer shall be from 0 to 65,535 increments. It shall be possible to program and display separately the timer's preset and accumulated values.
- F. The programmable controller shall store data in the following formats:
 - (a) Single integer numbers ranging from 0 to 65, 535.
 - (b) Floating point numbers conforming to IEEE floating point format

- (c) Decimal numbers ranging from 0 to 9,999
- G. At the request of the programmer, data contained in system memory shall be displayed on the CRT programming panel. This monitoring feature shall be provided for input/output status, timer/counter data, files, and system status. Ladder logic rungs shall be displayed on the CRT with rung numbers in sequential order.
- H. The system shall have the capability to enter address comments and symbols.
- I. The programming software shall also provide the following functions:
- (a) Full on-line and off line capabilities from one integrated software package.
 - (b) Hot Keys: Keys for short cut to software functions.
 - (c) File Management: Create, Delete, rename, and merge program files.
 - (d) Memory Map: Display processor memory usage.
 - (e) Data Monitor: Display the content of data files.
 - (f) Save & Restore: Save processor memory files to disk; restore processor memory files from disk.
 - (g) I/O Configuration: Configure intelligent I/O modules.
 - (h) General Utility: Display general system information and clear faults.
 - (i) Forcing: Force I/O on and off.
 - (j) Import & Export: Convert database files (which contain symbols, rung comments, instruction comments, and address comments) and processor memory files to ASCII and from ASCII to the programming software.
 - (k) Display I/O module health status.
 - (l) Password Protection: Allow up to eight password protected levels of functionality with each level increasing the capability to monitor, troubleshoot, and program.

- (m) The programming software shall reside in the operator workstation(s) or portable programming unit.
- (n) The referenced programming software shall be Allen-Bradley RSLogix5000 or approved equal.

J. PLC Configuration

The following Allen-Bradley CompactLogix Series components are set forth as a standard of quality.

- 1) Central Processing Unit: 1769-L35E CPU, 1.5MB User Memory, Compact Flash, Ethernet/IP, Serial RS-232
- 2) Digital Input Module: 1769-IQ16, 16 Point, 24 VDC Discrete Input Module
- 3) Digital Output Module: 1769-OW16, 16 Point, Relay Discrete Output Module
- 4) Analog Input Module: 1769-IF8, 8 Point, Analog 4-20mA Input Module
- 5) Analog Output Module: 1769-OF4CI, 4 Point, Analog 4-20mA Output Module
