SECTION 11395

ULTRAVIOLET DISINFECTION SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section covers the work necessary to procure, furnish and install, a complete, Trojan Technologies Inc., Trojan UV 3000 Plus ultraviolet (UV) disinfection system for use in disinfecting effluent at Williams WWTP.

B. Trojan Technologies Inc. shall provide personnel to certify proper installation by the Contractor, start-up and testing of the equipment, and training of the plant staff on the operation of the equipment as outlined in this Section.

1.2 SCOPE

A. The UV system shall be designed to disinfect a peak flow of 2.32 Mgal/day of filtered effluent in 2 channels. The UV system shall be a low pressure, high output, gravity flow system installed in two open channels, complete with cleaning system including all control equipment and accessories as specified herein. Each UV channel shall have a nominal design capacity of 1.16 Mgal/day.

B. The following terms are used consistently throughout this document:

1. Module: One or more UV lamps with a common electrical feed.
2. Bank: One or more UV modules that the entire flow for a given reactor train must pass through.
3. Reactor: An independent combination of single or multiple bank(s) in series with a common mode of failure.

C. Trojan Technologies Inc. Scope of Supply

1. The equipment to be supplied shall be Trojan UV 3000 Plus for the two-channel system with four banks per channel (fifth bank will be installed in the future), shall operate under gravity conditions, and shall include:

a. All required UV modules completely assembled containing lamps, quartz sleeves and electrically wired to each electronic ballast. Modules are shipped with a support rack used for installation of the UV modules in the channels.

1)	Number of lamps	256
2)	Number of operational channels	2
3)	Number of banks per channel	4
4)	Number of modules per bank	4

5) Number of lamps per module 8

b. One System Control Center (SCC) consisting of Allen Bradley Compact Logix Controller with Allen Bradley Operator Interface Panelview 1500+ color touch screen display.

c. Eight (8) Power Distribution Centers (PDC) in Type 4X 304 stainless steel enclosures to distribute power to the UV modules from the electrical service entrance.

d. Two (2) Hydraulic System Center (HSC) in Type 4X 304 stainless steel enclosures with ancillary equipment required to operate the quartz sleeve cleaning system.

e. Eight (8) 304 stainless steel UV module support racks.

f. Two (2) 304 stainless steel Fixed Serpentine Weir.

g. One (1) UV HACH Transmittance Monitor in Type 4X 304 stainless steel enclosures with mounting frame.

h. UV-intensity monitoring sensors (1 sensor per bank). Eight (8) sensors provided.

i. Water Level sensor (1 per channel). Two (2) kits provided.

j. Five (5) sets of Final Operating & Maintenance manuals.

k. Factory test according to Section 11395-2.1D and 11395-2.11.

l. F.O.B. jobsite including packaging of all the components supplied by Trojan Technologies Inc.

m. Manufacturer's field services according to Section 11395-3.1: 3 days for installation assistance, inspection, startup and testing assistance: 1 days for training.

n. Spare parts according to Section 11395-2.8 as far as applicable:

1) 10% of total furnished lamps: 26 lamps,

2) 5% of total furnished electronic ballasts: 7 ballasts,

3) 10% of total furnished quartz sleeves 26 sleeves,

4) 1 UV intensity sensor,

5) 1 Allen Bradley Compact Logix processor with as completed PLC program loaded into EEPROM module.

o. Seismic calculations sealed by a Professional Engineer registered in the State of California as per Section 11395-1. 5 K.

D. Trojan Technologies Terms and Conditions

Contractor shall accept the following terms and conditions of sale:

All purchase orders shall be addressed by the purchaser (the "Customer") to Trojan Technologies Inc. ("Trojan") and shall not be effective until accepted by Trojan. A purchase order accepted by Trojan shall constitute an agreement between Trojan and the Customer, the terms and conditions of which are set out below.

1. CONSTRUCTION AND LEGAL EFFECT

The sale by Trojan to the Customer of the equipment (the "Equipment") listed in the Scope of Supply, as the Scope of Supply is amended by any applicable change order (collectively, the "Scope of Supply") and any services supplied by Trojan in connection therewith (the "Services") will be solely upon the terms and conditions set out herein. These terms and conditions shall supercede all prior agreements and communications, written or oral, with respect to such sale. Any additional or different terms and conditions contained in any purchase order, order acknowledgement or other communication of the Customer, and any waiver or modification of any terms and conditions set out herein, will not be binding on Trojan unless specifically consented to in writing by an authorized representative of Trojan.

2. EQUIPMENT AND SERVICES SUPPLIED

Trojan will supply only the specific Equipment and Services listed in the Scope of Supply. Trojan assumes no responsibility to supply other equipment or services.

3. PRICES

Prices for the Equipment and Services are as specified in the agreement. Installation, maintenance and any other services which relate to the Equipment are not included unless specifically provided for in the Scope of Supply or in these terms and conditions. The amount of any present or future excise, sales, use, value-added or similar tax, duty or other governmental charge applicable to the production, sale, shipment or use of Equipment or Services will be the responsibility of Customer and will be in addition to the prices set out in the agreement unless the Customer provides Trojan with an applicable exemption certificate.

4. PAYMENT

4.1 Unless otherwise noted in the Scope of Supply, 10% of the purchase price for the Equipment is due 30 days after approval of engineering submittals, 80% of the purchase price is due 30 days after the Delivery Date (as defined below) and 10% of the purchase price is due 30 days after the Acceptance Date (as defined below). Notwithstanding the foregoing, Trojan may require cash on delivery, or stop the Equipment in transit, if it has any concern as to Customers ability to make payment or if it otherwise feels insecure.

4.2 Where the Customer is responsible for any delay in shipment by Trojan, the date on which the Equipment is ready for shipment by Trojan may be treated by it as the Delivery Date for purposes of determining the time of payment of the purchase price. In such event, the Equipment ready for shipment shall be held at the cost of the Customer and the Customer will be responsible for reasonable storage and insurance expenses with respect to such Equipment.

5. PACKAGING, SHIPPING, SITE STORAGE AND HANDLING

Unless otherwise specified in writing by the Customer and consented to in writing by an authorized representative of Trojan:

(a) Equipment will be boxed or crated as determined appropriate by Trojan for protection against normal handling and there will be an extra charge to the Customer for additional packaging required by the Customer with respect to waterproofing or other added protection,

(b) the manner and routing of shipments will be at Trojan's discretion,

(c) responsibility for payment of shipping costs to the project site will be as specified in the Scope of Supply,

(d) any insurance to be arranged with respect to shipping of the Equipment will be as specified in the Scope of Supply,

(e) on any shipments F.O.B. Trojan's plant, delivery of Equipment to the initial carrier will constitute delivery to the Customer and Equipment will be shipped at the Customer's risk; any claim of the Customer for loss or damage in transit must be placed with the carrier and pursued by the Customer,

(f) Customer has sole responsibility for off-loading, storage and handling of the Equipment at the project site.

6. DELIVERY

6.1 Trojan will request the Customer to provide it with a firm date for delivery of the Equipment to the project site (the "Delivery Date") which Trojan will then use to establish the production schedule for the Equipment. The Delivery Date will then be binding on the Customer except for any changes made in accordance with the provisions below.

6.2 The Customer can request a rescheduling of the Delivery Date on one occasion only by notifying Trojan in writing not less than four weeks prior to the scheduled Delivery Date. The Customer may request that the Delivery Date be extended by a period up to six weeks, without penalty, but may not request that the Delivery Date be moved forward. The Customer may also request that the Delivery Date be extended beyond a six week period but, Trojan may not agree to such extension, beyond the maximum six week extension period

6.3 Trojan may, in its sole discretion, agree to change the Delivery Date on more than one occasion or if less than four weeks' prior notice is provided of a requested change, but is under no obligation to do so.

6.4 Trojan reserves the right to reschedule the Delivery Date to a date prior to or subsequent to the scheduled Delivery Date in order to accommodate its shipping, production or other requirements. This right to reschedule will be applicable unless otherwise agreed in writing by an authorized officer of Trojan. Trojan will provide the Customer or its representative with a minimum of 24 hours notice of any such rescheduling.

Where any change to the Delivery Date is made at Customer's request, for all purposes with respect to the warranty provided by Trojan in connection with the Equipment, the initial Delivery Date will be considered to be the Delivery Date regardless of any change later made to the Delivery Date.

Where any change to the Delivery Date is made at Customer's request, 60% of the purchase price for the Equipment is due 30 days after the initial Delivery Date, which will be considered to be the Delivery Date regardless of any change later made to the Delivery Date. The remaining payment terms become 20% of the purchase price due 30 days after the actual on-site Delivery Date and 10% of the purchase price is due 30 days after the Acceptance Date (as defined below).

7. CANCELLATION AND RETURN OF EQUIPMENT

The whole or any part of this order for the Equipment may be cancelled only with the prior written consent of Trojan. If Trojan does consent to a cancellation, such consent will be given only upon payment of reasonable cancellation charges in an amount determined by Trojan. In addition, with respect to any Equipment which is returned on a cancellation consented to by Trojan, the Customer will pay Trojan's cost of placing the returned Equipment in a saleable condition, sales expenses incurred by Trojan in connection with such returned Equipment, a reasonable restocking charge and

freight costs incurred in connection with the original shipment and in connection with returning such Equipment to Trojan, all in such amounts as are advised to the Customer by Trojan.

8. ACCEPTANCE

8.1 During the period between the Delivery Date and the Start-up Date, the Customer shall prepare the Equipment and the project site for installation and start-up and, unless otherwise agreed in writing by an authorized representative of Trojan, shall complete acceptance testing with respect to the Equipment. The Equipment shall be deemed to be accepted on the earliest to occur of the following dates (the "Acceptance Date"):

(a) that date on which the Equipment can function in either manual or automatic operation and provide disinfection in accordance with criteria specified in the Scope of Supply, or

(b) 60 days after the Delivery Date.

8.2 All amounts which remain owing by the Customer for the Equipment, including any amount which is specified to be payable on the Acceptance Date, will be paid by the Customer to Trojan within 30 days after the Acceptance Date, unless otherwise agreed in writing by an authorized representative of Trojan.

8.3 Written notification must be given by the Customer to Trojan within seven days after the Acceptance Date listing any outstanding deficiencies with respect to the Equipment and Trojan will use all reasonable efforts to correct such deficiencies promptly.

9. START-UP

9.1 Trojan will request the Customer to provide it with a firm date for start-up of the Equipment (the "Start-Up Date"). Trojan will then schedule its technician to be on-site for the Start-up Date. The Start-up Date is binding except for any changes made in accordance with the provisions below.

9.2 On the Start-up Date, Customer must have the Equipment and site ready as provided in the Installation Preparation Checklist contained in the Contractor Installation Package sent to Customer.

9.3 Customer can request a rescheduling of the Start-up Date by notifying Trojan in writing not less than three weeks prior to the Start-up Date. Customer may request that the Start-up Date be extended, but may not request that the Start-up Date be moved forward. Trojan requires a minimum extension period of two weeks between the existing Start-up Date and the requested new Start-up Date in order to reschedule its technician.

9.4 Trojan may, in its sole discretion, agree to reschedule the Start-up Date where a Customer requests less than a two week extension but is under no obligation to do so. In the event that Trojan does agree to less than a two week extension or that Customer requests more than two changes to the Start-up Date, Customer will be charged an administration fee in an amount determined by Trojan.

9.5 Trojan reserves the right to reschedule the Start-up Date to a date which is prior to or subsequent to the scheduled Start-up Date in order to accommodate its resource availability. This right to reschedule will be applicable unless otherwise agreed in writing by an authorized officer of Trojan. Trojan will provide Customer or its representative with a minimum of 72 hours notice of any such change to the Start-up Date.

9.6 In the event that Trojan's technician arrives at the project site and finds that the Equipment or the project site is not ready for start-up as defined in the Contractor Installation Package, Customer will have the option of either:

(a) provided all amounts then due and payable to Trojan have been paid, issue a purchase order for all costs involved in having Trojan correct the deficiencies, or

(b) have Trojan's technician leave the site and then reschedule the Start-up Date to a date when all deficiencies will be corrected and the Equipment will be ready for start-up as defined in the Contractor Installation Package. If Customer selects this option, the cost of rescheduling will be not less than a minimum amount specified by Trojan, with the final cost being determined by Trojan based on its costs and expenses incurred in connection with the rescheduling.

10. EXCUSABLE DELAYS

Trojan shall not be liable for any failure to meet the Delivery Date or the Start-up Date if such failure is due to a reason beyond its reasonable control including, without limitation, acts or omissions of carriers, labour difficulties, shortages, strikes or work stoppages of any type, fire, accident, explosion, flood, defaults or delays of suppliers, governmental acts or omissions, acts of God, acts of civil or military authorities, incomplete or inaccurate information supplied by Customer or any other cause beyond Trojan's reasonable control. In any such event, the Delivery Date and Start-up Date shall be extended on a day for day basis to the extent of such delay.

11. WARRANTY

11.1 Trojan warrants to the Customer that during the period ending 18 months after the Delivery Date or 12 months after the Start-up Date, whichever occurs first, Equipment which is manufactured by Trojan

will be free from defects in material and workmanship and will function in accordance with the specifications specified in the Scope of Supply.

11.2 This warranty shall not apply to any failure or defect which results from the Equipment not being operated and maintained in strict accordance with instructions specified in Trojan's Operation and Maintenance manual or which results from mishandling, misuse, neglect, improper storage, improper operation of the Equipment with other equipment furnished by the Customer or by other third parties or from defects in designs or specifications furnished by or on behalf of the Customer by a person other than Trojan. In addition, this warranty shall not apply to Equipment that has been altered or repaired after start-up by any one except:

(a) authorized representatives of Trojan, or

(b) Customer acting under specific instructions from Trojan.

11.3 Customer must notify Trojan in writing within 5 days of the date of any Equipment failure. This notification shall include a description of the problem, a copy of the operator's log, a copy of the Customer's maintenance record and any analytical results detailing the problem. If Customer has not maintained the operator's log and maintenance record in the manner directed in the Operation and Maintenance manual, or does not notify Trojan of the problem as specified above, this warranty may, in Trojan's discretion, be invalid.

11.4 Customer will fully cooperate with Trojan, in the manner requested by Trojan, in attempting to diagnose and resolve the problem by way of telephone support. If the problem can be diagnosed by telephone support and a replacement part is required, Trojan will either, at Trojan's expense, ship a repaired, reworked or new part to the Customer who will install such part as directed by Trojan or will direct Customer to acquire, at Trojan's expense, such part from a third party and then install such part as directed by Trojan.

11.5 In the event that Trojan determines that the problem cannot be resolved by way of telephone support and/or shipment by Trojan, or acquisition by the Customer, of a replacement part for installation by the Customer, Trojan will send one or more persons to make an on-site inspection of the problem. If an on-site visit is made, Trojan personnel will

evaluate the problem and repair or replace any Equipment determined to be in breach of this warranty. If the problem is not attributable to a breach of this warranty, Trojan reserves the right to invoice the Customer for this service.

11.6 Components of the Equipment which are manufactured by a third party but furnished to Customer by Trojan are warranted by the original manufacturer, only to the extent of the original manufacturer's warranty, and are not covered by this warranty.

11.7 This warranty is the exclusive remedy of the Customer for all claims based on a failure of or defect in the Equipment, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or fitness for a particular purpose shall apply to the Equipment.

11.8 Lamp warranties, and obligations of Trojan concerning lamp replacements, are set out in separate lamp warranty documents.

12. LIMITATIONS OF LIABILITY

12.1 Trojan does not assume any liability for personal injury or property damage caused by use or misuse of the Equipment. Trojan shall not in any event be liable for special, incidental, indirect or consequential damages including, without limitation, lost profits, lost business opportunities, lost revenue or loss or depreciation of goodwill, even if it has been advised of the possibility thereof. Trojan's liability under the agreement shall, in all instances, be limited to repair or replacement of Equipment in breach of the above warranty and shall not exceed the cost of such repair or replacement. This liability with respect to repair or replacement will terminate upon the expiration date of the above warranty.

12.2 In addition to the foregoing, in no event shall Trojan's liability

under or relating to the agreement exceed that portion of the purchase price actually paid to it.

12.3 This limitation of liability shall survive any termination of this agreement.

13. STATUTORY AND OTHER OBLIGATIONS

Trojan shall not be responsible for verifying that the agreement is in compliance with all applicable laws, ordinances, regulations, codes and orders relating to it and/or the supply of Equipment and Services under it. If the Customer fails to notify Trojan in writing that the agreement or such supply is not in compliance with any applicable law, ordinance, regulation, code or order, the Customer shall be responsible for and hereby agrees to indemnify Trojan against all claims, demands, losses, liabilities, costs and expenses incurred by it as a result of such non-compliance.

14. INSPECTION

Inspection of Equipment by the Customer or its representative at Trojan's plant will be permitted provided that it does not unduly interfere with Trojan's production workflow and that complete details of the desired inspection are provided to Trojan in writing with sufficient advance notice.

15. PATENT INDEMNIFICATION

15.1 Trojan will not be liable with respect to any claim of patent or other intellectual property infringement made regarding any Equipment unless such claim is based on an assertion that Equipment manufactured by Trojan, in the form in which such Equipment is supplied to the Customer, infringes any United States or Canadian patent. Trojan's obligations hereunder shall not apply to Equipment modified, or used in an unauthorized manner, by the Customer or to the extent that infringement arises as a result of combining the Equipment with any other equipment, whether or not supplied by Trojan. Subject to the foregoing, provided that the Customer notifies Trojan promptly in writing of any such claim of infringement and authorizes Trojan to exercise sole control over the defence and/or settlement of any such claim, Trojan will indemnify the Customer against the reasonable expenses of defending such claim as well as any resulting damages finally awarded against Customer or agreed to in any settlement but only up to a maximum amount not exceeding the purchase price actually paid to Trojan for the allegedly infringing Equipment.

15.2 If an injunction is obtained against the further use of allegedly infringing Equipment, Trojan shall, at its option and expense, use its reasonable efforts to:

(a) procure for the Customer the right to continue using the Equipment,

(b) modify the Equipment so that it is no longer infringing,

(c) replace the allegedly infringing Equipment with non-infringing Equipment, or

(d) refund the purchase price paid to Trojan for the Equipment, less reasonable depreciation as determined by Trojan.

15.3 The foregoing provisions constitute Trojan's sole responsibility and liability, and the Customer's sole remedy, with respect to actual or alleged infringement of patents or other intellectual property.

15.4 The Customer hereby agrees to indemnify Trojan against all claims relating to or resulting from any actual or alleged patent infringement by Trojan which arises out of the manufacture and/or supply by Trojan of Equipment manufactured according to a design and/or specifications furnished to Trojan by the Customer or on behalf of the Customer by a person other than Trojan.

16. SPECIAL TOOLS, DIES, JIGS, FIXTURES AND PATTERNS

Any tools, dies, jigs, fixtures, patterns and similar items which are included or required in connection with the manufacture and/or supply of the Equipment will remain the property of Trojan without credit to the Customer. Trojan assumes the cost for maintenance and replacement of such items and shall have the right to discard and scrap any such item after it has been inactive for a minimum of one year, without credit to the Customer.

17. RECORDS, AUDITS & PROPRIETARY DATA

Unless otherwise specifically agreed in writing by an authorized

representative of Trojan, neither the Customer nor any representative of the Customer shall have the right to examine or audit any books,

records or accounts of Trojan or be entitled to, or have control over, any engineering or production prints, drawings or technical data which Trojan, in its sole discretion, considers to be of a confidential nature.

18. ASSIGNMENT

All rights and obligations of Trojan and the Customer will enure to the benefit of and be binding upon their respective successors and permitted assigns. The rights and obligations of Customer hereunder shall not be assignable without the prior written consent of Trojan. All rights and obligations of Trojan may be assigned in whole or in part to any Affiliate or to any person acquiring any assets of Trojan outside the ordinary course of business. An "Affiliate" shall mean any entity which controls, is controlled by or is under common control with Trojan, whether directly or indirectly. Any attempted assignment in violation of the provisions of this section shall be void.

19. CONFIDENTIALITY

19.1 All technical information, specifications, drawings, documentation and knowhow of every kind and description disclosed by Trojan to the Customer and which is identified by Trojan as confidential shall be deemed to constitute "Confidential Information" of Trojan unless such information:

(a) becomes part of the public domain through no fault of the Customer,

(b) is disclosed to the Customer by a third party without breach of any obligation or other restriction,

(c) is known to the Customer at the time of disclosure and has been documented as such, or

(d) is required to be disclosed by legal, judicial or administrative proceeding.

19.2 All Confidential Information shall be owned by, and remain the exclusive property of, Trojan.

19.3 All Confidential Information shall be held in confidence by the Customer and, if in any form of physical media, returned by the Customer to Trojan upon request. The Customer shall not:

(a) reproduce the Confidential Information without the written consent of Trojan, or

(b) use the Confidential Information for any purpose other than in connection with the operation and maintenance of the Equipment.

19.4 The Customer shall be liable for and shall indemnify Trojan against all claims, demands, liabilities, losses, costs and expenses arising from any failure to comply with the terms hereof relating to Confidential Information. The Customer acknowledges that monetary damages may not be adequate in the event of any such failure to comply and that Trojan shall be entitled to injunctive relief in the event of any such non-compliance.

20. GOVERNING LAW

All issues relating to the construction, validity, interpretation, enforcement and performance of this agreement and the rights and obligations of Trojan and the Customer hereunder shall be governed by the laws of the Province of Ontario and the federal laws of Canada applicable therein. Any provisions of the *International Sale of Goods Act* or any convention on contracts for the international sale of goods shall not be applicable to this agreement. The parties submit to and consent to the non-exclusive jurisdiction of courts located in the Province of Ontario.

E. Goods and Services

1. The Manufacturer shall assume all costs and complete responsibilities for the fabrication, assembly, factory testing, integration, specified installation, and start-up of the entire system. In general, the Manufacturer shall provide as a minimum the Product described as follows:

   a. All equipment and support systems necessary to meet this Specification.

   b. Instruction manuals, operating instructions, maintenance manuals, drawings, termination (wire-marking) diagrams, and all other appropriate documentation.

   c. Spare parts.

2. In general, the Manufacturer shall provide as a minimum the services described as follows:

   a. Execution of factory acceptance tests of the equipment.

   b. Complete testing and start-up of all equipment supplied.

   c. Coordination of the work with the Contractor and all subcontractors.

   d. Field testing and other quality assurance requirements.

   e. Proper training of Owner personnel.

   f. Warranty and maintenance.

   g. Other services as defined in the attached Technical Specifications.

3. The agreed upon Product shall be provided within the number of days established by the following schedule:

   a. Accepted equipment submittals within 12 weeks of approved shop drawings by Engineer.

   b. Ship the equipment at the direction of the Contractor.

   c. Installation manuals will be furnished with equipment.

   d. Operation and Maintenance Manuals will be submitted within 60 days prior to start-up.

4. The place where Product is to be delivered (Point of Delivery) is designated as: City of Williams WWTP, Williams, California.

F. Payment and Procedures

1. Payment Terms and Conditions: The Manufacturer's payment terms and conditions have been developed specifically for the UV Disinfection Process Equipment. The payment schedule by Contractor to Manufacturer shall be as follows:

Final approval of submitted complete shop drawings by Engineer and submittal of Payment Request by Manufacturer	(10%)
Delivery of equipment on-site and submittal of Payment Request by Manufacturer	(80%)
Final acceptance by Owner and Engineer after start-up and testing.	(10%)
TOTAL	(100%)

2. Final Payment: Upon completion of installation and final acceptance of all Goods and Services of the Manufacturer, final payment and release of retention funds may be claimed.

1.3 PROCUREMENT PROCEDURES

The Contractor shall enter an agreement with Trojan Technologies to provide all of the materials and services indicated in the above referenced documents. The price for the Trojan Technologies scope of supply as defined in these documents is as indicated in the Trojan Technologies proposal and on the Bid Schedule. No alteration to the Trojan Technologies Scope as defined herein that would result in a reduction in the materials or services to be provided by Trojan Technologies shall be allowed. If the Contractor desires to have Trojan Technologies provide additional materials and/or services, the costs therefore shall be included in the Contractor's Base Bid.

1.4 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Section 11010: General Mechanical Equipment Provisions

B. Section 01300: Submittals

C. Section 03100: Concrete

D. Section 14312: Underhung Single Girder Bridge Crane

E. Division 16: Electrical

1.5 SUBMITTALS

In accordance with Section 01300, submit the following items:

A. Shop Drawings depicting each UV channel configuration and module arrangement. Details of module fabrication, control redundancy elements, controller, lamps and ballasts, including materials of construction and drawings.

B. Detailed specifications, drawings, descriptions, sizes, and catalog information (as applicable) on all equipment provided by manufacturer, including:

1. UV disinfection lamp modules.
2. Low pressure high intensity UV lamps.
3. Quartz sleeves.
4. Water level control devices.
5. Ultrasonic channel level transmitters.
6. Ballasts.
7. Equipment monitoring system, including individual lamp elapsed operating hours timers, on-off lamp cycle counters, UV transmittance monitoring.
8. Continuous UV transmittance monitoring equipment.
9. All control panels and associated instrumentation and control devices to all modules. Details of module and electrical enclosure fabrication, control redundancy elements, controller, lamps and ballasts, including materials of construction and drawings.

10. Power Distribution Center and interconnecting power and data cables to modules.

11. In-channel cleaning system.

12. UV control panel with programmable logic controller and local operator interface (LOI). Complete information on the UV Control System hardware, software, and configuration. PLC Ladder diagrams accompanied by a narrative functional description of the control system programming logic shall be submitted. The Manufacturer shall submit the ladder logic diagrams utilizing AB RS Logix. A narrative functional description shall accompany the ladder diagram describing system operation on a line-by-line basis. LOI graphic screen printouts shall also be submitted for all proposed screens for display.

13. Other required system instrumentation.

14. Complete assembly and installation drawings, schematics, and wiring diagrams, together with detailed specifications and data covering materials used, parts, devices, and other accessories forming a part of the equipment furnished.

15. Electrical schematics, layouts, single-line diagrams, interconnection diagrams, and internal wiring diagrams of the UV system sealed by a licensed Professional Engineer

C. Power consumption calculations of the UV system at 0.5 mgd hydraulic loading, including lamps, ballasts, and controls.

D. Description of installation/ startup services provided by Manufacturer.

E. Nominal lamp life in hours.

F. Design hydraulic gradient through UV system

G. System P&IDs utilizing the equipment and instrument numbering system specific to this plant.

H. I/O list and control descriptions

I. Manufacturer's installation instructions, parts list, and operating and maintenance instructions.

J. Proposed PLC ladder logic program listing and graphic screen printouts submitted for approval.

K. Seismic design calculations and anchorage requirements sealed be a Professional Engineer registered in the State of California.

L. Operation and Maintenance Manuals.

M. Disinfection performance guarantee.

1.6 GUARANTEE

A. Equipment: The equipment furnished under this section will be free of defects in material and workmanship, including damages that may be incurred during shipping for a period of 12 months from date of start-up or 18 months after shipment, which ever comes first.

B. Performance: The UV disinfection equipment Manufacturer shall warranty compliance with the effluent limitations listed herein for a period of two (2) years from startup,

provided: 1) failure to meet effluent quality requirements is not caused by substantial deviations of the constructed facilities from the design recommendations of the Manufacturer, 2) influent flows are less than or equal to the values indicated in Section 2.3 A) failure to meet effluent quality requirements is not caused by wastewater characteristics (e.g. UV transmittance) being substantially different than indicated in Section 2.3 A, 4) failure to meet effluent quality requirements is not due to failure of the Owner to operate and maintain the system in accordance with the manufacturer's recommendations. If the plant should fail to meet effluent quality requirements, except for non-warranted causes as noted, the Owner shall notify the Manufacturer and the Manufacturer shall investigate the problem and develop a corrective plan within two weeks of said notification. If the cause of failure is determined to be non-warranted, the owner shall reimburse the Manufacturer for all reasonable costs of the investigation, otherwise, the Manufacturer shall pay for all modifications to the plant that are required to bring the plant into compliance with the effluent quality requirements.

C. The Manufacturer shall also warranty compliance with the UV Disinfection Guidelines for full-scale system design shall match that of the unit used for reactor validation testing performed for DHS approval. Testing of the full-scale UV disinfection equipment will be performed as a field test per Section 11395-3.2.

D. UV Lamps: The UV lamps to be 100% warranted for a minimum of 9,000 hours when operated in automatic mode. In addition if more than 20% of the lamps fail prior to this warranty Trojan will replace all lamps within the system without cost to the Owner if the system has been operated and maintained per Trojan O&M manual.

E. Ballasts to be warranted for 5 years, prorated after 1 year.

F. The Contractor shall provide a written guarantee that the purchase price of the UV lamps, quartz sleeves, and ballasts shall be linked to the published annual Consumer Price Index for twenty (20) years after the date of completion of work under the general construction contract. The purchase price of lamps at the time of system installation shall be $190.00 per lamp. The purchase price of quartz sleeves at the time of system installation shall be $60.00 per sleeve. The purchase price of ballast shall be $450.00 per ballast.

G. The Owner and the Manufacturer and Contractor agree that all guarantee provisions shall commence upon start-up.

1.7 SUPPLEMENTAL INFORMATION REQUIRED AFTER SYSTEM INSTALLATION AND PRIOR TO ACCEPTANCE OF THE WORK

Manufacturer shall conduct a field commissioning test upon start-up of the facility. The field commissioning test must verify power consumption claims provided by the Manufacturer and proper operation of:

A. Electrical components.

B. Water level.

C. Flow split between reactor channels.

D. Controls and alarms.

E. Instrument calibration and continuation of power usage.

1.8 CONTRACTOR RESPONSIBLE FOR COMPLETE AND OPERABLE SYSTEM

All labor, materials, equipment, appurtenances, and services of any kind, which are not furnished by Trojan but are required to provide a complete and operable system as shown on the drawings and/or specified, shall be furnished by the Contractor.

PART 2 MATERIALS

2.1 GENERAL

A. Manufacturer shall provide entire UV disinfection system including UV modules, hydraulic flow controls, instrumentation and controls, and all accessories required for automatic operation of the UV system.

B. The disinfection system will be hydraulically situated between the Tertiary Filters and the Re-Aeration Basin. The UV system shall consist of low pressure, high output UV lamps grouped into modules and installed in two channels. The Contractor shall construct a concrete basin with two concrete channels, with inlet and outlet chambers to ensure uniform flow as shown on the drawings.

C. The following is a list of components that comprise the UV disinfection system to be furnished and/or designed by the Manufacturer:

1. NEMA 4X, submersible, or wash-resistant, non-corrosive horizontal UV disinfection lamp modules arranged in units to form cohesive UV reactors capable of treating the flow.
2. Low-pressure high intensity UV lamps with quartz sleeves.
3. Water level control devices (Fixed Serpentine Weirs) and channel level transmitters.
4. Flow paced lamp control.
5. Ballasts.
6. Equipment monitoring system, including individual lamp elapsed operating hours timers, and on-off lamp cycle counters.
7. Continuous UV transmittance monitoring.
8. UV control panel with programmable logic controller (PLC), Local Operator controls and displays along with associated, instrumentation and control devices to all modules.
9. Power Distribution Centers, isolation transformer, and interconnecting power and data cables to modules.
10. Channel covers (to be furnished and installed by the Contractor).
11. In-channel lamp cleaning system.

D. The complete UV system shall be factory assembled and tested by operating all lamps, monitoring equipment, and controls prior to shipment. This test may be witnessed by either the City or the Engineer. The Contractor shall inform the Engineer four weeks before the commencement of testing of the date and time of testing. This notification shall also include a submission of all factory test protocols for the Engineer to review. Testing will not commence until Engineer's comments have been addressed. Systems that are not factory assembled and

tested or that require extensive field assembly are not acceptable. During factory testing the entire UV system is to be U.L. tested, approved, and stickered – prior to shipment. Modules, level controllers, UV transmission monitor, etc. are not UL tested.

2.2 MANUFACTURE/SUPPLIER

A. Trojan Technologies, System Trojan UV3000 Plus

B. The physical layout of the system shown on the Drawings and the equipment specified herein are based upon Trojan Technologies', System Trojan UV3000 Plus P.

2.3 DESIGN AND PERFORMANCE REQUIREMENTS

A. The UV equipment shall be designed for the following operating conditions at minimum and peak flow unless otherwise noted.

Peak Design Flow, mgd (Initial/ future)	2.32/ 3.88
Minumum Design Flow, mgd	0.3
5-day BOD_5, mg/L	10
TSS, mg/L maximum	10
Turbidity, NTU	2
Wastewater Temperature Range, °C	15 to 25
Maximum Effluent Total Coliform Bacteria/100 mL	
MPN, 7-day median of last seven consecutive days	2.2
MPN, daily maximum	23
Number of Channels	2
Disinfection Channel Length Each, ft	±70
Disinfection Channel Width Each, in	16
Disinfection Channel Depth Each, in	62
Number of UV Banks per Channel (initial/future)	4/5
Number of UV Modules per Bank	4
Number of UV Lamps per Module	8
Number of Lamps Initially	256
Water Depth, in	32
UV transmittance (at 253.7 nm)	55%
Minimum design UV dose, mJ/cm^2 at maximum flow	100

B. UV equipment shall be installed in two channels as shown on the drawings.

C. Only low pressure high output UV lamps are acceptable.

D. Redundancy shall be provided, such that the peak design flow will receive treatment to comply with the "2.2 seven day median coliform bacteria/100 mL" standard when one bank in each channel is out of service.

E. The UV channel covers shall be furnished and installed by the Contractor such that there shall be no emission of UV light from any of the UV disinfection channels.

2.4 UV SYSTEM CONSTRUCTION

A. General:

1. All welded metal components in contact with effluent shall be Type 316L stainless steel.
2. All metal components above the effluent shall be Type 304 stainless steel with the exception of the ballast enclosure, which shall be constructed of anodised aluminium.
3. All wiring exposed to UV light shall be Teflon™ coated.
4. All wires connecting the lamps to the ballasts shall be enclosed inside the frame of the UV Module and not exposed to the effluent.
5. Flanges and pipe threads shall comply with all applicable codes and standards.

B. Lamp Array Configuration:

1. The lamp array configuration shall be the uniform array with all lamps parallel to each other and to the flow.
2. The system shall be designed for complete immersion of the UV lamps including both electrodes and the full length of the lamp tube in the effluent. Both lamp electrodes shall operate at the same temperature and be cooled by the effluent.

C. UV Module:

1. Each UV module shall consist of UV lamps with an electronic ballast enclosure mounted on a Type 316L stainless steel frame.
2. Each lamp shall be enclosed in its individual quartz sleeve, one end of which shall be closed and the other end sealed by a lamp end seal.
3. The closed end of the quartz sleeve shall be held in place by means of a retaining O-ring. The quartz sleeve shall not come in contact with any steel in the frame.
4. The ends of the lamp sleeve shall not protrude beyond the stainless steel frame of the UV Module.
5. Lamp wires shall terminate in the electronic ballast enclosure located at the top of the UV Module.
6. All lamp to ballast connections shall be made by and tested by the UV Manufacturer.
7. The electronic ballast enclosure shall contain the electronic ballasts and addressable lamp status monitoring systems.
8. Each UV Module shall be connected to a receptacle on the Power Distribution Center by means of a multiconductor cable with a moulded connector.
9. At the point of exit from the UV Module frame the multiconductor cable shall pass through a waterproof strain relief.
10. Each UV module shall have a rating of Type 6P.

D. UV Lamps:

1. Lamps shall be high intensity low pressure amalgam design. The lamp shall be preheated to promote longevity. Lamps that are not amalgam or that are based on driving a low pressure lamp at an amperage greater than 500 milliamps will not be allowed.
2. The filament shall be of the clamped design, significantly rugged to withstand shock and vibration.
3. Electrical connections shall be at one end of the lamp and have four pins, dielectrically tested for 2500 volts.
4. Lamps shall be rated to produce zero levels of ozone.
5. Lamps shall be operated by electronic ballasts with variable output settings.
6. A dual source of supply shall be available for replacement lamps.

E. Lamp End Seal and Lamp Holder:

1. The open end of the lamp sleeve shall be sealed by means of a sleeve nut which threads onto a sleeve cup and compresses the sleeve O-ring.
2. The sleeve nut shall have a knurled surface to allow a handgrip for tightening. The sleeve nut shall not require any tools for removal.
3. The lamp shall be held in place by means of a moulded lampholder that shall incorporate two seals. The lampholder shall incorporate a double seal against the inside of the quartz sleeve to act in series with the external O-ring seal.
4. The second seal on the lampholder shall isolate and seal the lamp from the module frame and all other lamps in the module.
5. In the event of a quartz sleeve fracture the two seals of the lamp holder shall prevent moisture from entering the lamp module frame and the electrical connections to the other lamps in the module.
6. The lampholder shall also incorporate a UV resistant PVC moulded stop that shall prevent the lamp sleeve from touching the steel sleeve cup.

F. UV Lamp Sleeves:

1. Type 214 clear fused quartz circular tubing as manufactured by General Electric or equal.
2. Lamp sleeves shall be domed at one end.
3. The nominal wall thickness shall be 1.5 mm.

G. UV Lamp Module Support Rack:

1. The module support rack shall be Type 304 stainless steel and be suspended above the effluent in the channel by means of slotted angles allowing adjustment to the precise height of the channel and requiring no fastening of the individual UV lamp modules.
2. The module support rack shall be designed so that no ultraviolet light will radiate above the channel when the UV lamp modules are energized and fully immersed in the effluent.

H. Effluent Level Controller:

1. Fixed Serpentine Weir

   a. Located at the discharge end of the UV channel.

   b. Designed to maintain a minimum effluent level, within minimal variations as required to keep lamps submerged.

   c. Constructed of Type 304 stainless steel, and other non-corroding materials.

I. Water Level Sensor:

   1. One water level sensor shall be provided by the UV Manufacturer for each UV channel.

   2. During manual, automatic and remote modes of system operation, the water level sensor shall ensure that lamps extinguish automatically if the water level in the channel drops below an acceptable level.

J. Anchor Bolts: All anchor bolts, nuts, and washers to be provided and installed by the Contractor shall be stainless steel and shall comply with the anchor bolts and expansion anchors section. Tie rod connections will not be permitted. Contractor shall furnish anchor bolts for process equipment per Section 11010. Note requirements in Section 11010 for seismic calculations by registered (California) structural engineer. Seismic calculations are to be provided by the Manufacturer.

K. Fasteners: All bolts, nuts, washers, and other fasteners that are submergered or subject to contact with the liquid shall be Type 316 stainless steel.

L. Edge Grinding: Sharp corners of cut or sheared edges shall be dulled by at least one pass of a power grinder.

M. Surface Preparation: All ferrous metal surfaces, except stainless steel, shall be shop cleaned by sandblasting or equivalent, conforming to the paint manufacturer's recommendation. All mill scale, rust, and contaminants shall be removed before shop primer is applied.

N. Stainless Steel Cleaning: Unless otherwise specified or permitted, items fabricated from stainless steel shall be thoroughly cleaned, degreased, and pickled following fabrication. Pickling shall produce a modest etch and shall remove all embedded iron and heat tint. Pickled surfaces shall be adequately protected during shipping, handling, and installation to prevent contact with iron or steel objects or surfaces. Blast cleaning of stainless steel will not be acceptable.

O. Shop Painting: All ferrous metal surfaces, except stainless steel, shall be shop painted in accordance with the General Mechanical Equipment Provisions.

2.5 CONTROL AND INSTRUMENTATION REQUIREMENTS.

A. System Control Center (SCC):

   1. The operation of the UV3000™Plus is managed at the SCC by a programmable logic controller (PLC) based controller which continuously monitors and controls the system functions. PLC shall be SLC5/05 as manufactured by Allen Bradley.

   2. The System Control Center shall be delivered to the plant site assembled, pre-wired, and factory tested in accordance with applicable electrical codes.

3. The operator interface, display screen, and message keypad shall be menu driven with automatic fault message windows appearing upon alarm conditions. PLC Operator Interface shall be "Panelview 1500+" as Manufactured by Allen Bradley.

4. Keypad shall have a sealed membrane overlay covering all function keys and numerical keys.

5. The PLC with local operator interface (LOI) shall control system modules, without exception. The PLC shall be furnished, with CPU complete with input/output cards, power supplies, programming, all interconnections to the PLC related instrumentation, controls, and panel devices. The PLC shall be capable of monitoring and controlling each individual module and UV bank based on a 4-20 mA signal. The UV system shall be provided with all necessary equipment to allow direct interface and communication with the Plant SCADA system which will operate on an "Ethernet data network".

6. The UV Control Panel shall provide complete operator interface hardwired panel devices and meters to allow manual or automatic control of processors. The minimum functions to be displayed and controlled include:

   a. UV intensity of each bank.

   b. Percent transmittance of the treated fluid.

   c. All alarm conditions.

   d. Individual lamp status, including lamp out indication, for each module.

   e. Flow rate through the channel (signal from remote meter).

   f. Manual, off, or automatic module selector switches for all equipment.

7. Alarms shall be provided to indicate to plant operators that maintenance attention is required or to indicate an extreme alarm condition in which the disinfection performance may be jeopardized. The alarms shall include:

   a. Lamp Failure: Each alarm shall identify the affected lamps by an address system. The address shall specify the bank, module and lamp. i.e. Bank #1A, Module #3, Lamp #2.

   b. Low UV Intensity: Pre-set at 80% of the intensity after 100 hours burn-in of the lamp

   c. Multiple Lamp Failure

   d. Module Communication Alarm

   e. Ballast failure alarm shall indicate the failure of one or more ballasts in a bank of lamps.

   f. Low UV dose delivered alarm.

   g. Low UV transmission alarm.

   h. High and low water level alarms.

   i. All alarm conditions will be displayed locally on UV control panel and graphically on the remote plant SCADA screens.

8. The 70 most recent alarms shall be recorded in an alarm history register and displayed when prompted.

9. Bank status shall be capable of being placed either in Manual, Off or Auto mode.

10. Banks shall be cycled for equal wear and timed off to minimize bank cycling.

11. Elapsed time of each bank shall be recorded and displayed on the display screen when prompted.

12. Panel shall be CSA approved or equivalent, rated Type 4X and be will be located not more than 500 feet from the channel.

13. Digital I/O modules rated for 3 amps shall be provided to remotely indicate status and alarms such as:

    a. Common Major Alarm Condition

    b. Bank Status (one for each UV bank supplied)

    c. Ethernet connection from PLC to plant SCADA if required.

14. The Manufacturer shall provide the PLC ladder logic programs on disks to the City, along with all relevant PLC addresses to enable the SCADA system to monitor the UV system remotely or from a laptop computer utilizing Wonderware graphic system.

15. The UV control system shall provide remote transmittance of data to the Plant SCADA PC. The Plant SCADA PC will be used for remote operator interface control and data monitoring of UV PLC parameters. The transfer of data between the UV-PLC and the main PC/SCADA system shall be via an Ethernet data network.

16. The PLC shall be fully programmable to reflect the specifics of the UV disinfection system. Software shall provide a user-friendly interface to system status display information.

17. The PLC shall have uninterruptible power supply (UPS) sized to provide a minimum of 1 hour operation during a power outage. PLC shall include non-volatile or battery backup memory capable of retaining stored data relative to all on-board conditions including alarms, UV intensity, and elapsed operating hours, even if the module is temporarily removed from the UV channel.

18. The control system shall be capable of controlling either the number of UV lamps in operation or vary the intensity of the UV lamps to optimize energy and lamp conservation. Each bank shall be equipped with one intensity sensor. The bank shall be operated as one entity. Banks shall be operator-selectable for automatic or manual operation on an individual basis. The flow signal set points to initiate control of the banks shall be field-adjustable. The Manufacturer shall be responsible to fully configure and program the PLC to perform all control and interlock functions.

19. The PLC shall be sized with all I/0 points necessary for a complete operating system, with an additional 20 percent I/O points as spares.

20. The PLC shall be provided with a communication interface card as required to allow the PLC to communicate over an AB RS485 data network to power monitoring system.

21. Shop drawing submittal shall include complete information on PLC software and programming. The Manufacturer shall submit the ladder logic diagrams utilizing AB RS Logix. A narrative functional description shall accompany the ladder diagram describing system operation on a line-by-line basis.

22. PLC programming shall be supplied by the Manufacturer.

23. No passwords shall be enabled on PLC software or hardware developed for this project. All electronic disk copies provided to Owner shall not have any password protection enabled on them or the software.

B. Trojan On-Line UV Transmittance Unit Monitor:

1. An On-line UVT monitor shall automatically track the transmittance of the effluent at the 253.7 nm germicidal wavelength. The monitoring shall be continuous. To ensure valid results, an automatic calibration sequence shall be utilized using 100% distilled water. UVT monitors using air to calibrate to 100% shall not be allowed.

2. The UVT monitor shall be measured from 0 to 100% with an accuracy of ±1%.

3. A RS-485 serial link shall be available for interfacing the UVT monitor with the System Control Center (SCC). This will create an effluent UV demand feedback loop. The SCC shall modulate the lamp output in response to the effluent UV Transmission.

4. Power feed of 120 Volts, 1 phase, 2 wire (plus ground), 500 VA shall be provided to the sensor sampler at the channel edge.

C. UV Intensity Detection System:

1. A submersible UV sensor shall continuously monitor the UV intensity produced in each bank of UV lamps.

2. The sensor shall measure only the germicidal portion of the light emitted by the UV lamps. The detection system shall be factory calibrated. Detection systems that can be field calibrated will not be permitted.

D. Lamp Age Monitoring:

1. Lamp age monitoring shall be done bank-wise. Each individual UV bank shall be provided with a counter UV control panel to indicate total operating hours of the lamp. The counter output shall be shown on the graphical user interface located on the control panel.

E. Dose-Pacing:

1. A dose-pacing system shall be supplied to modulate the lamp UV output in relationship to a 4-20 mA DC signal from an effluent flow meter (to be provided by the Contractor), in conjunction with entered UV transmittance values. Dose pacing using the UV Detection System will not be allowed.

2. The system to be dose-paced such that as the flow and effluent quality change, the UV dose delivered is optimized while conserving power.

3. The dose-pacing system shall allow the operator to vary the design dose setting. Logic and time delays shall be provided to regulate the UV bank ON/OFF cycle.

4. The system shall be capable of being placed in either Manual, Off, or Automatic mode. When the system is in the Auto mode, the controller shall operate the system based on the UV system PLC logic program. Control of the disinfection system shall be possible from Manual mode via physical switches.

5. Each UV bank is to have Manual Override ON/OFF physical switches. Maintenance operation shall be controlled at the PLC. Physical switches shall be mounted on each individual Power Distribution Center (PDC). One PDC provided per bank

6. Dose pacing controls shall be provided to turn UV banks on and off as calculated by the UV system controller via an internally generated algorithm that relates the flow, the UV transmittance, and lamp age to the applied UV dose. The dose pacing system shall allow the operator to vary the dose setting and to regulate the UV bank ON/OFF cycle. The ability to vary the number of UV lamps in service at any time based on flow (flow pacing) shall be incorporated into the equipment control system. The dose pacing system shall minimize the number of ON/OFF cycles of the unit per day. The system shall incorporate features to allow manual operation of individual banks of lamps.

F. Hydraulic Systems Center (HSC):

1. Two (2) HSCs will be supplied to house all components required to operate the automatic cleaning system.

2. Enclosure material of construction will be Type 304 stainless steel.

3. Each HSC shall contain a hydraulic pump complete with integral 4-way valve and fluid reservoir housed inside the HSC.

G. Monitoring and Control

1. UV system Control Unit(s):

   a. Provide vendor's standard monitoring control functions of modules, lamps.

   b. Provide manual mode control of all required components.

   c. Provide automatic mode to sequence lamps on and off on the basis of flow and UV transmittance.

2. UV PLC Control Panels:

   a. Displays:

      1) On status for cleaning system.

      2) Various monitoring and alarm conditions associated with each UV module

   b. Analog Displays:

      1) UV system influent flow rate.

      2) Level, in the UV channel.

   c. Control Mode, Local:

      1) Provide Start/Stop control of UV cleaning system.

      2) Provide local control of various UV modules.

   d. Control Modes:

      1) Provide Manual Override ON/OFF selection of each bank.

2) Implement Auto mode logic in the PLC. Include varying UV light intensity or turning the UV lamps on in proportion to process flow rate into the UV system.

3) Provide for adjustment of automatic mode parameters in PLC ladder logic program.

e. The cleaning system is to be controlled and programmable through the PLC.

H. Major Field Instrumentation:

1. UV Channel Water Level Sensor in the UV channel.

2. UV Sensor at each UV bank.

3. UV transmittance monitor in influent channel to aid in modulation of UV modules.

2.6 EQUIPMENT NETWORKING INTO SCADA

A. The supplier shall incorporate and provide an open interface to the PLC based control system. This interface shall allow the operator to view all information used in the execution of the program including, but not limited to, alarms and indications of all equipment, as well as all scaled analog information. Any alarms or delays used within the program shall be available for viewing via the SCADA system. The supplier may not claim that the code is proprietary and closed, but may require the Owner and its agent to sign confidential agreements to prevent disclosing trade secrets to the supplier's competition.

B. The supplier shall provide the PLC program to the owner or its agents in printed ladder logic via electronic media of the program, whenever possible. This information will be used to integrate the equipment into the overall SCADA system. The supplier shall make modifications as required to allow for Ethernet based communication from the supplier's equipment to the SCADA system as part of the base bid for this project. The modifications shall include items such as replacing the CPU or processor with a higher end model that has Ethernet or other communications capabilities. Addition f terminal servers, modems or other interface modules that convert the SCADA Ethernet to a native protocol like Modbus or DF1 serial communications shall be provided by the supplier as part of this contract. All labor required to perform this conversion, upgrade, or enhancement shall be supplied under this contract by the supplier. The interface shall be demonstrated and prove that this networking is operable during startup and prior to owner acceptance of the equipment.

C. The supplier hereby agrees to authorize the Contractor, or their agents, or the Owner's SCADA agents, to be reimbursed via deductive change order for the cost of performing the conversions or upgrades necessary to allow the equipment to be networked into the SCADA system. These costs shall be calculated at published rates and equipment costs plus 25%. The allowable cost for this work shall not exceed twenty thousand dollars per sub-system.

D. If the vendor refuses to perform this work or will not allow this work to be performed, the owner shall be credited with a deductive change order of twenty thousand dollars per subsystem type from the Contractor.

E. If the PLC supplied is not the same manufacturer and type as the overall PLCs, the Supplier shall provide a full development package to the Owner including cables, interfaces, or other accessories required to connect a Windows XP based laptop to the PLC. The PLC used in this project is an Allen Bradley Compact LogixcPLC.

2.7 ELECTRICAL REQUIREMENTS

A. General:

1. Each module shall be powered from the Power Distribution Center and shall include a ground detection/fused relay board and watertight connector.
2. Electrical supply to each System Control Center shall be 120 Volts, 1 phase, 2 wire (plus ground), 1800 VA.
3. Electrical supply to each Power Distribution Center shall be 480 Volts, 3 phase, 4 wire (plus ground), 8.2 kVA.
4. Electrical supply to each Hydraulic Systems Center shall be 480 Volts, 3 phase, 3 wire (plus ground), 2.5 kVA.
5. Electrical supply to the water level sensor will be provided by Power Distribution Center and shall be 12 Volt DC.
6. UV manufacturer to perform all terminations between lamps and ballasts.
7. UV manufacturer to supply all cabling and conduit between lamps and ballasts.
8. Contractor shall provide electrical disconnects for each electrical power supply, including the Power Distribution Centers, System Control Center, and Hydraulic System Centers.

B. Power Distribution Center:

1. Power distribution will be through environmentally sealed receptacles to allow for local connection of UV Modules.
2. Data concentration will be through integrated circuit boards located inside the Power Distribution Center.
3. Fusing and Ground detection circuits will be located inside the Power Distribution Center.
4. Enclosure material will be Type 304 stainless steel.
5. All internal components will be sealed from the environment.
6. All Power Distribution Centers located outdoors will be equipped with a Type 304 stainless steel sunshade complete with stainless steel stand-offs to minimize heat gain.
7. All Power Distribution Centers to be UL approved or equivalent with a rating of Type 4X.
8. One separate sealed Power Distribution Center will be provided per bank of lamps.

C. Power Transformer

1. Electrical Contractor to Provide and install power transformer. The UV system supplier shall coordinate with the Electrical Contractor to provide a properly sized "K" rated power transformer for the UV system. Transformer to be constructed and sized to reduce harmonics on transformer primary connection (point of common coupling) in order to meet IEEE 519 standards for voltage distortion limits.
2. The transformer shall provide the required power and voltage for the PDC's.

3. Electrical power supply to the transformer shall be 480 volts / 60 Hz, thee (3) phase 3 wire (Delta) connection.

4. The location of the transformer shall be adjacent to the Power Distribution Centers and placed in a NEMA 3R enclosure.

D. Electrical:

1. All wiring and electrical connections must be protected against moisture to prevent electrical shorts or failure. All electrical components, installation, wiring, and controls on or within the disinfection system shall be designed, constructed, and installed in accordance with the current edition of the National Electrical Code and all applicable state and local electrical codes. The UV system modules shall be completely wired, requiring only an external connection for a single external power supply and remote alarms.

2. Electrical wiring installed between the control panel and the UV channels will be located in conduits embedded within concrete by the Contractor. The installer of electrical wiring shall be responsible for coordinating with the Contractor the installation of conduit in the concrete slab prior to the pouring of the concrete slab. Empty conduits shall be installed for future installation of additional UV banks. The Contractor shall supply and install the conduit and wiring between the control panel and the UV channels per UV manufacturer's drawings and requirements.

E. Power Supply:

1. It is the responsibility of the Contractor to provide the required voltage and capacity step-down transformer(s) as required for the furnished equipment 120VAC control and operating voltage(s).

2.8 SPARE PARTS

A set of spare parts consisting of the quantities below are to be furnished for the UV disinfection system installation:

UV germicidal lamps	10% of total furnished lamps: 26 lamps
Lamp ballasts, electronic	5% of total furnished electronic ballasts: 7 ballasts
Quartz sleeves	10% of total furnished quartz sleeves 26 sleeves
Intensity Sensors	1 UV intensity Sensor
PLCs	1 Allen Bradley Compact Logix processor with as completed PLC program loaded into EEPROM module
One-year supply of maintenance and calibration parts for the transmission monitor	1 year supply

Spare parts shall be suitably packaged in accordance with the Section 11010, with labels indicating the contents of each package. Spare parts shall be delivered to the Owner as directed.

2.9 CLEANING SYSTEM

A. Cleaning system will have mechanical and chemical cleaning abilities, complete with an automatically initiated and controlled cleaning cycle.

B. The cleaning system, including both mechanical and chemical components, will be fully operational *without* requiring either lamps or modules be placed out of service.

C. Cleaning cycle intervals to be field adjustable within the range of once every 24 hours to once every 500 hours. Remote Manual and Remote Auto cleaning control to be available through the operator interface.

D. The system will be provided with the required cleaning solutions necessary for initial equipment testing and for equipment start-up.

E. The Contractor shall provide the hydraulic conduits from the Hydraulic Centers to the Power Distribution Centers for each bank.

F. The cleaning system shall maintain full efficiency throughout its life, with no deterioration in quality of cleaning.

2.10 ACCESSORIES

A. Accessories shall be provided on each UV unit as specified herein.

1. Safety Equipment: One face shields that block UV light in wavelengths between 200 and 400 nm shall be provided. Two UV area warning signs shall also be provided and installed as required.

2. Brackets: Brackets to hold banks of lamps in place in the channel shall be provided and installed as required.

2.11 SHOP TESTS

Prior to shipment, the UV units shall be operated to check for leaks, faulty equipment and controls, and proper wiring. The UV Control Panel with PLC shall be shop tested with fully functional PLC program utilizing simulated inputs. The UV intensity monitor shall be calibrated to the manufacturer's specifications. Defective equipment and controls disclosed by such tests shall be replaced and the equipment package placed in satisfactory operating condition before shipping. Shop tests may be verified by the Owner. Contractor will notify Engineer at least 2 weeks before the test to verify either the Owner or Engineer will be attending the test.

PART 3 EXECUTION

3.1 INSTALLATION AND STARTUP SERVICES

The Manufacturer shall furnish a competent, qualified field representative and any necessary assistants to perform Manufacturer's field services, including duties set forth herein or installation, equipment certification, startup, adjustment, and instruction of the Owner's personnel in operation and maintenance of all materials and equipment furnished. The field representative shall be acceptable to the Engineer.

A. Manufacturer's Field Representative: The field representative shall report to the site at the times designated by the Owner and Contractor, provided not less than 15 calendar days notice is given to the Manufacturer. The Manufacturer shall provide sufficient site visit

time for all equipment installation, modification, equipment certification, startup, and instruction.

B. The Manufacturer's field representative shall be made available for four days. Additional services and travel expenses necessary to correct defective installation, materials, or equipment shall be paid by the Contractor.

C. Duties of the field representative during installation shall include the following:

1. Instructing and guiding the Contractor concerning proper methods and procedures on all technical phases of UV equipment installation.

2. Inspecting and indicating approval or disapproval of the installation as it progresses.

3. Reporting his observations in writing to be Contractor, with copies to the Owner through the Engineer.

4. Determining when equipment is ready for startup and operational checks.

D. All startup adjustment and testing of equipment will be performed in the presence of the Engineer and the manufacturer's field representative, unless otherwise agreed, and such operations will be in accordance with the manufacturer's instructions. No startup or testing will be undertaken without the manufacturer's approval.

E. It shall be the duty of the Manufacturer's field representative, during the process of installation, startup, testing, and such other times as may be required, to instruct the Owner's designated personnel in the proper operation and maintenance of the equipment. Such instruction shall terminate only when both the field representative and the Engineer are satisfied that the personnel are properly instructed, but shall be not less than two days total.

F. The Manufacturer shall furnish to the Owner, through the Engineer, a written report certifying that the equipment (1) has been properly installed, (2) is in accurate alignment, and (3) is free from any undue stress imposed by anchor bolts.

G. Installation: The Manufacturer shall communicate to the Contractor proper methodology for leveling, aligning, and placing the UV units into position in the open channel.

3.2 PERFORMANCE TESTS

A. The initial observation of tests by the Engineer during the first day of sampling shall be at the Owner's expense. All costs of subsequent visits by the Engineer (where applicable) to witness or observe additional tests because of failure of the initial tests or inability to conduct the initial tests shall be paid for by the Manufacturer if the repetition is due to shortcomings of the Manufacturer or by the Contractor if the repetition is due to shortcomings of the Contractor.

B. The Manufacturer's field representative shall prepare a report on the test results. Five copies of the report shall be submitted to the Engineer. The information collected will be used as a basis for determining acceptability of the Manufacturer's results. In case of conflict, interpretations and calculations made by the Engineer will govern. The Contractor shall provide all support facilities and equipment required to properly conduct the tests, including all flow supplementation equipment necessary to produce the specified flow rate and effluent solids concentrations.

C. Testing Procedures: The testing shall be conducted after a 100-hour burn-in period for the lamps previously described. ECO:LOGIC Engineering, paid for by the Owner, will perform velocity and hydraulic residence time profiling of the UV disinfection channels. Alternatively, if approved by DHS, bioassay spot-check validation test will be performed by ECO:LOGIC. The validation testing will be conducted at minimum flow, one intermediate flow, and peak flow for the UV channel. If the full-scale UV system should fail to meet validation test requirements, the Owner shall notify the Manufacturer, and the Manufacturer shall investigate the problem and develop a corrective plan within two weeks of said notification. The Manufacturer shall pay for all modifications to the plant that are required to bring the plant into compliance with the validation requirements.

3.3 EQUIPMENT ACCEPTANCE

Within 14 calendar days after the initial tests and any retests, a report of the testing results shall be submitted by the Manufacturer to the Engineer for review. Within 14 days after receipt of the initial test results and any retests, the Engineer will review the report submitted by the Manufacturer and make a recommendation to the Owner regarding the acceptability of the equipment with respect to the performance tests. Upon acceptance of the Manufacturer's report by the Engineer, the Engineer will notify the Owner of the acceptability of the performance tests. The Owner will promptly thereafter notify both the Contractor and Manufacturer in writing that the equipment is acceptable. If after the second, and any subsequent retests allowed, the equipment does not meet the performance requirements, the Owner may, at the Owner's option, select one of the following courses of action:

A. Allow the general construction contractor and Manufacturer to make additional modifications and retests.

B. Accept the UV equipment without conditions and issue a written notice that the UV equipment is acceptable. Warranty requirements shall still be met for the full duration of the warranty.

END OF SECTION