

SECTION 01000

SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. Furnish all labor, equipment and materials necessary to deepen and test two (2) existing Upper Floridan Aquifer wells (Well N7 and Well S1) for Indian River County Utilities Department (OWNER). Well N7 located at the North County (Hobart Park) reverse osmosis treatment facility and S1 is located at the South County (Oslo Road) reverse osmosis treatment facility. The scope of work for each well will include: mobilization; removal of portions of the existing wellhead, removal of the column pipe, pump, and appurtenances; preliminary downhole video logging; deepening of the existing borehole; formation water disposal system (including temporary piping and pumps, and compliance with discharge permit requirements); performance of a full geophysical logging suite; installation of a straddle packer and performance of a packer test to evaluate the confining unit; installation of an off bottom packer and performance of a 24-hour constant rate aquifer performance test (APT) of the Avon Park Permeable Zone (AAPZ); performance of a 24-hour constant rate APT of the Upper Floridan Aquifer (UFA); optional back-plugging of the borehole with neat cement; optional well acidization; pump development; step-drawdown testing; re-installation of the permanent well pump, column pipe, and wellhead; well facility disinfection; purging and bacteriological clearance; demobilization and restoration of the well sites as described herein.

B. Construction details for the existing production wells are as follows:

	S-1	N-7
Casing Diameter (inches)	12	16
Cased Depth (feet)	382	398
Total Depth (feet)	697*	708
Open Hole Diameter (inches)	11	14
Pump Type	Vertical Turbine	Vertical Turbine
Pump Intake depth	100^	100^

Well construction depths indicated are approximate and based on grades at the time of construction. Contractor shall verify depths during geophysical and video logging as needed to perform work.

*Following rehab of well S-1 in 2000, open hole was reamed from 8" to nominal 11" diameter. After failed attempts to remove drill bit at bottom of the well, it was cemented in place at bottom of borehole. Video survey measured TD of borehole at 697 feet.

^Pump depth estimated.

C. Work will be performed with the artesian flow from the well controlled by the CONTRACTOR's pump using the connection provided on the OWNER's

wellhead. Well artesian head shall not be “killed” using a salt concentrate solution or other method.

- D. The CONTRACTOR shall be responsible for all labor, materials, transportation, tools, supplies, equipment, and appurtenances necessary to deepen, develop, and test the well as specified herein. In general, all methods and material used under this construction shall be in accordance with the latest revisions of the American Water Works Association Standard for Wells (AWWA A100-15) and the National Groundwater Association Standards as they apply to the particular needs or conditions encountered in the proposed work.
- E. Discharge water generated during rehabilitation shall be discharged to the CONTRACTOR’s formation water disposal system and then to discharge locations identified in the project drawings for each well site. All well sites will require additional temporary piping to discharge water to the approved locations. Settling and treatment of formation water to be discharged is the CONTRACTOR’S responsibility and shall be in accordance with all applicable regulations and as described herein.
- F. The CONTRACTOR shall diligently and timely perform the scope of work independently of all others who may perform concurrent tasks during execution of the scope of work.
- G. Following completion of well rehabilitation, the CONTRACTOR shall reinstall the pump, column pipe, wellhead, appurtenances to the extent the well is ready for service by the OWNER. CONTRACTOR shall perform disinfection and bacteriological testing as required for well clearance. Substantial completion will be deemed complete following restoration of operational service of the subject well.
- H. Project Substantial and Final Completion Dates
 - a. Substantial Completion: 90 calendar days per well (Substantial completion will be deemed complete following restoration of operational service of the subject well)
 - b. Final Completion: 120 calendar days per well (240 calendar days total) from the Notice to Proceed.
- I. The CONTRACTOR will be allowed only one (1) well out of service per water treatment plant for rehabilitation. The OWNER shall determine the sequence of wells to be rehabbed based on WTP operational constraints.
- J. Depths presented in these specifications are estimated; specific construction details, such as open hole intervals and testing intervals for each well will be determined based on site specific lithologic conditions, water quality, and well performance encountered during drilling and testing.

- K. The OWNER reserves the right to add to the work in accordance with the Contract Documents.

1.02 WORK BY OTHERS

- A. The CONTRACTOR shall yield to operations at the water treatment plant at all times and not interfere in any way with operations or personnel. The CONTRACTOR shall comply and adhere to all security requirements including but not limited to background checks and issuance of security badges. Access to the well site and work areas shall be limited to the areas shown on the project drawings and as discussed in the pre-construction meeting(s).
- B. Throughout the construction process, the ENGINEER or OWNER's representative reserves the right to perform onsite inspections of the CONTRACTOR and construction process. Documentation of work shall include, but not be limited to, detailed documentation of daily work performed by the CONTRACTOR, and photographs and/or videos of critical phases of well construction, development, and testing.
- C. Perimeter fencing must be secured at all times including but not limited to the installation of temporary construction fencing prior to the removal of existing perimeter and security fencing required for construction. CONTRACTOR must submit a plan outlining the installation and removal of fencing for approval by OWNER prior to mobilization.

1.03 WORK SEQUENCE

- A. Sequence of the work will be discussed at the pre-construction conference and will be as described in the Rehabilitation Sequence below.
- B. CONTRACTOR must contact the SJRWMD and County Health Department and submit the "Well Construction Permit Application", and any others required for construction, prior to commencement of well drilling activities.
- C. Sequence of detailed work shall be discussed at the Pre-Construction meeting. Alternative sequence of work may be considered if the proposed sequence is of benefit to the OWNER. The Contractor shall be prepared to perform the sequence as outlined.
- D. The construction schedule shall be met based on day work only (M-F, 7 AM – 7 PM) and excludes nights, weekends, and Indian River County and Federal holidays.
- E. The CONTRACTOR shall obtain approval from the OWNER for all 24-hour work excluding weekends and Federal holidays.

1.04 REHABILITATION SEQUENCE

The sequence of work is described below. Work shall begin with Well S1 followed by N7.

- A. Mobilize to the OWNER approved well rehabilitation site and prepare for well rehabilitation. Coordinate the work with OWNER to isolate the well from the raw water main, and OWNER to lock out and tag out all electrical power. Set up construction and support equipment within the OWNER controlled area of the well site. Additional CONTRACTOR laydown will be provided by the OWNER.
- B. Remove external piping, fittings, valves, wellhead assembly, pump column, and pump and secure exposed wiring from harm during site activities. Protect and secure well site components to remain on site. Following the well rehabilitation, the CONTRACTOR shall re-install any equipment previously removed unless approval not to do so is given in writing by the OWNER. The removed pump shall be transported by the CONTRACTOR to the plant during the out-of-service period. During the period of the contract, the CONTRACTOR will protect all well appurtenances removed by the CONTRACTOR; protect all remaining improvements; and protect any equipment loaned to the CONTRACTOR by the OWNER. If the CONTRACTOR becomes aware of any faulty or damaged OWNER equipment, the CONTRACTOR shall notify the OWNER immediately.
- C. Removal of the well pump shall be performed by the CONTRACTOR under 'no-kill' conditions. The CONTRACTOR shall dewater the well during pump removal using the existing wellhead or other approved methods.
- D. Install formation water discharge piping and settling system to approved location for wells S1 and N7. For well S1 assume approximately 1,500 feet of minimum 12-inch diameter HDPE or equivalent discharge piping to connect the contractor formation water settling system to the outfall location. For well N7 assume approximately 800 feet of minimum 12-inch diameter HDPE or equivalent discharge piping to connect the contractor formation water settling system to the outfall location.
- E. Perform a down hole video camera log of the casing and open interval under pumping conditions in the presence of the HYDROGEOLOGIST. Turbidity and suspended sediment shall have been removed from the formation water by the CONTRACTOR to the extent that visibility is not impaired during logging to the satisfaction of the HYDROGEOLOGIST.

All static (non-flowing/pumping) logs shall be performed prior to dynamic (pumping) logs. Flow rate shall be a minimum 50% of the well design rate or 500 gpm whichever is more. If the well is not capable of flowing at the above rate, the CONTRACTOR shall install a test pump to pump the well at the said rate. The video camera lens shall be color and capable of 360-degree

movement; be controlled by the logging technician; be independent of the camera body; and have focus capability. The video camera shall be centralized in the borehole. The centralizers shall self-adjust to different casing and hole sizes as necessary. If the HYDROGEOLOGIST determines that the video is unacceptable due to poor quality, the CONTRACTOR at his expense shall obtain the necessary equipment to perform additional logging to the satisfaction of the HYDROGEOLOGIST.

- E. Drill a nominal 12-inch diameter borehole using the reverse air method from current total depth to approximately 1,500 feet bls, collecting cuttings and water quality every five (5) feet.
- F. Pump test the well during reverse air drilling every 30 feet or drill rod change. Water level measurements shall be performed with the use of a water level meter or manometer if artesian. Pumping rates shall be measured using a recently calibrated flow meter and verified by an orifice weir. If orifice pipe and flow meter are not capable of measuring flow, volumetric tests may be performed to determine flow rates and confirm flow meter measurements. Obtain daily static water levels for specific capacity calculations. A manometer tube and fixed measuring tape shall be connected to the construction header and erected to a height above the static water level of the drilled zone if static water levels are artesian.
- G. Perform a complete suite of geophysical, water quality and flow logs from the base of casing to the total depth of the well, including.
 - 1. Dual Induction logs (static)
 - 2. Natural gamma log (static)
 - 3. Spontaneous potential log (static)
 - 4. Caliper log (static)
 - 5. Temperature log (static and dynamic)
 - 6. Fluid resistivity (static and dynamic)
 - 7. Flow log (static and dynamic)
 - 8. Borehole compensated sonic log (static)

All static (non-flowing) logs shall be performed prior to dynamic (flowing) logs.

- H. The OWNER and HYDROGEOLOGIST will review the collected geophysical and video logging and will be provided up to three (3) working days to evaluate what intervals of the well to further test. The evaluation days shall be included in the CONTRACTOR price; no standby time will be awarded for this evaluation time.
- I. Perform Straddle and off bottom packer pump testing, as directed by the HYDROGEOLOGIST to test the intermediate confining unit, the Avon Park Permeable Zone (APPZ) and the UFA. The details and execution are as

follows:

- i. For all packer tests, the work pipe shall consist of drill pipe or equivalent with a minimum 6-inch inside diameter to facilitate the installation of an appropriate submersible electric pump and water level monitoring equipment. The pump shall be set at a depth of approximately 250 feet (or greater) below pad level.
- ii. The internal surfaces of the drill pipe, casings and other fittings used for the packer tests shall be free of rust, scale and other materials that could be dislodged and interfere with the results of a test. The Contractor shall ensure the stand pipe and joints do not leak during testing operations.
- i. CONTRACTOR shall provide water level pressure transducers data loggers manufactured by Insitu™ or equal. The transducers shall have an appropriate range and accuracy for the well as approved by the HYDROGEOLOGIST prior to testing for intervals both above and below the upper packer. The Contractor shall provide a means to monitor the packer seal, by water-level measurements of the work (drop) pipe annulus, using an electronic probe/transducer and computerized data logger.
- ii. Pressure transducers shall be placed inside the drill pipe just above the pump and in the annulus with at least 50 feet of submergence. The recorded data-logger data must be able to be viewed during testing.
- iii. Pressure transducers may be installed in up to two additional nearby production wells during pump testing of either S1 or N7, if requested by HYDROGEOLOGIST, to delineate the effects of pumping.
- iv. The pressure transducers shall be calibrated in the well on the day that it is installed for monitoring the tests. The transducer pressure measurement shall be plotted against depth and a correction formula determined, if deemed necessary by the HYDROGEOLOGIST.
- v. The CONTRACTOR shall be responsible for providing appropriately sized submersible pumps necessary to successfully complete each packer pumping test. The pump(s) shall have the capability of pumping at constant rates from 0.5 to 100 gpm at a total head up to 200 feet for testing the confining layer. The pumping rate for the pump test on the AAPZ is anticipated to be performed at rates up to 1,500 gpm.
- v. A straddle packer test is anticipated to be performed between the approximate depth of 850 and 900 feet bls. The HYDROGEOLOGIST will select the depth intervals to be tested based on the geophysical

logs, geologic logs, and other available site-specific and regional data. The packer tests shall be conducted such that hydrologic properties of the formation can be determined and a representative water sample can be collected for analysis (to be collected by OWNER/HYDROGEOLOGIST and facilitated by CONTRACTOR).

- vi. Furnish and install a dual-seal, open-hole packer, as manufactured by Baker, TAM J, Baski, or equal, of a diameter appropriate for the size of hole drilled. Large diameter packer or packer sleeves may be necessary to test large diameter portions of the borehole.
- vii. The pipe used between the inflatable packers shall consist of appropriate diameter steel pipe or tubing. The pipe/tubing shall be uniformly slotted; the slots shall be distributed near the top, middle, and bottom of the tubing with the slotted openings occupying at least 25 percent of the surface area.
- viii. The CONTRACTOR shall furnish and install in the pipeline within 30 feet of the well to be pumped, a flowmeter capable of recording instantaneous flow rates and totalizing flow. The flow meter shall have an accuracy of 5 percent at the tested rate. The flow meter shall be sufficiently removed from valves, elbows and reductions and obstructions in the pipeline to allow the meter to perform within specifications. The CONTRACTOR shall provide a throttling valve downstream of the flowmeter to regulate flow.
- ix. After successfully setting and inflating the packer, the CONTRACTOR shall develop each zone so that the discharge water is free of any drilling mud/fluid (and produces stable water-quality results, as determined by the HYDROGEOLOGIST). Unless directed otherwise by the HYDROGEOLOGIST, the CONTRACTOR shall allow for a minimum of 8 hours of pre-test development (and development of a minimum of 2 drill pipe volumes) prior to each packer pumping test.
- x. The CONTRACTOR may perform multiple methods to develop the test interval. The final development shall be performed with the pump to be used for the packer test. The CONTRACTOR shall record data from pump development using the pressure transducers.
- xi. After development, the CONTRACTOR shall allow water levels in the work pipe to return to static conditions to the satisfaction of the HYDROGEOLOGIST. The CONTRACTOR shall continue to record transducer data during recovery following development.
- xii. After post-development recovery, the CONTRACTOR shall ensure the transducers and data-loggers are collecting data at the frequency required by the HYDROGEOLOGIST. A minimum of 12-hours of

background data will be recorded. The CONTRACTOR shall then turn on the pump and initiate pump testing.

- xiii. The HYDROGEOLOGIST will determine the duration of the pump test, but the CONTRACTOR may assume a duration of twenty-four (24) hours for pump testing of the AAPZ and UFA, and approximately eight (8) hours for the straddle packer test of the confining unit, or until a minimum of one drill pipe volume plus three test interval volumes have been pumped from the well, whichever is longer.
 - xiv. If the formation does not produce enough water to purge one drill pipe volume and three test interval volumes within 8 hours, the CONTRACTOR may propose to collect the water quality sample using a thief sampler, subject to HYDROGEOLOGIST's approval. If approved, the sample shall be collected after completion of post-test recovery and prior to deflating the packers. The thief sampler shall be capable of collecting a sample directly within the test interval and shall be able to collect a sufficient volume of water, as determined by the HYDROGEOLOGIST.
 - xv. After completion of the packer test, as determined by the HYDROGEOLOGIST, the CONTRACTOR shall ensure the transducers and data-loggers are collecting data at the frequency required by the HYDROGEOLOGIST. The CONTRACTOR shall then turn off the pump and allow water levels to recover. The HYDROGEOLOGIST will determine the duration of post-test recovery, but the CONTRACTOR shall assume a duration of twelve (12) hours.
 - xvi. Upon completion of post-test recovery, the CONTRACTOR shall provide the recorded data-logger data to the HYDROGEOLOGIST in Microsoft™ Excel format. The CONTRACTOR shall not deflate and move the packers until the HYDROGEOLOGIST receives the electronic data and confirms that it is acceptable.
 - xvii. The CONTRACTOR shall be solely responsible for the collection and downloading of test data. Throughout development, testing and recovery activities, the CONTRACTOR shall provide the HYDROGEOLOGIST access to view transducer data on a real-time basis.
 - xviii. In the event of test failure for any cause, including loss or non-recording of data, the CONTRACTOR shall repeat the test at his own cost.
- J. If requested by the HYDROGEOLOGIST and OWNER, grout the nominal 12-inch diameter pilot hole back with neat cement between a depth of 1,250 and 1,500 feet bls as directed by the HYDROGEOLOGIST. If grouting is conducted in stages; the top of the hardened grout from the previous grouting

stage shall be measured in the presence of the HYDROGEOLOGIST prior to each cementing stage. Each stage shall be given 12 hours of curing time prior to resuming cementing. Grout shall be allowed to cure for 48 hours before continuation of drilling operations.

- K. If requested by HYDROGEOLOGIST, backfill the nominal 12-inch diameter borehole from approximately 900-feet to approximately 1,250 feet bls (anticipated to be the AAPZ) using clean gravel topped with an approximately 5 foot layer of fine sand to seal the zone at approximately 900 feet bls (depth to be determined by HYDROGEOLOGIST). The top of the gravel and sand backfill shall be hard tagged in the presence of the HYDROGEOLOGIST prior to cementing. Prior to installation in the well, the gravel and sand shall be immersed for a minimum of 4 hours in a chlorinated water solution, having not less than 50 PPM available chlorine.

- L. If requested by the HYDROGEOLOGIST and OWNER, grout the nominal 12-inch diameter pilot hole back with neat cement between a depth of 850 and 900 feet bls as directed by the HYDROGEOLOGIST. If grouting is conducted in stages; the top of the hardened grout from the previous grouting stage shall be measured in the presence of the HYDROGEOLOGIST prior to each cementing stage. Each stage shall be given 12 hours of curing time prior to resuming cementing. Grout shall be allowed to cure for 48 hours before continuation of drilling operations.

- M. If requested by the HYDROGEOLOGIST, acidize the well using approximately 4,000 gallons of 32% (20 Baume strength, food service grade) hydrochloric acid. An acidization header drawing including location of acid line, water injection line, gas bleed line, associated pressure gauges, and other access ports as needed to complete the scope of work will be provided by the CONTRACTOR for approval by the HYDROGEOLOGIST. In addition, CONTRACTOR shall provide plan for acidization, temporary acid storage, containment and safety for approval by HYDROGEOLOGIST. Acidization shall be performed as follows:
 - i. Install approximately 500 feet of drop tubing, or as directed by the HYDROGEOLOGIST. Exact depth of drop tubing shall be determined by the HYDROGEOLOGIST following completion of preliminary well video and geophysical logging. The drop tubing shall be attached to a temporary CONTRACTOR provided water tight assembly. The CONTRACTOR provided temporary acidization wellhead assembly shall have access for drop tubing, a two-inch water injection line, a gas relief line and a pressure gage fitting.
 - ii. All access ports shall be fitted with isolation valves. The wellhead shall provide a tight seal up to 100 psi. Provide and install a new pressure gauge on the wellhead to monitor pressure at the wellhead.

- iii. Pump the HYDROGEOLOGIST approved quantity of acid through the drop tubing at a minimum rate of 200 gallons per minute (gpm). The pumping method shall not introduce ambient air into the well. At all times the wellhead pressure shall be monitored and shall not exceed 50 psi. All equipment and materials must be approved by the HYDROGEOLOGIST.
 - iv. Provide adequate water supply to pump up to 2,000 gallons of chase water, plus the drop tubing capacity. This volume may be more or less depending on conditions and the acid reaction. The chase water shall be pumped into the well through the drop tubing and through the casing. The pumping rate shall be 100 gpm or as designated by the HYDROGEOLOGIST. Chase water shall be potable water, chlorinated to 1 mg/l available chlorine.
 - v. Casing pressures shall be monitored continuously by the CONTRACTOR for at least 12 hours following acid treatment. If required, excess gas pressure shall be bled off as needed. A gas relief pipe shall be extended a minimum of 50 feet away from the work area, downwind from any potential immediate receptor.
 - vi. Using the drop tubing, a water sample shall be collected by the HYDROGEOLOGIST for analysis 24 hours after acid treatment. If required by the HYDROGEOLOGIST, the CONTRACTOR shall pump 2,000 gallons of additional chase water into the well using the same method as Paragraph iv.
 - vii. Purge spent acid water between acid treatments and after treatment. CONTRACTOR shall retain and treat spent acid water prior to discharge.
 - viii. Discharge well through the formation water disposal system until discharge water is clear with a pH of 6.0 or higher, and well conductivity is restored to a minimum of 80% of background. Water with a pH below 6.0 shall be contained and treated using a sodium bicarbonate solution to neutralize residual acid or be removed from the site. Treated water shall only be discharged from the holding tank after approval by the HYDROGEOLOGIST. All discharge to the outfall location shall comply with FDEP Generic Permit discharge requirements and as specified in preconstruction meeting.
- N. Provide and install two (2), 1-inch ID drop tubes between the pump column and casing, from the water level access fitting at the wellhead to 5 feet above the pump intake or as directed by the HYDROGEOLOGIST. The drop tube shall enable the HYDROGEOLOGIST to manually measure water levels without interference of the pump, pump column or electronic water level monitoring equipment.

- O. Install a test pump with a minimum of 120 feet of pump column and develop the well until the discharge water is free of cuttings and visible sediment as determined by HYDROGEOLOGIST. The CONTRACTOR provided test pump shall be capable of a variable discharge rate with sustained surges up to 3000 gpm. Development shall continue to the satisfaction of the HYDROGEOLOGIST. Provide a manometer tube for manual measurement of static water levels and pumping water levels above land surface. The CONTRACTOR shall provide a method of erecting the tube and also provide access for water level measurement throughout development and the pumping test.
- P. Conduct a four (4) step, 8-hour variable rate pumping test to measure drawdown and well efficiency. A manometer tube and pressure transducer/data logger setup shall be used to measure the static water level and pumping water levels during pumping when the water level is above the top of the wellhead. Water level measurement below the wellhead shall be performed using an electric water level tape and the data logger/transducer setup. The CONTRACTOR shall assist the HYDROGEOLOGIST with connections required to connect the HYDROGEOLOGIST'S provided silt density index (SDI) testing equipment to the pump discharge. The CONTRACTOR shall provide, operate and maintain a clean auxiliary pump capable of maintaining 35 pounds per square inch (psi) for SDI testing. The auxiliary pump shall be plumbed to the Floridan Aquifer well discharge for sampling and testing. The CONTRACTOR shall provide fittings and fabricate connections as needed to enable the HYDROGEOLOGIST to perform the SDI tests through the duration of the pumping test.
- Q. Perform a down hole camera video log of the casing and open interval under artesian flow conditions. Turbidity and suspended sediment shall have been removed from the formation water by the CONTRACTOR to the extent that visibility is not impaired during logging to the satisfaction of the HYDROGEOLOGIST. All static (non-flowing) logs shall be performed prior to dynamic (flowing) logs.
- R. Re-install well pump and discharge apparatus, well transducer, wellhead components, to the extent work is complete and the well facility is ready for service. Perform well disinfection consistent with methodology provided in AWWA C-601 and perform bacteriological sample collection to confirm disinfection was successful and the well is ready for service. The CONTRACTOR shall subcontract an analytical laboratory to perform analytical services including providing appropriate sample containers, sample preservation, sample analyses, chain of custody documents and all associated work in accordance with regulations. The laboratory shall be certified to perform the scope of work by the Florida Department of Environmental Protection and County Health Department. Two (2) water samples shall be collected at an approved location 48 hours after disinfection procedure. Sample collection and handling procedures shall be in accordance with state approved laboratory quality assurance plan by an

experienced sampling technician. Notify OWNER and Plant operations that rehabilitation is complete and ready for service.

- K. Restore the well and the site. The well shall be left clean and free of oils, grease, and all other substances used during CONTRACTOR activities. Replace and restore damaged sod until established. All areas, structures and facilities disturbed by the CONTRACTOR's activities shall be restored by CONTRACTOR to equal or better condition than conditions were prior to CONTRACTOR's work.

END OF SECTION