Addendum No. 1

To: All Plan Holders

From: Ryan W. Hager, PE

Date: June 16, 2011

Re: Well #3 Treatment System
Harrisburg, North Carolina
WKD No. 20110025.00.HI

Your attention is directed to the following changes and/or additions to the contract documents, specifications and plans for the aforementioned project:

Contract Documents and Technical Specifications:

Contract Documents:

1. Cover – DELETE and replace with the enclosed Cover sheet. WK Dickson NC License No. was added.

Technical Specifications:

1. Section 31 23 16 – "Excavation and Fill NC", Part 3.13. ADD paragraph E which reads:

   E. In stormwater embankments (e.g Pond, Bio-retention area), compact each layer of backfill or fill material at 95% of the standard Proctor Density (ASTM D-698). Moisture content of the fill during placement shall be kept within 3% of optimum.

2. Section 31 23 17 – "Trenching NC", Part 3.13. ADD paragraph D which reads:

   D. In stormwater embankments (e.g Pond, Bio-retention area):
      1. Subsoil Fill in maxium 8-inch loose lifts.
      2. Compact each layer of backfill or fill material at 95% of the standard Proctor Density (ASTM D-698). Moisture content of the fill during placement shall be kept within 3% of optimum.

3. Section 33 11 19 – Cation Exchange System – DELETE Section 33 11 19 in its entirety and replace with the enclosed Section 33 11 19.

Contract Plans:

1. Sheet C1 (Cover) – DELETE Sheet C1 in its entirety and REPLACE with the enclosed Sheet C1.
2. Sheet C5 – DELETE Sheet C5 in its entirety and REPLACE with the enclosed Sheet C5.
3. Sheet C7 – DELETE Sheet C7 in its entirety and REPLACE with the enclosed Sheet C7.
4. Sheet C8 – DELETE Sheet C8 in its entirety and REPLACE with the enclosed Sheet C8.
5. Sheet C9 – DELETE Sheet C9 in its entirety and REPLACE with the enclosed Sheet C9.
6. Sheet C10 – DELETE Sheet C10 in its entirety and REPLACE with the enclosed Sheet C10.
7. Sheet C15 – DELETE Sheet C15 in its entirety and REPLACE with the enclosed Sheet C15.
8. Sheet C16 – INSERT Sheet C16 for incorporation into the Contract Plans.
9. Sheet C17 – INSERT Sheet C17 for incorporation into the Contract Plans.
10. Sheet C18 – INSERT Sheet C18 for incorporation into the Contract Plans.
11. Sheet C19 – INSERT Sheet C19 for incorporation into the Contract Plans.

12. Sheet C20 – INSERT Sheet C20 for incorporation into the Contract Plans.
13. Sheet E1 – DELETE Sheet E1 in its entirety and Replace with the enclosed Sheet E1.
14. Sheet E2 – DELETE Sheet E2 in its entirety and Replace with the enclosed Sheet E2.
15. Sheet E3 – DELETE Sheet E3 in its entirety and Replace with the enclosed Sheet E3.
16. Sheet E4 – DELETE Sheet E4 in its entirety and Replace with the enclosed Sheet E4. Contractor shall not be responsible for providing the specified 130 KW natural gas generator and 250 amp automatic transfer switch. The Town of Harrisburg will provide a 150 KW, Cummins Model GM 8.1L-HO, natural gas generator and 300 amp automatic transfer switch delivered to the project site. Contractor shall be responsible for installing, connecting, and insuring proper operation of the provided generator. Contractor shall provide start-up and testing services for the provided generator as specified in the Contract Plans.
17. Sheet E5 – DELETE Sheet E5 in its entirety and Replace with the enclosed Sheet E5.

The Contractor shall acknowledge the receipt of Addendum # 1 on their bid.

Addendum No. 1
Contractor Questions & Answers

To: All Plan Holders

From: Ryan W. Hager, PE

Date: June 16, 2011

Re: Well #3 Treatment System
Harrisburg, North Carolina
WKD No. 20110025.00.HI

Your attention is directed to the following questions and answers related to the contract documents, specifications and plans for the aforementioned project:

1. Will there be a pre-bid meeting for this project.
   No.

2. Who should we contact to gain access to the project site?
   Contact Derek Slocum, Town Engineer, at 704-455-4758.

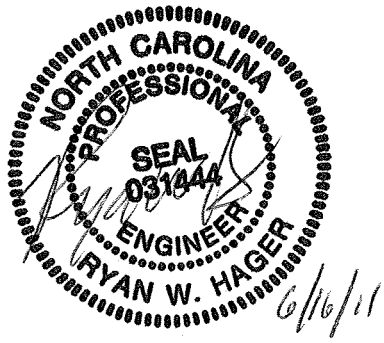
3. Will Leyland Cypress trees be acceptable for the proposed evergreen plantings around the site?
   Yes.

CONTRACT DOCUMENTS

for

Well #3 Treatment System
June, 2011
WK Dickson #20110025.00.HI

Town of Harrisburg, North Carolina
Harrisburg, NC



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SECTION 33 11 19
CATION EXCHANGE SYSTEM

PART 1 - GENERAL

1.1 GENERAL

A. This specification describes a complete operational system to be furnished by a single responsible equipment manufacturer. The equipment described herein is based on products and services as manufactured by Tonka Equipment Company of Plymouth, MN or Hungerford and Terry, Inc. of Clayton, NJ. The contractor shall prepare his bid on the basis of the materials and equipment listed herein. Any bid using other than the Base Bid equipment must be pre-approved by the Engineer. Failing to do so will be considered non-responsive and the bid will not be considered for award.

B. It is the intent of this specification that the ion exchange equipment manufacturer assume system and process responsibility for the ion exchange equipment and appurtenances. Therefore the ion exchange equipment manufacturer, including any alternate suppliers pre-approved by the Engineer, shall provide the ion exchange equipment and all appurtenances described in this section of the specification including but not limited to; facepiping, valves, compressors, controls, etc.

C. This specification has been prepared on the basis of the specific requirements for this application. These specifications require modification of manufacturer's standard equipment design. It will be mandatory that all equipment manufacturers meet all requirements of this specification. Equipment manufacturer shall modify their standard designs and recommended operational parameters to meet all requirements of this specification. Any claims to the contrary, whether specific or implied, indicating that the equipment may not meet the specifications, will be considered grounds for rejection of the bid.

1.2 QUALITY ASSURANCE

A. Reference Standards. AWWA, ANSI, ASME, FDA, and NSF.

B. Qualification of Manufacturers.

1. All bidding contractors shall base their bids on systems and equipment manufactured by the named base bid manufacturer, Tonka Equipment Company, Plymouth, MN or Hungerford and Terry, Inc. of Clayton, NJ.

2. Contractors wishing to pre-qualify alternate manufacturers shall submit the following information, in triplicate, to the engineer at least 14 days prior to the published bid date and time. Submission of pre-qualification materials by equipment manufacturers rather than Bidding Contractors will not be considered.

   (1) A list of ten reference systems of identical type and similar size which have been installed and in successful operation for at least 1 year, using the processes and methods specified herein.
   (2) Detailed equipment drawings, to scale, and complete detailed information covering equipment, processes and methods specified.
      (2a) A minimum of six month's operation data from three of the above reference installations.
   (3) An unpriced proposal indicating the total scope of the work being proposed and containing an itemized list of all equipment, materials and appurtenances, including structural configuration drawings and details.
   (4) Installation, operation and maintenance manuals from the ten references in paragraph (2.1) above.

(5) Evidence of manufacturer's engineering staff experience necessary to complete this project. Included shall be the resume of the supervisory P.E. who will affix his stamp on the submittal drawings. Such engineer shall be a direct employee of the manufacturer.
(6) Warranties and Bonds. Proof of ability to furnish warranties and bonds as described elsewhere in this specification.
(7) Failure to submit the pre-qualification documents as described above shall cause rejection of the contractor's bid if such bid indicates a manufacturer other than Tonka Equipment Company or Hungerford and Terry, Inc. of Clayton, NJ.

1. Engineer Review. The above submittal information will be reviewed by the engineer. Contractors submitting requests for alternate manufacturer approval will be notified by contract addendum 5 days before receipt of bids. All such decisions shall be final.

2. Proposals from other suppliers pre-approved by the Engineer shall be considered after the contract is awarded to the lowest responsible bidder incorporating the Base Bid equipment. Only alternative proposals from suppliers pre-approved by the Engineer will be considered.

1.3 SUBMITTALS/SHOP DRAWINGS

A. Six (6) sets of submittal information shall be transmitted to the engineer for approval. Equipment shall not be fabricated until manufacturer receives written approval of submitted information.

B. Six (6) sets of O&M manuals shall be provided.

PART 2 - PRODUCTS

2.1 MATERIALS/EQUIPMENT

A. All components of the system herein described shall be fabricated and manufactured from new, unused materials, free from defects, of the highest quality possible.

B. The materials and equipment shall be of the configuration, quantity and design features as described on the Equipment Schedule found in this specification.

2.2 DETAILS OF CONSTRUCTION

A. VESSEL

1. All pressure vessels shall conform to the Equipment Schedule and be constructed in accordance with Section VIII of the ASME code requirements for cold fired pressure vessels, and shall bear the ASME stamp. Minimum thicknesses shall be furnished in accordance with ASME code requirements. Verification of ASME code design to include calculated head and shell thicknesses. They shall be submitted with the first submittal drawing and be approved by the engineer prior to authorization of fabrication. Vessels shall be fabricated in a facility holding a current ASME U-stamp. Facilities holding an ASME R ("repair") or other certification shall not be considered acceptable for vessel fabrication.

2. Pressure containing welds shall be in accordance with the current edition of the ASME CODE SECTION VIII, DIV 1 for NON-FIRED PRESSURE VESSELS DESIGN. For all other welds, pre-qualified weld procedures, joint design and fabrication specifications, as detailed in the current edition of AWS D1.1/D1.1M, SECTION 5 shall be used to ensure joint strength and integrity. Final weld surface condition shall be consistent with paint pre-application requirements.

B. VESSEL INTERIOR CONSTRUCTION

1. Raw Water Distributor/Backwash Collection System

   a. The vessel shall be equipped with a raw water distribution/backwash waste collection system consisting of a steel header/lateral with upturned elbows. The header/lateral shall be designed for equal distribution and collection of water across the entire surface area of the media. Splash plate systems are not acceptable.

   b. The header/lateral shall be designed to accept a backwash flow of 15 gpm/sq. ft.

2. Underdrain System

   a. The underdrain shall consist of a rigidly supported 3/8" underdrain plate placed in sections on wide flange A36 steel beams which shall be located on not more than 3' centers. The beams shall be continuously welded to the sideshell and head as required and shall be coped at these points as necessary. The underdrain plate shall be continuously welded to the top flanges of the beams. Only pre-qualified weld procedure and joint design, as detailed in the current edition of AWS D1.1/D1.1M, SECTION 5 shall be permitted to ensure joint strength and integrity. Final weld area surface condition shall be consistent with paint pre-application requirements. The underdrain system shall be structurally reinforced as necessary to withstand a differential pressure in either direction of 12 psig. The underdrain plate shall be fitted with 1" openings to accept underdrain nozzles located on 12" centers throughout the entire cross section of the underdrain area.

   b. The underdrain diffuser nozzles shall be non-metallic, self-cleaning nozzles. They shall be mounted in the underdrain plate on 12" centers with orifice control area of the underdrain diffuser nozzle equal to 0.3% of the total ion exchange bed measured at the surface of the resin media. Nozzles shall be provided with peripheral slot openings as required to collect and distribute flow laterally. Slot openings shall be tapered inward to prevent lodging of support gravel in the slot opening. Diffuser nozzles using pressed or crimped sheet metal which are tack welded to the underdrain plate are not acceptable due to galvanic corrosion potential with the weld. Toggle-bolted designs are not permitted due to their inherent loosening potential. Diffuser nozzles using parallel metal or plastic plates, spacers and coupling bolts shall not be acceptable due to their "dead spot" characteristics and inability to uniformly collect and distribute flow laterally.

C. VESSEL MISCELLANEOUS COMPONENTS

1. Each ion exchange vessel shall be equipped with two (2) 14" x 18" manway, rated for the working pressure of the vessel. One (1) manway shall be placed on the top head for access into the vessel for purposes of resin loading and observation. One (1) manway shall be placed on the lower head for access into the vessel for purposes of underdrain painting and inspection

2. 1/2" diameter, full couplings shall be provided as described in the Equipment Schedule for sample taps.

3. Structural steel legs shall be provided for support of the vessels. Anchor bolts, if required, shall be furnished by the installing contractor.

4. Pipe nozzles shall be of the size as shown on the Equipment Schedule and shall consist of Sch. 40 steel pipe, projecting and terminating in a flange 6" from the outside face of the sideshell. Flanges shall be standard ANSI pattern, welded on split centers and shall be true and plumb.

5. A 2" drain with ball valve and plug shall be provided at the bottom head center consisting of a half coupling. A 2" air release half coupling shall be provided in the top head center. Gauge taps shall be furnished in the influent and effluent nozzle connections (1/2" NPT tap with plug).

2.3 SUPPORT GRAVELS

A. The support gravel shall consist of hard rounded stones with an average specific gravity of not less than 2.5. It shall not contain more than 2% of weight of pieces in which the length is three times the width. The gravel shall be free of shale, mica, clay, sand, dirt and organic impurities.

B. The support gravels shall be placed in the tank as follows:

Layer	Depth	Size
Bottom	4"	3/4" x 1/2"
Second	4"	1/2" x 1/4"
Third	4"	1/4" x 1/8"
Top	3"	0.8 - 1.2 mm torpedo sand

C. The bottom layer of the screened support gravel shall be placed by hand to avoid damage to the diffuser assemblies. Each layer shall be placed and leveled before the addition of the next layer is started. A gravel-less underdrain shall not be acceptable.

D. The resin shall be placed on top of the support gravel and meet the requirements as shown on the attached Equipment Schedule.

E. The support gravels shall be procured from a manufacturer that complies with AWWA B-100 standards. Installation of the support gravel shall be in accordance with AWWA B-100 procedures. Installation of support gravels and resin shall be under the direct supervision of an employee of the equipment manufacturer experienced in this procedure.

2.4 CATION EXCHANGE RESIN

A. A high capacity polystyrene cation exchange resin shall be furnished for each ion exchange vessel as indicated in the equipment schedule. The resin shall have a rated exchange capacity of 20,000 grains of hardness as $CaCO_3$ per cu. ft. when regenerated with six pounds of salt per cu. ft.

B. The ion exchange resin shall be of the highest quality available. Approved manufacturers are Rohm and Haas, Purolite and Thermax.

C. The resin shall be delivered to the jobsite in one cu. ft. bags, palletized, and shall be placed in the ion exchange vessels above the support gravel beds.

D. Placement of the ion exchange resin shall be under the direct supervision of a field supervisor who is an employee of the ion exchange equipment manufacturer.

2.5 CO-FLOW REGENERANT DISTRIBUTOR

A. Distributor

1. The distribution system shall be a Tonka header/lateral design or as designed by Hungerford and Terry, Inc. of Clayton, N.J. located at an elevation of approximately 6" above the resin bed. Brine injection through the inlet distributor shall not be acceptable due to mal-distribution.

2. Materials. The system construction shall be Sch. 80 PVC pipe and fittings. Laterals shall be shop fabricated from Sch. 80 PVC, minimum 3/4" diameter, and solvent welded in place by the installing contractor. Each lateral shall be fitted with an end cap and a specially machined Sch. 80 male adapter for solvent welding into the distribution header. Laterals shall be evenly spaced at not more than 12" lateral to lateral spacing along the entire length of the header, each side. Laterals shall be supported at not greater than 2' intervals using steel angles. Supports shall be adjustable in two directions.

3. Lateral Design. Each lateral shall be secured using a double wrap at each support with polypropylene ties. Specially sized brine metering control orifices shall be placed at 6" intervals along each lateral. Each orifice shall be installed at a 45° angle, alternating from the vertical axis of the installed brine laterals.

4. Configuration. The system used shall be the Tonka brine grid design or as designed by Hungerford and Terry, Inc. of Clayton, NJ. Calculations verifying adequate brine distribution design including orifice headloss calculations, shall be submitted to the engineer for approval upon request.

2.6 FACEPIPING

A. All piping and fittings shall be Sch. 40 steel or Class 53 cement mortar lined and asphaltic coated ductile iron. Flanges on all welded piping shall be slip-on weld type of ANSI construction and bolt pattern.

B. Ion exchange facepiping shall be provided by the ion exchange manufacturer to the limits shown on the plans.

2.7 VALVES

A. Ion exchange function valves shall be pneumatically actuated and shall be provided by the ion exchange equipment manufacturer. Valve size shall be as specified on the attached Equipment Schedule.

B. Ion exchange function valves shall be wafer style butterfly valves, and shall be one-piece disc through shaft constructed with resilient seats to ASTM A-126 Class B for mounting between two bolted flanges without the need for gaskets. Disc construction shall be bronze, cast iron with a welded nickel or 316 stainless steel edge, or Nylon 11 coating ASTM A536 Gr. 65-45-12. Valve shaft shall be one-piece stainless steel and supported on Teflon coated stainless steel or inert nylon bearings. Seat shall be EPDM or Buna N material. Valves supplied shall be Pratt MKII series; DeZurik BRS series; Bray Series 30; or Engineer Approved Equal.

C. Where specified on plans, an electric motor operator shall be supplied on butterfly valves. Motor operators shall be quarter turn type and have a cast aluminum NEMA 4 water tight housing, open and closed limit switches 24v for PLC feedback, open and closed torque switches, end of travel mechanical stops, declutching handwheel manual override, self-locking worm gears, position indicator, and condensate heater. Operators shall use 120VAC single phase power. Valves used for modulating service shall include a 4-20 mA input modulating card. Electric motor operators shall be Pratt Positron series; Auma; Bray Series 70 or Engineer Approved Equal.

D. Where manual actuators are specified in the Equipment Schedule they shall be handwheel type gear with cast iron housing and handwheel, position indicator, and have adjustable open and closed position stops.

E. Each ion exchange vessel shall be provided with an air release valve Val-Matic Model #22.9VC as shown on the plans. The air release valve shall incorporate a built-in check valve. In addition, the air release valve shall be supplied with a 2" isolating gate valve. The exhaust piping shall be by the

installing contractor, and shall be as shown on the plans. Each valve exhaust piping shall be piped separately to a floor drain.

2.8 INSTRUMENTATION

A. Loss of Head Gauge Panel.

1. The Contractor shall furnish and install one Tonka Equipment Company or Hungerford and Terry aluminum loss of head gauge panel completely factory fabricated from 3/16" brushed aluminum plate having a textured finish, with minimum dimensions of 18" x 22".

2. The gauge panel shall have the following 4-1/2" flush-mounted gauges:

   (a) Inlet header (0-100 psi)
   (b) Effluent header (0-100 psi)

3. Each panel shall be equipped with the following components:

   (a) Phenolic nameplates identifying gauges and sample taps.
   (b) Two flush mounted sample taps for influent and effluent locations.
   (c) Manufacturer nameplate, aluminum construction.

4. Manufacturer shall furnish mounting hardware (brackets, U-bolts, nuts, washers, etc.) for affixing to facepiping. Installation of panel shall be by Contractor.

B. Backwash Rate of Flow Panel.

1. The Contractor shall furnish and install a Tonka Equipment Company or Hungerford and Terry backwash rate of flow panel completely factory fabricated from 3/16" brushed aluminum plate having a textured finish, with minimum dimensions of 9" x 12".

2. The panel shall have one 4-1/2" flush mounted gauge for backwash rate of flow, calibrated in gpm.

3. The above gauge shall work in conjunction with, and shall be calibrated with, a 1/8" stainless steel sharp edged orifice plate. The orifice plate shall be sized and placed into the backwash effluent piping so that the proper backwash flow rate is maintained and measured.

4. Each panel shall be equipped with the following components:

   (a) Phenolic nameplate identifying gauge.
   (b) Manufacturer nameplate, aluminum construction.

5. Manufacturer shall furnish mounting hardware (brackets, U-bolts, nuts, washers, etc.) for affixing to facepiping. Installation of panel shall be by Contractor.

2.9 AUTOMATIC REGENERATION CONTROLS

A. General.

1. The ion exchange system manufacturer shall furnish an automatic control system consisting of a PLC-based control panel with OIT necessary hardware, components, timers, operator interface terminal, enclosure, relays, switches, alarms, I/O, and other items necessary for a complete operational system. The automatic regeneration control system shall be essentially as described below.

B. Hardware.

1. PLC. The automatic regeneration control panel shall be PLC-based using Allen-Bradley Series PLC's with Allen-Bradley I/O modules and communication hardware compatible with Ethernet IP network interface to remote plant SCADA or Engineer Approved Equal. Manufacturer to provide 10% spare I/O capacity including digital and analog I/O.

2. Components. All HOA switches, lights, and indication shall be NEMA 4 rated, Allen-Bradley or Engineer Approved Equal. Nameplates shall be black Phenolic with white lettering indicating all functions, displays, indication, etc.

3. Operator interface terminal (OIT) shall be Series 1000 PanelView Plus OIT color touch screen by Allen-Bradley or Engineer Approved Equal.

   The OIT shall be panel mounted and shall indicate the following, via a series of custom designed screens:

   - Each ion exchange vessel status (batch set point and batch remaining, flow rate, etc.)
   - Service or regeneration sequence/step
   - Totalized ion exchange vessel treated flow
   - Alarms/alarm acknowledges
   - Status of exterior signals (regenerant waste tank level, storage level, brine system level, etc.)
   - Other functions, indication and information as required for a complete operating system
   - NOTE: Screens shall be printed for review by the engineer with the submittal documentation.

4. Panel shall include one 15 minute UPS (uninterruptible power supply), UL rated, and shall be furnished to automatically trickle charge. Adequately sized NiCad batteries shall be included to insure function and indication for an uninterrupted power outage of 15 minutes duration.

5. Enclosure. UL/NEMA 12 rated, wall mount enclosure, containing space for separate back panel mounting of PLC, power supply, I/O racks, wiring terminal blocks properly labeled and numbered, uninterruptible back-up power supply, fuses, switches, communication modem, etc., all as required for a complete operating system. Enclosure shall be UL rated and bear the UL stamp prior to shipment.

6. Timers. Countdown timers shall be located on a timer screen on the OIT in the ion exchange control panel. Timers will be provided to indicate the following:

   - Backwash
   - Brining
   - Slow Rinse
   - Fast Rinse

7. Equipment supplier is responsible to coordinate the PLC data table information with the SCADA system supplier for proper interface.

8. Documented copy of final as-built PLC and Panelview programs to be provided to the Owner on CD.

C. Functional Control Description.

1. General. During automatic operation the PLC shall control the individual ion exchange functions and shall indicate and communicate individual ion exchange vessel status to the OIT and remote SCADA system as required.

2. Normal operation consists of opening ion exchange vessels influent and effluent valves, which are their normal positions. As each individual ion exchange vessel batch meter reaches its batch setpoint, the individual ion exchange vessel is placed into regeneration. Only one ion exchange vessel may be regenerated at a time. If a second ion exchange vessel should require regeneration while another unit is in regeneration, it will remain in service until the first ion exchange vessel regeneration has been completed.

3. Once regeneration has been initiated the regeneration will automatically sequence as programmed.

4. The regeneration sequence shall be:

Step	Description	Duration
1	Backwash of the ion exchange vessel	OIT timer screen, adjustable timer, 0-20 minutes.
2	Brine	Brine batch meter control with adjustable watch dog timer.
3	Slow Rinse	OIT timer screen, adjustable timer, 0-30 minutes.
4	Fast Rinse.	OIT timer screen, adjustable timer, 0-20 minutes.

NOTE: Above parameters to be verified by performance testing at time of start-up

D. Power Failure. If power to the PLC is lost, the uninterruptible power supply shall engage and shall continue automatic operation of the filter control panel (all function and indication) for a minimum of 15 minutes. If after 15 minutes power has not been restored to the ion exchange control panel, then all valves shall fail to "service" condition, meaning that all ion exchange vessels shall be placed into normal service mode.

E. Alarms. The following minimum alarms shall be indicated on the alarm OIT screen: regeneration hold; regeneration abort; low brine tank level; brine feed error; high regenerant waste holding tank; and other alarm conditions affecting ion exchange operation.

F. Communications Modem. The control panel shall contain capability for use of a communication modem allowing remote access to its PLC and OIT to effect program changes remotely from the factory. Note: NO REMOTE PROGRAM CHANGES SHALL BE ALLOWED WITHOUT APPROVAL FROM THE ENGINEER and then a new as-build copy of the PLC program shall be provided to the Owner with the issue date noted.

G. Shop Testing Prior to Shipment. Prior to shipment, the ion exchange control panel shall be fully tested with all alarms, indication and I/O fully simulated at the factory prior to shipment. All screens shall be tested along with all alarm functions and other control parameters, verified by factory certification as to inspector and date inspected. Testing shall be subject to verified witnessing by the Engineer if required.

2.10 ION EXCHANGE EFFLUENT WATER METERS

A. Each ion exchange vessel shall be provided with a flanged in-line turbine type water meter located in the treated water effluent line as shown. The meter shall be of cast iron construction with 316 stainless steel straightening vanes. The meter housing shall be rated for an operating pressure of 125/150 psi. The head assembly shall be designed to permit removal of the meter internals without removal of the meter housing.

B. The meter rotor and nose cone shall be of Ryton and shall incorporate ceramic bearings. The meters shall have an accuracy of ± 1.5% with a repeatability of ± 0.25%.

C. The meters shall be fitted with an electronic transmitter capable of producing a pulse output. The signal shall be transmitted to the PLC control where the signal will be used for the batch and reset control. The OIT on the ion exchange control panel will include a batch control screen for each of the ion exchange vessels. The batch control screen will allow the operator to set the batch volume in gallons. The meter signal shall be used to show a count up volume in gallons for each ion exchange vessel. Once the batch counter has reached the batch set point the ion exchange vessel will be placed into regeneration by the PLC. Upon completion of the regeneration the batch control will be reset for the next service cycle.

2.11 BRINE METER

A. A positive displacement, nutating disc, type brine meter shall be provided for installation in the brine line for measuring gallons of brine pumped and controlling operation of the brine pumps. The meter shall be of bronze construction with thermoplastic internals. The meter housing shall be rated for an operating pressure of 150 psi.

B. The meters shall be fitted with an electronic transmitter capable of producing a pulse output. The signal shall be transmitted to the PLC control where the signal will be used for the batch and reset control. The OIT on the ion exchange control panel will include a batch control screen for the brine meter. The batch control screen will allow the operator to set the batch volume in gallons. The meter signal shall be used to calculate a count up volume in gallons for the brine feed system. Once the batch counter has reached the batch set point the brine pumps will be shutdown and the slow rinse step of the regeneration will be initiated. Upon completion of the ion exchange vessel regeneration, the batch control shall be reset for the next regeneration brine cycle.

2.12 BRINE SYSTEM COMPONENTS

A. Brine Pumps

1. Two brine pumps shall be supplied for the application of brine during ion exchange regeneration. One brine pump will be installed for operation. The second brine pump will be provided to the Owner for a spare. The OIT shall also incorporate provisions to activate the pump for regeneration.

2. The brine pumps shall be of adequate head and capacity to meet the brining requirements of ion exchange regeneration. The brine pump housings shall be constructed of Polypropylene or other non-corrosive materials when used with saturated salt brine. Other internal components exposed to the salt brine solution being pumped shall be constructed of thermoplastic materials. The brine pumps shall incorporate a magnetic drive assembly to prevent seal leakage and to protect the motor from overloading. The brine pumps shall be designed for flooded suction applications.

3. The brine pump motors shall be multi-voltage, single or three phase, NEMA 56 frame, TEFC designs. Motor horsepower will be as required for the operating conditions.

B. Brine Line Components

1. The brine line shall include components as shown on the plans. These components shall include, but are not limited to, rate control valves, isolation valves, check valves and sample taps. Brine line components shall be constructed of PVC. Interconnecting PVC brine line piping is to be provided by others.

2. A brine dilution line shall be piped into the brine feed line as shown on the plans. The ion exchange system manufacturer shall provide the brine dilution line components. These components include, but are not limited to, flow controllers, automatic valves check valves and isolation valves. All dilution line components shall be constructed of PVC. Interconnecting PVC brine dilution piping is to be provided by others.

C. Brine Storage Tank

1. A properly sized salt storage brine maker tank shall be provided that will allow a minimum of 20gpm brine flow for the purposes of regeneration. The salt storage capacity shall be as indicated in the Equipment Schedule. The tank shall be constructed of FRP. The laminate process of construction shall include an interior surface, an interior layer, a structural layer and an exterior protective surface.

2. To maintain a high quality of vessel construction the following tests shall be employed. Hardness Test, the surface area of the vessel shall be tested with a barcol impresser. Ten readings of a resin rich surface are taken with the two highest and two lowest eliminated. An average is taken of the remaining six readings, which must equal at least ninety percent of the resin manufacturer's recommendation. Fabricator shall have a written quality control program demonstrating the capability to design and supply equipment conforming to customer specification with periodic internal auditing and semi-annual audits such as ISO-9001. The brine vessel shall be certified to NSF 61 and shall be traceable to an NSF authorized production facility.

3. The brine vessel shall have the following accessories: 304 stainless steel tie down lugs and lifting channels. 4" conically gusseted flanged nozzle with 4" diameter 304 stainless steel schedule 40 salt unloading pipe with ¾" water injection port, aluminum Kamlock fitting and cap. 2" conically gusseted flanged nozzle brine outlet with internal brine plenum and slotted PVC filter pipe. 2" conically gusseted flanged nozzle with PVC water inlet ring. 8" gooseneck vent with PVC vent extension, clips to attach to vessel wall, polyester dust bag, rubber connection boot. 24" top flanged manway with cover spring loaded for emergency pressure relief, 304 stainless steel fasteners. 24" side flanged manway with cover, gasket, and 304 stainless steel fasteners. One water level control system to include a pressure sensing transducer, liquid level controller/level indicator and water supply solenoid valve. OHSA approved fiberglass ladder with safety cage.

4. Heat Retention System
The system shall be a Plasta-Therm™ system. Current demands will be determined by a sensing bulb which directly reflects temperature of vessels contents. System shall be able to maintain 60°F at a minimum ambient temperature of 0°F. The first 6 feet of the brine vessel is to be insulated with 2" thick foam with 1/8" thick fiberglass protective covering. The top of the insulation will be capped to seal out any moisture. The insulated portion will be finished with a white exterior gel coat.

2.13 RAW WATER BLENDING SYSTEM

A. The ion exchange treatment system shall incorporate a raw water blending system. A controlled amount of raw water shall be blended with the treated water effluent, so as to maintain a finished water quality as specified in the Equipment Schedule.

B. The raw water blend line shall include a propeller type flow meter as shown on the plans. The meter shall be in accordance with AWWA standards incorporating a rate of flow indicator as well as a six digit totalizer. A butterfly valve with handwheel gearbox actuator shall be provided for throttling control. A diaphragm type, pilot operated automatic proportioning differential control valve shall be provided to automatically proportion the raw water blend flow with that of the ion exchange effluent flow. The differential control valve shall operate in conjunction with a stainless steel orifice plate. The orifice plate will be factory sized based on the flow and pressure conditions of the application. The orifice shall be mounted in the soft water effluent line of the ion exchanges as shown on the plans. A manual shutoff valve shall be installed on each end of the blend line to permit complete isolation of the blend line components as shown on the plans.

2.14 PAINTING

A. The interior of the ion exchange vessels above and below the underdrain plate shall be sandblasted and protected from corrosion by proper application of approved coatings for potable water. The exterior of the vessels shall be sandblasted and prime painted at the factory.

B. Surface preparation:

1. Interior - Sandblast to near white blast cleaning (SSPC-SP10).

2. Exterior - Sandblast to commercial blast cleaning (SSPC-SP6).

C. Coating:

1. Interior - Stripe coating: hand-apply one coat Tnemec Series 20 tank white to all welds and hard to reach areas using high quality natural or synthetic bristle brush, to a dry film thickness of 3-5 mils. Prime coating: Tnemec Series 20 Beige primer to a dry mil thickness of 3-5 mils before any rust can form. Finish coating: Tnemec Series 20 tank white to a dry mil thickness of 4-6 mils for a total dry film thickness of 7-11 mils.

2. Exterior - Stripe coating: hand-apply one coat Tnemec Series 20 tank white to all welds and hard to reach areas using high quality natural or synthetic bristle brush, to a dry film thickness of 3-5 mils. Prime coating: Tnemec Series 20 Beige primer to a dry mil thickness of 3-5 mils before any rust can form. The exterior finish coat shall be applied by others with compatible system.

D. The total paint system shall be the product of and be applied in accordance with the recommendations of one manufacturer. Alternate paint systems must be pre-approved by engineer. Contractor shall purchase an adequate amount of touch-up paint, if required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Delivery and Storage.

1. Upon delivery of the equipment to the jobsite, the contractor shall take inventory of the shipment and immediately report to the equipment manufacturer any discrepancies between the equipment manufacturer's packing lists and shipping documents.

2. The contractor shall be responsible for off-loading and protection of all equipment against damage and during on-site storage and installation. All media must be stored on pallets in a manner that protects it from UV, radiation and weather. Damaged equipment and materials will be replaced by the contractor at the contractor's expense.

B. Manufacturer's Instructions. Installation shall be as shown on the plans and in accordance with the manufacturer's recommendations, installation instructions and assembly drawings. Manufacturer's installation instructions and assembly drawings shall be submitted and approved by the engineer prior to shipment of equipment. Installation of the ion exchange system shall be in strict accordance with the details shown on the drawings and in complete conformance to manufacturer's instructions and procedures.

3.2 FACTORY SERVICES AND START-UP

A. Installation Supervision. The contractor shall coordinate with the ion exchange equipment manufacturer to provide factory supervision (as outlined on the Equipment Schedule) or direction during critical phases of installation. Critical phases will include setting of equipment, installation of internals, installation of controls, wiring instrumentation and other components critical to the successful operation of the system.

B. Media Installation. Installation of support gravels and ion exchange resin shall be under the direct supervision of an employee of the ion exchange manufacturer experienced in this procedure, in accordance with the Equipment Schedule.

C. System Start-Up and Training

1. The contractor will verify in writing that the project is ready for manufacturer field services. Copies of written verification shall be given to the manufacturer, engineer and owner prior to scheduling field services.

2. The contractor shall provide the services of a factory representative during start-up of the ion exchange equipment. The contractor shall provide the number of days on site for start-up supervision as outlined in the Equipment Schedule. At a minimum, the ion exchange manufacturer's technician shall perform the following start-up functions:

   (a) Inspect the final installation to assure proper installation, connection and wiring of all equipment of the manufacturer's supply.

   (b) Start-up of the equipment in the presence of the Contractor and Owner's operating personnel.

   (c) Training of Owner's operating personnel in proper operation and maintenance procedures, start-up/shutdown procedures, response to emergency conditions, and troubleshooting. The responsibility of the Contractor and the factory service representative with regard to start-up shall be fulfilled when the start-up is complete, the equipment is functioning properly, operating personnel have been trained and the equipment has been accepted by the Owner.

3.3 WARRANTY AND BONDS

A. Effluent Performance Warranty

1. During start-up, the ion exchange manufacturer's representative shall perform raw water and treated water effluent field tests to confirm performance of the equipment.

2. The equipment shall be warranteed for a period of one year from the date of placing it on-line. The treated water effluent during this period of time shall be as detailed in the Equipment Schedule.

3. Sampling for conformance shall be taken during the middle of a run. All adjustments necessary to comply with this guarantee shall be made at the Contractor's expense.

EQUIPMENT SCHEDULE CATION EXCHANGE SYSTEM
PROJECT: HARRISBURG, NC WELL 3

2.1 Materials and/Equipment

Design Flow Rate:	485 gpm
Bypass Flow Rate:	108 gpm
Flow to Ion Exchange	378 gpm
Raw Water Hardness:	182 mg/L as $CaCO_3$
Raw Water Combined Radium:	2.0 pCi/L
Design Blended Effluent Hardness:	40 mg/L as $CaCO_3$
Design Loading Rate, 1 vessel offline:	6.6 gpm/sq. ft.
Design Loading Rate, 2 vessels in service:	3.3 gpm/sq. ft.

2.2.A Vessel Construction

Number of Vessels:	2
Vessel Diameter:	8.5 feet
Design Working Pressure:	100 psig
Hydrostatic Test Pressure:	130 psig
Surface Area per vessel:	56.7 square feet
Minimum Sideshell Height:	6 feet
Over all height:	13 feet

2.2 Vessel Misc. Components

1/2" Sample Taps (2 required per ion exchange):

- Influent
- Effluent

Nozzle/Connection Sizing:

Influent	6" flanged
Effluent	6" flanged
Brine:	2" NPT
Drain	2" NPT
Air Release	2" NPT

2.4.A Ion Exchange Resin

Resin Bed Depth:	36"
Gals. between regen.:	639,800

2.7 Valves

Function	Size	Actuator	Quantity
Raw water influent (RWI)	6"	Electric	1 per vessel
Treated water effluent (TWE)	6"	Electric	1 per vessel
Backwash influent (BWI)	6"	Electric	1 per vessel
Backwash effluent (BWE)	6"	Electric	1 per vessel
Brine influent (BRI)	2"	Electric	1 per vessel
Fast rinse effluent (FRE)	6"	Electric	1 per vessel
Air/vacuum release (CAVR)	2"	Automatic	1 per vessel
Blend valve	6"	Automatic	1
Blend isolation valve	6"	Manual	1

2.12.C Brine system components

Storage tank dimensions	10' diameter x 15' tall
Storage capacity	36 tons

2.14.A Vessel effluent hardness <1 mg/L ±10%

3.2 Factory Services & Start-Up

Equipment Installation Supervision:	2 days
Media Installation Supervision:	2 days
Start-up & Operator Instruction:	2 days
Minimum number of trips required:	2

3.3.A Effluent Performance Warranty

Hardness (Blended)	40 mg/L ±10%

END OF SECTION