Technical Specifications for Construction and Testing of Lower Tamiami Wells Foxfire Site, Collier County

PREPARED FOR:

Collier County

APRIL 2022
UPDATED JULY, 2024

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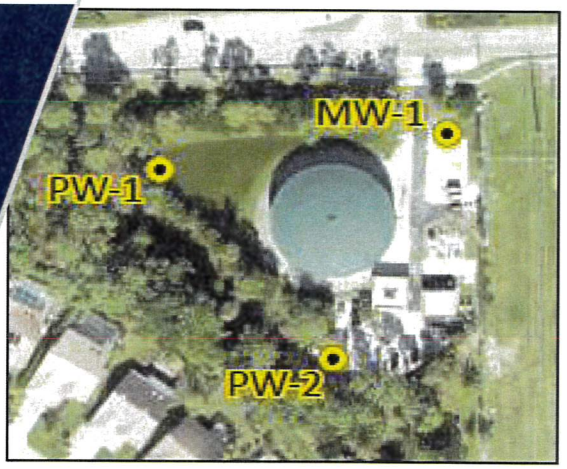

PREPARED FOR:

COLLIER COUNTY PUBLIC UTILITIES DEPARTMENT

Water Science Associates

RAHUL JOHN LICENSE No. PG 2761 STATE OF FLORIDA PROFESSIONAL GEOLOGIST

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SCOPE OF WORK

The Scope of Work for this project includes furnishing all labor, equipment, and materials for the installation and testing of up to three (3) Lower Tamiami Aquifer Production Wells and one (1) Lower Tamiami Aquifer monitoring well for Collier County. The wells will be located at the Foxfire Tank site and will be utilized to supplement the County's Irrigation Quality (IQ) water distribution system. Three of the production wells and one monitoring well are currently permitted under the South Florida Water Management District Permit (No.11-00052-W). The project will require wells, pumps, interconnecting piping, and associated electrical and control systems.

For the production wells, the CONTRACTOR shall provide and install 12-inch internal diameter fiberglass reinforced plastic (FRP) well casing cement grouted in place to a depth of approximately 60 feet below land surface (BLS) and shall drill out the open hole via the direct-air method to a total depth of approximately 80 feet BLS. For the monitoring well, the CONTRACTOR shall provide and install 4-inch internal diameter schedule 40 PVC well casing cement grouted in place to a depth of approximately 100 feet below land surface (BLS) and shall drill out the open hole via the mud rotary method to a total depth of approximately 110 feet BLS. The proposed well depths are estimates based on regional hydrogeologic data; actual casing and total depths of the wells are likely to vary based on site-specific data.

Geophysical logging surveys shall be performed at various stages of construction and shall include static and dynamic geophysical logs and a final video survey upon completion of the wells. Well development shall be performed for up to 8 hours by a combination of air-development and pumping during which testing for sand content, and turbidity shall be conducted. A step-drawdown test shall be conducted for the production wells using a submersible test pump and shall have a duration of 5 hours at pumping rates of up to 1000 gallons per minute and shall include sampling for Primary and Secondary drinking water standards. The CONTRACTOR shall provide all the materials and equipment required to accomplish the work as described below. All work is to be completed in the presence of the ENGINEER.

DIVISION 01 – GENERAL REQUIREMENTS

DIVISION 02 – SITE CONSTRUCTION

DIVISION 13 – SPECIAL CONSTRUCTION

FIGURES

DIVISION 01
GENERAL REQUIREMENTS
SECTION 01005

PART 1 – GENERAL

1.1 CONTRACTOR'S LICENSURE REQUIREMENT

The CONTRACTOR shall hold a valid Florida Water Well Drilling License

1.2 PROJECT SCHEDULE

The CONTRACTOR shall submit a detailed schedule prior to the commencement of any site work. The schedule shall include a proposed mobilization, completion, and demobilization date. The CONTRACTOR shall schedule all work or tests during daylight hours (7:00 a.m. to 7:00 p.m.), unless prior approval from the ENGINEER has been obtained. The CONTRACTOR shall be required to complete the project within 180 days from the notice to proceed.

1.3 WORK EQUIPMENT

Equipment utilized for this project shall be in first-class working order. The CONTRACTOR shall use his own drilling equipment having the minimum capabilities necessary to do the described work. No unnecessary delays or work stoppages will be tolerated because of equipment failure. Equipment failure shall not be considered a valid reason for extending the length of the Contract. The CONTRACTOR shall be held responsible and payment may be withheld for damages to the well due to any cause of negligence, faulty operation, or equipment failure.

1.4 REMEDIAL WORK

If remedial work proves to be necessary to make the wells acceptable to the OWNER to comply with the regulations and/or Specifications because of accident, loss of tools, defective material, or for any other cause, the CONTRACTOR shall propose a method of correcting the problem, in writing. Suggested methods shall be reviewed and approved by the ENGINEER before work proceeds. Such work shall be performed at no additional cost to the OWNER and it shall not extend the length of the Contract. The CONTRACTOR is notified that all specifications shall be met, including hole straightness and setting of casings to the points designated by the ENGINEER.

1.5 DAILY LOG

The CONTRACTOR shall maintain a detailed daily log of the well construction and testing operations. The logs shall be on printed forms and shall give a brief description of all field activities and pertinent data as may be required by the ENGINEER. Two copies of each daily log shall be submitted to the ENGINEER (or ENGINEER's representative) on a daily basis.

1.6 SAFETY

The CONTRACTOR is expected to perform the proposed work in a safe manner. In the event that the CONTRACTOR has safety concerns regarding the proposed work, alternate methods may be proposed by the CONTRACTOR in writing prior to commencement of work, which need to be approved from the ENGINEER before execution. The CONTRACTOR shall use every precaution necessary to ensure a safe work area and shall comply with all U.S. Occupational Safety and Health Administration (OSHA) and U.S. Environmental Protection Agency (USEPA) regulations regarding the types of work described in this Specifications.

The CONTRACTOR shall provide a written Health and Safety Plan (HASP) to the ENGINEER which shall include but not be limited to the following: emergency contact information, location maps to the nearest hospital emergency room, lists of know hazards associated with the work, material safety data sheets, personal protective equipment requirements, contact information for the CONTRACTOR's designated safety officer, etc. The CONTRACTOR shall perform the proposed work in a safe manner and shall adhere to the approved HASP.

1.7 MAINTENANCE OF TRAFFIC

As applicable, and as directed by the ENGINEER, the CONTRACTOR shall file a traffic control plan and obtain approval within the appropriate local, county, or state traffic departments. When work will occur within the Department of Transportation rights-of-way or easements, the CONTRACTOR shall submit to the ENGINEER, a Maintenance of Traffic Plan that shows the measures for traffic management during the well installation. This Plan shall include appropriate signage, barricades and/or temporary striping in accordance with the Florida Department of Transportation, Roadway and Traffic Design Standards, (Topic #625-010-003-6) and/or the Manual on Uniform Traffic Control Devices (MUTCD), Part VI, Standards and Guides for Traffic Controls for Street and Highway Construction, Maintenance, Utility, and Incident Management Operations.

1.8 ABANDONMENT

If the CONTRACTOR voluntarily stops work, and/or fails to complete in a satisfactory manner, in accordance with the regulations and/or Specifications and approved changes, the OWNER shall consider the project to be abandoned by him. If the OWNER declares the project abandoned by the CONTRACTOR, then no payment will be made. All salvageable material furnished by the CONTRACTOR may be removed and remain his property. Written approval from the OWNER shall be required before the CONTRACTOR is allowed to proceed.

1.9 GUARANTEE

The CONTRACTOR guarantees that the work and service to be performed under the Contract and all workmanship, materials, equipment performed, furnished, used, or installed in the work shall be free from defect and flaws, and shall be performed and furnished in strict accordance with the Contract documents; that the strength of all parts of all manufactured equipment shall be adequate and as specified; and that the performance test requirements of the Contract documents shall be fulfilled. The CONTRACTOR shall repair, correct or replace all damage to the work resulting from failures covered by the guarantee.

1.10 STANDBY TIME

The OWNER may ask the CONTRACTOR to stop operations so that extra work not included in these Specifications, such as testing and additional data collection, can be performed. The OWNER and ENGINEER shall schedule the request so it causes a minimum of delay. All standby time for which extra payment will be made shall be approved by the ENGINEER in writing in advance. The CONTRACTOR shall be reimbursed at hourly rates listed in the unit cost bid form.

1.11 REGULATORY REQUIREMENTS

The CONTRACTOR shall comply with all requirements and conditions of all permits related to the work of this contract and shall comply with provisions of any permits issued. Specifically, the CONTRACTOR shall be required to obtain coverage under the FDEP Generic Permit for the Discharge of Produced Groundwater. The CONTRACTOR shall be responsible for obtaining any necessary licenses and permits, and for complying with any applicable federal, state, and municipal laws, codes and regulations, in connection with the execution of the Work. The CONTRACTOR shall take proper safety and health precautions to protect the Work, the workers, the public and the property of others.

1.12 REFERENCE STANDARDS

All design, material and work shall be in strict accordance with all applicable governmental, regulatory and testing organizations including, but not limited to the following:

ANSI – American National Standards Institute
ASTM – American Society of Testing and Materials
AWWA – American Water Works Association
FDOH – Florida Department of Health
FDEP – Florida Department of Environmental Protection
FDOT – Florida Department of Transportation
NSF – National Sanitation Foundation
OSHA – Occupational Safety and Health Administration
CCHD – Collier County Health Department

Florida Building Code 2001 and Companion Codes as amended
TSSS – Recommended Standards for Sewage Works
TSSW – Recommended Standards for Water Works

1.13 NOISE CONTROL

Noise produced by field operations shall be kept to a minimum. Noisy operations shall be conducted whenever possible during daylight hours and scheduled to minimize duration. The CONTRACTOR shall comply with all applicable federal, state, and Collier County noise pollution control regulations. Noisy equipment shall be kept as far as possible from noise sensitive site boundaries. Equipment shall be properly maintained to reduce noise from excessive vibration, faulty mufflers, or other sources. No equipment shall be left idling unnecessarily.

1.14 RESPONSIBILITY AND HANDLING OF MATERIALS

The CONTRACTOR shall be responsible for all materials furnished by it and shall replace at its own expense all such materials found to be defective in manufacture or damaged in handling. The CONTRACTOR shall be responsible for the safe storage of materials. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times. All materials shall be delivered and distributed at the site by the CONTRACTOR. All casing, fittings, and accessories shall be loaded and unloaded so as to avoid shock or damage. Handling of casings and fittings shall conform to all manufacturers' recommendations. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

1.15 MONTHLY PROGRESS MEETINGS

The CONTRACTOR shall prepare for and provide a qualified representative to attend a monthly Construction Progress Meeting to be held at the construction site and attended by representatives of the ENGINEER and the OWNER. The CONTRACTOR shall provide an updated schedule and detail of work completed during the previous month and work anticipated to be completed during the upcoming month.

1.16 PROTECTION OF PROPERTY

The CONTRACTOR shall take special precautions to reduce to a minimum the nuisances and damage to property which could result from working in remote areas, residential areas, and adjacent to roads. As applicable, and as directed by the ENGINEER, the CONTRACTOR shall file a traffic control plan and obtain approval within the appropriate local, county, or state traffic departments. Any damage to public or private property shall be immediately repaired and paid for by the CONTRACTOR at no expense to the OWNER. Equipment, tools, and materials shall be located in places where they will produce a minimum of nuisance.

The remote location of the construction site presents an increased risk of vandalism and/or theft. The CONTRACTOR should take all measures to secure his equipment and to deter any criminal activity. Appropriate warning signs, including lighted warnings, shall be posted on the streets and the Collier County Sheriff's Department shall be informed of the location of the construction site.

1.17 CERTIFICATION OF CHEMICALS

All chemicals used during the project shall show approval of either USEPA or the U.S. Department of Agriculture (USDA) for use in and around public water supply wells. The CONTRACTOR shall submit the most recent Material Safety Data Sheets (MSDS's) in accordance with OSHA Rule 29 Code of Federal Regulations (CFR) 1910.1200 for each chemical to be used during the project. Two copies shall be furnished to the ENGINEER.

1.18 SITE VIDEO

The CONTRACTOR is required to take a digital video of pre- and post- construction site conditions of the well site and surrounding area to allow for clear comparisons of site conditions before and after the work is conducted.

1.19 SUBMITTALS

The CONTRACTOR is required to submit the following at least 10 days prior to the commencement of work:

1. Detailed work schedule
2. Well Construction Permits from Collier County Growth Management Division
2. FDEP Generic Permit to Discharge Produced Groundwater
3. Health and Safety Plan for the project
4. List of personnel that will be working on the project and their contact information
5. Relevant MSDS sheets for all chemicals to be used for the project
6. Name and address of any subcontractors used for the job
7. Name and site address of site for disposal of drilling fluids
8. Name and address of certified laboratory to be used for water testing
9. Manufacturer's specifications for all materials including casings, centralizers, and cement
10. Information on the type of well drilling rig to be used for the project
11. Calibration certificates for flow and water quality meters
12. Manufacturer's specifications on testing equipment including Submersible Test Pump, Rossum Sand Tester, Pressure Transducer/Datalogger, Turbidimeter, Calibration certificates for flow and water quality meter
13. Digital copy of pre-construction site video

The CONTRACTOR is required to submit the following at within 30 days after completion of all construction and testing.

1. CONTRACTOR's Daily Logs
2. Final copies of geophysical logs and videos
3. Water quality sampling results
4. Copies of all delivery tickets for cement if applicable
5. Digital copy of post-construction site video
6. State of Florida Water Well Completion Reports (form 62-532.900(2))for all new wells

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION

SECTION 01015
MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.1 REQUIREMENT

The CONTRACTOR shall receive and accept the compensation as provided in the Bid Form as full payment for furnishing all materials, labor, tools, equipment, and for performing all operations necessary to complete the WORK.

The prices stated in the Bid Form include all costs and expenses for taxes, labor, equipment, materials, traffic control and maintenance, commissions, transportation charges and expenses, patent fees and royalties, labor for handling materials during inspection, together with any and all other costs and expenses for performing and completing the WORK as shown on the Drawings and specified herein. The Basis for Payment for an item at the unit price shown shall be in accordance with the description of the item in this Section.

The Unit Prices for the various items of WORK are intended to establish a total price for completing the WORK in its entirety. Should the CONTRACTOR feel that the costs for any items of WORK has not been established by the Bid Form and this Section, he shall include the costs for that WORK in a related WORK item or in some other applicable bid item, so that his proposal for the project reflects his total price for completing the WORK in its entirety.

1.2 MEASUREMENT

The quantities for payment under this Contract Agreement shall be determined by actual measurement of the completed items, in place, ready for service and accepted by the OWNER, in accordance with the applicable method of measurement. A representative of the CONTRACTOR shall witness all field measurements. As built drawings shall reflect all changes so that field measurements will match the scaled plan drawings.

1.3 SAVINGS PROPOSALS

The CONTRACTOR may make proposals to change the WORK, which result in savings in the cost to perform the WORK. When such proposals are made, they will be referred to the OWNER for evaluation. If it is determined by the OWNER that the proposal provides the same level of service and if the OWNER accepts the change, the CONTRACTOR shall provide an estimate of the savings resulting from the proposed change. The OWNER and the CONTRACTOR shall share equally in the savings after all costs for evaluation and review by the OWNER have been deducted. A change order documenting the changes will be issued by the OWNER to incorporate the changes including the savings through revised Unit Prices.

1.4 ALLOWANCES

Allowances that may be included on the Bid Form will be performed in accordance with the General Conditions and will be paid for on the basis of the Cost of the Work.

Payment for items requiring excavation will be made at the Bid Form unit price for the size and type installed, which payment shall be full compensation for all excavation, including removal and proper disposal of rock, inorganic and organic unsuitable fill materials. Include the cost of removal and proper disposal of these materials in the item for which they are most closely associated.

1.5 MEASUREMENT AND PAYMENT ITEMS

Bid Schedule for the Construction of Three Production Wells:

The following information is provided as a convenience to the CONTRACTOR and while the OWNER utilized its best due diligence in the preparation of the data it makes no guarantee to its actual validity or accuracy.

Item 1: Mobilization, Demobilization, Maintenance of Traffic (MOT), Erosion Control, Site Restoration and Pre- and Post- site Videos

This Item applies to all wells. Payment will be made at the Bid Schedule Lump Sum Price for Mobilization, Demobilization, Maintenance of Traffic (MOT), Erosion Control, Site Restoration and Pre- an Post Video Log which includes such items as bonds, insurance, licenses and permits (not covered under "Allowance for Local Government Permits and Fees"), schedules, submittals, mobilization of equipment and personnel to the project site, erosion control, MOT, clean up, closeout and demobilization of equipment and personnel. Payment made at the Bid Schedule Lump Price shall also include, but is not limited to, restoration of surface features, removal and resetting of any private or public signs, markers, mailboxes, fences, repair and replacement of existing sprinkler pipe and heads and other appurtenances, filling and final grading of all disturbed areas within the project to provide positive drainage, removal of trees (upon approval by the County), removal and replacement of existing shrubs, bushes and other vegetation, surface preparation, fertilizing, restoration of lawn areas to include sodding to match existing grass surface, rolling/seating, seeding, mulching, hauling watering, watering, maintaining area until sod/grass is established and project or portion thereof is accepted by the County.

Item 2: Install Surface Casing

Payment will be made at the Bid Schedule unit price to drill a nominal 12-inch diameter pilot hole by mud rotary method to approximately 20 feet below land surface (BLS) or until the extent of surficial unconsolidated sediments is identified. Ream pilot hole to 30-inch diameter. Install and grout in place approximately 20 feet of 22-inch outer diameter surface casing. Note that casing

material and depth for surface casing are at the discretion of the CONTRACTOR with ENGINEER's approval.

Item 3: Drill 12-Inch Diameter Pilot Hole By Mud Rotary To 70 Feet Below Land Surface

Drilling of a 12-inch diameter hole by mud rotary method for each well will be paid at the unit price per foot and shall include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work. All wellbores drilled as part of this contract shall meet the plumbness and alignment criteria.

Item 4: Conduct Geophysical Logging to 70 feet Below Land Surface

Payment will be made at the Bid Schedule per unit price for each well to conduct geophysical logging and shall include, but is not limited to, furnishing all equipment, labor and materials required to conduct geophysical logging of the entire pilot hole. The geophysical logging shall include dual Induction and caliper/gamma.

Item 5: Ream the Pilot Hole Using a Nominal 22-inch Diameter Bit to Approximately 60 Feet Below Land Surface

Payment for reaming of the pilot hole using a nominal 22-inch diameter bit to approximately 60 Feet BLS in each well will be paid at the unit price and shall include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work. All wellbores drilled as part of this contract shall meet the plumbness and alignment criteria.

Item 6: Run Caliper Log and then Install 12-Inch Diameter Fiberglass Reinforced Plastic (FRP) Casing In Each Well to Approximately 60 feet Below Land Surface

Installing a 12-inch inside diameter FRP casing in each well will be paid for at the specified unit price. A caliper log of the borehole immediately prior the casing installation is included in this pay item. The said price per foot shall include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work.

Item 7: Grout Annular Space Between Casing And Borehole To Land Surface

Grouting the annular space between the casing and the borehole to land surface in each production and monitor well will be paid for at the specified unit price per linear foot and shall include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work.

Item 8: Drill Nominal 11-Inch Diameter Hole By Direct-Air from Approximately 60 Feet to 80 Feet Below Land Surface

Drilling of a nominal 11-inch diameter hole by direct air for each well will be paid at the unit price and shall include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work.

Item 9: Conduct Geophysical and Video Logging from Land Surface to 80 Feet Below Land Surface

Payment will be made at the Bid Schedule per each unit price to conduct geophysical and video logging and shall include, but is not limited to, all equipment, labor and materials required to conduct geophysical and video logging of the entire interior of the cased and open-hole sections of the well. The work shall also include, but is not limited to: 1) conducting the geophysical logging: a) dual induction, b) caliper, c) flowmeter (static and dynamic), d) borehole compensated sonic, e) fluid resistivity (static and dynamic), f) temperature, and g) video (static and synamic); 2) providing the COUNTY and/or the COUNTY's Representative four (4) high quality field copies of the geophysical logs and five (5) final copies of the geophysical logs along with an electronic version in a digital format acceptable to the COUNTY, 3) providing 5 copies of the video survey in a digital format acceptable to the COUNTY.

Item 10: Develop the Well with Air

Airlift development of the well shall be paid at the specified unit price per hour and include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work as specified.

Item 11: Develop the Well with Pump

Pumping development of the test and observation wells shall be paid at the specified unit price per hour and include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work as specified. Testing during pumping development shall include sand content and turbidity as specified.

Item 12: Conduct Specific Capacity Pumping Tests

Conducting specific capacity pumping tests in each test well shall be paid for an individual well basis and include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work as specified.

Item 13: Collect Water Samples for Primary and Secondary Drinking Water Standards

Collection of water samples for primary and secondary standards and analysis by a FDH certified laboratory shall be paid at the specified price.

Item 14: Install Wellhead Flange

Installation of a wellhead flange at an elevation to be provided by the ENGINEER, set at a minimum of 1.0 foot above the 100-year flood elevation, will be paid at the specified price in the Bid Schedule.

Item 15: Standby With Rig And Drilling Crew On-Site

This Item applies to all wells. If standby time is required with the rig and drilling crew on site, payment will be made at the specified unit price based on the number of hours required.

Item 16: Standby With Rig On-Site And Drilling Crew Off-Site

This Item applies to all wells. If standby time is required with the rig on site and drilling crew off site, payment will be made at the specified unit price based on the number of hours required.

Bid Schedule for the Construction of One Monitoring Well:

Item 17: Install Surface Casing

Payment will be at the bid schedule unit price per well to drill a nominal 12-inch diameter pilot hole by mud rotary method to approximately 20 feet below land surface (BLS) or until the extent of surficial unconsolidated sediments is identified. Ream pilot hole to 20-inch diameter. Install and grout in place approximately 20 feet of 14-inch outer diameter surface casing. Note that casing material and depth for surface casing are at the discretion of the CONTRACTOR with ENGINEER's approval.

Item 18: Drill 6-Inch Diameter Pilot Hole By Mud Rotary To 110 Feet Below Land Surface

Drilling of a 6-inch diameter hole by mud rotary method for the monitoring well will be paid at the unit price per foot and shall include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work. All wellbores drilled as part of this contract shall meet the plumbness and alignment criteria.

Item 19: Conduct Geophysical Logging to 110 feet Below Land Surface

Payment will be made at the bid schedule unit price for each well to Conduct Geophysical and shall include, but is not limited to, furnishing all equipment, labor and materials required to conduct geophysical logging of the entire pilot hole. The geophysical logging shall include dual Induction and caliper/gamma.

Item 20: Ream the Pilot Hole Using a Nominal 14-inch Diameter Bit to Approximately 100 Feet Below Land Surface

Payment for reaming of the pilot hole using a nominal 14-inch diameter bit to approximately 100 feet BLS in the monitor well will be paid at the unit price and shall include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work. All wellbores drilled as part of this contract shall meet the plumbness and alignment.

Item 21: Run Caliper Log and then Install 4-Inch Diameter Schedule 40 PVC Casing to Approximately 100 feet Below Land Surface

Installing a 4-inch inside diameter schedule 40 PVC well casing will be paid for at the specified unit price. A caliper log of the borehole immediately prior the casing installation is included in this pay item. The said price per foot shall include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work.

Item 22: Grout Annular Space Between Casing And Borehole To Land Surface

Grouting the annular space between the casing and the borehole to land surface in each test and observation well will be paid for at the specified unit price per linear foot and shall include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work.

Item 23: Develop the Well with Direct Air

Airlift development of the well shall be paid at the specified unit price per hour and include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work as specified.

Item 24: Develop the Well with Pump

Pumping development of the test and observation wells shall be paid at the specified unit price per hour and include the furnishing of all material, labor, tools, taxes, and equipment necessary to complete the work as specified. Testing during pumping development shall include sand content and turbidity as specified.

Item 25: Collect Water Samples for Primary and Secondary Drinking Water Standards

Collection of water samples for primary and secondary standards and analysis by a FDH certified laboratory shall be paid at the specified price.

Item 26: Install Wellhead Flange

Installation of a wellhead flange at an elevation to be provided by the ENGINEER, set at a minimum of 1.0 foot above the 100-year flood elevation, will be paid at the specified price in the Bid Schedule.

Surface Facilities Improvements (CDM Smith):

Item 27: Structural Slabs and Supports

Payment at the lump sum price bid for this item shall be full compensation for all labor, equipment, materials, and incidentals as specified in the plans and specifications necessary to construct concrete well pads and pipe supports. This item will include all clearing, grubbing, removal and disposal of unsuitable material, importing of clean fill, geotechnical and material testing, compaction, grading, topsoil, and sod.

Item 28: Process Mechanical Piping, Pump and Motors

Payment at the lump sum price bid for this item shall be full compensation for all labor, equipment, materials, and incidentals as specified in the plans and specifications necessary to construct the wellhead, pumps, motors, aboveground and below ground piping, meters, valves, air release valves, drop pipe, and miscellaneous fittings. This item also includes all excavation (including rock excavation), backfill, compaction, sheeting, shoring and bracing, drainage and dewatering, erosion control, fencing, grading, gravel, protection of existing utilities, chlorination and pressure testing of the piping, dewatering permit, connection to existing piping, grouting and removal and disposal of pipe to be abandoned. Any work or materials necessary for a complete and operational well not covered under any other bid item shall be included in this bid item.

Item 29: Electrical Improvements

Payment at the lump sum price bid for this item shall be full compensation for all labor, equipment, materials, and incidentals as specified in the specifications necessary to construct the complete electrical system associated with the wells. This items will include installation of conduit and wiring, electrical components, cabinets, cabinet sunshades, lightning protection, coordination with FPL.

Item 30: Instrumentation and Control Improvements

Payment at the lump sum price bid for this item shall be full compensation for all labor, equipment, materials, and incidentals as specified in the specifications necessary to construct the complete instrumentation and control system associated with the wells. Integrator shall be pre-approved by County.

Item 31: Well Startup and Testing

Payment at the lump sum price bid for this item shall be full compensation for all labor, equipment, materials, and incidentals for complete startup and testing of the wells and the provision of as-built drawings and equipment manuals.

Owner Directed Allowance
An allowance amount has been allocated by Collier County for this project. The allowance has been established to cover unanticipated costs including, but not limited to, additional quantities required due to unforeseen geologic conditions, and unforeseen site conditions. Use of the Allowance must be approved in advance by Collier County prior to the execution of the work. All work must be billed on a time and material price basis unless otherwise approved by Collier County.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01025
PERMITS AND FEES

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

The CONTRACTOR shall comply with all requirements and conditions of all permits related to the work of this contract and shall comply with provisions of any permits issued. The CONTRACTOR shall be responsible for obtaining any necessary licenses and permits, and for complying with any applicable federal, state, and municipal laws, codes and regulations, in connection with the execution of the Work. The CONTRACTOR shall take proper safety and health precautions to protect the Work, the workers, the public and the property of others.

The CONTRACTOR shall obtain and pay for any permits and licenses required to complete the project except for those permits obtained by the OWNER as listed below.

The CONTRACTOR shall schedule all necessary inspections with the regulatory agencies to be in compliance with the permits.

1.2 PERMITS BY OWNER

The OWNER has secured or will secure the following permits:

1. South Florida Water Management District – Consumptive Use permit
2. FDEP Wastewater Facility Minor Modification Permit
3. Collier County Insubstantial Change to a Site Development Plan

1.3 PERMITS BY CONTRACTOR

The CONTRACTOR shall be responsible for obtaining the Well Construction Permit from the County.

To accomplish direct-air drilling and development, the CONTRACTOR shall secure the FDEP Generic Permit for the Discharge of Produced Groundwater and/or NPDES Permit.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION

DIVISION 02
SITE CONSTRUCTION
SECTION 02005
SITE PREPARATION

PART 1 – GENERAL

1.1 SITE PREPARATION

The wells are located in a fenced-in compound or easements by the road controlled by the OWNER. The CONTRACTOR shall coordinate site access with the OWNER. Access to the County wellfield shall be limited to the CONTRACTOR's employees and subcontractors. Clearing of vegetation for equipment setup at the well site may be necessary. The CONTRACTOR shall take precautions to avoid damage to OWNER's property. Any damage to public or private property shall be repaired or paid for by the CONTRACTOR at no expense to the OWNER.

1.2 MOBILIZATION

Mobilization shall include all items required for the proper completion of the work. The CONTRCTOR shall bring to the site all necessary equipment required for the first month's operation. Work elements pertaining to mobilization shall include, but not limited to:

- Installation of silt fences around the construction site and where surface drainage discharges to existing stormwater inlets
- Establish a safety protocol
- Secure construction utility requirements (water supply, electrical, etc.)
- Install onsite sanitary facilities
- Submit all insurance and bond requirements
- Secure all necessary permits
- Post all notices required by regulatory agencies (OSHA, FDEP, etc.)
- Post the "No Trespassing" sign and other relevant project signs for well sites in public areas
- Submit a detailed project schedule acceptable to the ENGINEER
- Submit a Hurricane Preparedness Plan if required by the ENGINEER
- Prepare and implement traffic maintenance and control plans

1.3 SEDIMENTATION AND EROSION CONTROL

The CONTRACTOR shall not discharge any fluids generated during this project to any surface water body without first obtaining an FDEP Generic Permit for the Discharge of Produced Groundwater. The CONTRACTOR will be responsible for containment of all fluids within the existing stormwater swales and insuring that produced water does not run off into adjacent

protected or environmentally sensitive areas or private land. The CONTRACTOR will be responsible for installation of appropriate erosion and sedimentation control measures such as silt fencing, hay bales, ditch blocks, temporary sediment traps, and/or containment berms. All erosion and sedimentation control measures employed shall be installed to the standards set forth by the Florida Stormwater Erosion and Sedimentation Control Inspector's Manual and shall be approved by ENGINEER.

1.4 DRILLING FLUID AND DRILL CUTTINGS HANDLING AND DISPOSAL

Disposal of drilling fluid onsite is not permitted. A closed-circulation system shall be used for the drilling fluids, employing suitable devices such as screens, shale shakers, and settling tanks to remove cuttings. Drilling fluid shall be removed from the drilling site and disposed of at an approved location. The CONTRACTOR shall furnish to the ENGINEER and OWNER, prior to beginning construction, the name and location of the disposal site along with documentation that the site has been approved by the appropriate regulatory agencies. The fluid displaced from the borehole during cementing operations shall be considered excess drilling fluid and shall be disposed of in an approved manner. All costs of disposal shall be included in the unit cost for borehole drilling.

1.5 SITE RESTORATION AND DEMOBILIZATION

Upon completion of the work, the CONTRACTOR shall disassemble all temporary piping and equipment modifications from the site and demobilize. The CONTRACTOR shall remove all equipment which is not part of the well and leave the site in a condition acceptable to the OWNER. The CONTRACTOR shall broom clean exterior paved surfaces and rake clean other adjacent surfaces of the grounds. The CONTRACTOR shall return the Site to original condition as defined by the ENGINEER.

Restoration of surface features, removal and resetting of any private or public signs, markers, mailboxes, fences, repair and replacement of existing sprinkler pipe and heads and other appurtenances, filling and final grading of all disturbed areas within the project to provide positive drainage, removal of trees (upon approval by the County), removal and replacement of existing shrubs, bushes and other vegetation, surface preparation, fertilizing, restoration of lawn areas to include sodding to match existing grass surface, rolling/seating, seeding, mulching, hauling watering, watering, maintaining area until sod/grass is established and project or portion thereof is accepted by the OWNER shall be required.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)END OF SECTION

SECTION 02010
TEMPORARY UTILITIES

PART 1 – GENERAL

1.1 UTILITY REQUIREMENTS

A. WATER SUPPLY

The CONTRACTOR shall provide the OWNER and ENGINEER a description of his water supply needs at a required pre-construction meeting. The CONTRACTOR shall provide for himself any clean, fresh water that he requires for the work described in these Specifications. If the OWNER provides water, the CONTRACTOR is responsible for metering the volume of water supplied by the OWNER to the OWNER's satisfaction. CONTRACTOR shall maintain any temporary supply line with backflow prevention as required by the OWNER. The CONTRACTOR shall be responsible for securing any other permits, licenses, or approvals that shall be obtained from the South Florida Water Management District, Collier County, or any other local regulatory entity.

B. ELECTRICITY

All electric current required by the CONTRACTOR shall be furnished at his own expense. All temporary lines shall be furnished, installed, connected, and maintained by the CONTRACTOR in a workmanlike manner satisfactory to the OWNER and ENGINEER and shall be removed by the CONTRACTOR in like manner at his expense at the completion of the work. All temporary electrical fixtures, lines, and related equipment and installation shall be in accordance with applicable county and state regulations.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION

DIVISION 13
SPECIAL CONSTRUCTION
SECTION 13005
PRODUCTION WELL

PART 1 – GENERAL

1.1 SCOPE OF WORK

The Scope of Work for this project includes furnishing all labor and materials for the installation and testing of three Lower Tamiami Aquifer Production Wells and one Lower Tamiami Aquifer Monitoring Well for Collier County (refer to Figure 1 for well locations). The CONTRACTOR shall provide all the materials and equipment required to accomplish the work as described below. All work is to be completed in the presence of the ENGINEER.

The CONTRACTOR is advised and should be aware of difficult drilling conditions and problems he may encounter during the drilling, construction, and testing of the wells. Difficult drilling conditions and problems include, but are not limited to, lost circulation, cavities, potential squeezing zones and sand intervals, along with attendant caving problems.

PART 2 – PRODUCTS

2.1 SURFACE CASING

All casings shall be new, approved for use in municipal public supply wells and to specifications as outlined under Construction Sequence for Wells section. The contract will indicate an estimate of the amount of casing for the well; however, actual field conditions will dictate the exact amount of casing.

A surface casing shall be installed with an inside diameter sufficient to accommodate a drilling bit capable of drilling the specified borehole dimensions. The material, length, and method of installation shall be at the CONTRACTOR's option subject to approval by the ENGINEER.

2.2 FINAL CASING

For the three production wells, the final casing string shall be nominal 12-inch internal diameter, perfectly round, new and unused, Burgess "EON" Fiberglass Reinforced Plastic (FRP) or equivalent FRP casing approved for use in public supply production wells. For the one monitoring well, the final casing string shall be nominal 4-inch internal diameter, schedule 40 PVC well casing. The casing shall be approved by the National Sanitation Foundation (NSF) for use with potable water. The casing shall be of sufficient collapse resistance and tensile strength to withstand downhole stress during construction and development of the well or an equivalent approved by the ENGINEER and shall be free of defects in workmanship and handling.

2.3 ANNULAR GROUT

Sulfate resistant cement shall be used for all casing cementing operations. The final well casing grout shall be sulfate resistant API Class B (ASTM Type II) Portland cement mixed with no more than 5.2 gallons of water per sack of cement. Surface casing grout may be API Class A (ASTM Type I) cement mixed with no more than 5.2 gallons of water per 94 pound sack. If the proposed cement types are not available, the CONTRACTOR shall propose alternative cement types and submit specifications for ENGINEER's consideration and approval. Only fresh water may be used for grout mix. A cementing plan for each stage of cement shall be submitted to the ENGINEER for approval prior to emplacement of any cement grout. The first stage of each production well cementing operation shall be performed using the pressure grout method. For all subsequent stages, performed using the tremie method, the top of cement shall be accurately tagged and the bottom of the tremie pipe shall be set no more than five (5) feet above the bottom of the interval to be grouted. The first cement stage and the basal 50 feet emplaced around the final production well casing shall be neat cement. Cement with up to 5% bentonite gel additive shall be used to cement the casings (except the bottom 50 feet as discussed above). All cement blends shall be approved by the ENGINEER in advance of placement, and the CONTRACTOR shall make provisions to pump more or less cement during specific stages as directed by the ENGINEER.

2.4 CENTRALIZERS

All production well final casings shall be fitted with Halliburton-type centralizers with steel straps at 0, 90, 180, and 250 degrees around the casing at each position. The CONTRACTOR shall attach the centralizers with stainless steel bands. Shop drawings of the centralizer shall be submitted to the ENGINEER for approval prior to installation. The centralizers shall be located as follows: one set 5 feet above the base of casing, one set at 30 feet BLS, and one set at 20 feet BLS.

2.5 DRILLING FLUID

No drilling fluid other than clear potable water will be used in the open hole section of the production wells below the final casing. Drilling fluids used during drilling of the pilot hole and the reaming of the cased portion of hole and open hole of the monitoring well shall be approved for use in construction of municipal public supply wells and shall be bentonite based. The addition of drilling additives such as polymers or surfactants shall require pre-approval by the ENGINEER.

PART 3 – EXECUTION

3.1 CONSTRUCTION SEQUENCE

The monitoring well shall be installed first followed by the production wells.

Monitoring Well

1. Perform pre-construction site video, mobilize equipment and prepare site.

2. Drill a nominal 12-inch diameter pilot hole by mud rotary method to approximately 20 feet BLS. Ream pilot hole to a nominal 20-inch diameter. Install and grout in place approximately 20 feet of 14-inch diameter surface casing to the satisfaction of the ENGINEER.

3. Drill a nominal 6-inch diameter borehole to a depth of approximately 110 feet using the mud rotary method. All wellbores drilled as part of this contract shall meet the plumbness and alignment conditions set forth in Section 3.4 below.

4. Prepare the hole for geophysical logging by circulation of the drilling fluid until it is uniform and free of drill cuttings. Perform geophysical logging (caliper/gamma/dual Induction).

5. Ream pilot hole to a nominal 14-inch diameter borehole to a depth of 100 feet BLS. Perform geophysical logging (caliper)

6. Set 4.0-inch inside diameter PVC Schedule 40 casing equipped with rubber boot or cement basket at the base, and centralizers as specified to a depth of 100 feet BLS. The rubber boot/cement basket at the base of the casing should be capable of holding cement without leaking into the open hole during the grouting process.

7. Grout the annular space to land surface in stages by the tremie grout method. The first stage of cementing shall be designed to provide only 10 feet of lift. The basal 50 feet of grout shall be neat. Subsequent cementing stages may contain up to 5% bentonite. The cement grout shall meet the specifications within Section 13005, Part 2.3 ANNULAR GROUT, and shall be installed per Section 13005, Part 3.3 CEMENTING PROCEDURES.

8. Clean out the open hole to a depth of 110 feet BLS with a nominal 4.0-inch drilling bit and clear drill cuttings from the open hole.

9. Develop the well for up to 8 hours using the direct-airlift method. Water shall be clear and free of sediment after development as per SECTION 13005, PART 3.7 WELL DEVELOPMENT

10. Collect water samples for primary and secondary drinking water standards, deliver samples to a laboratory approved by the ENGINEER, and submit complete laboratory analysis results to the ENGINEER within 1 month of completion of the sampling. Sampling for required field parameters shall be conducted by a representative of the approved

laboratory and shall be according to FDEP approved SOP *FS 2200 Groundwater Sampling.* Refer to Section 13015 WELL TESTING for specific testing requirements.

11. Install a wellhead flange at an elevation to be provided by the ENGINEER, set at a minimum of 1.0 foot above the 100-year flood elevation.

12. Perform post-construction site video, demobilize equipment and restore site. Remove all drill cuttings and drilling fluids for disposal at a location approved by the ENGINEER. The wells shall be left clean, free of oils, grease, or other substances used during well construction and testing.

Production Wells

1. Perform pre-construction site video, mobilize equipment and prepare site.

2. Drill a nominal 12-inch diameter pilot hole by the mud rotary method to approximately 20 feet BLS. Ream the pilot hole to a nominal 30-inch diameter. Install and grout in place approximately 20 feet of 22-inch diameter surface casing to the satisfaction of the ENGINEER.

3. Drill a nominal 12-inch diameter borehole to a depth of approximately 70 feet using the mud rotary method. All wellbores drilled as part of this contract shall meet the plumbness and alignment conditions set forth in Section 3.4 below.

4. Prepare the hole for geophysical logging by circulation of the drilling fluid until it is uniform and free of drill cuttings. Perform geophysical logging (Dual Induction, Gamma Ray/Caliper) as per Section 13010 GEOPHYSICAL LOGGING

5. Ream pilot hole using a nominal 22-inch diameter bit to approximately 60 feet BLS.

6. Prepare the hole for geophysical logging by circulation of the drilling fluid until it is uniform and free of drill cuttings. Perform geophysical logging (caliper). Immediately set 12-inch inside diameter Fiberglass Reinforced Plastic (FRP) casing with centralizers as specified.

7. Grout the annular space to land surface in stages, with the first stage being neat cement by the pressure grout method. The basal 50 feet of grout shall be neat. Subsequent cementing stages shall be by the tremie method and may contain up to 5% bentonite. The cement grout shall meet the specifications within Section 13005, Part 2.3 ANNULAR GROUT, and shall be installed per Section 13005, Part 3.3 CEMENTING PROCEDURES.

8. Drill a nominal 11-inch diameter hole by air rotary method to approximately 80 feet BLS.

9. Conduct geophysical logging from total depth to land surface, to include dual induction, gamma ray/caliper, flowmeter (static and dynamic), conductivity/temperature (static and dynamic), borehole compensated sonic and video logs as per Section 13010 GEOPHYSICAL LOGGING.

10. Develop the well for up to 8 hours. Water shall be clear and free of sediment after development as per SECTION 13005, PART 3.7 WELL DEVELOPMENT

11. Install a submersible test pump capable of pumping up to 1000 gpm and conduct high rate pumping and surging for up to 8 hours. Discharge assembly will include throttling valve and totalizing flowmeter. Testing for sand content and turbidity will be conducted during pump development as per Section 13005, Part 3.7 WELL DEVELOPMENT and Section 13015 WELL TESTING

12. Using a submersible test pump, set at an approximate depth of 40 to 50 feet BLS, conduct a five-step specific capacity pumping test with a step duration ofone hour per pumping rate. Refer to Section 03015 WELL TESTING for specific testing requirements.

13. Collect water samples for primary and secondary drinking water standards, deliver samples to a laboratory approved by the ENGINEER, and submit complete laboratory analysis results to the ENGINEER within 1 month of completion of the sampling. Sampling for required field parameters shall be conducted by a representative of the approved laboratory and shall be according to FDEP approved SOP *FS 2200 Groundwater Sampling.* Refer to Section 13015 WELL TESTING for specific testing requirements.

14. Install a wellhead flange at an elevation to be provided by the ENGINEER, set at a minimum of 1.0 foot above the 100-year flood elevation.

15. Perform post-construction site video, demobilize equipment and restore site. Remove all drill cuttings and drilling fluids for disposal at a location approved by the ENGINEER. The wells shall be left clean, free of oils, grease, or other substances used during well construction and testing.

3.2 DRILLING METHODS

It is essential that turbid water produced from any source during the drilling operations is prevented from entering surface water features. Any water produced during drilling shall be confined in a closed-circulation system. Alternatively, the CONTRACTOR may route the produced water to a storm water discharge location if approved by the regulatory agencies and necessary permits are obtained.

The conventional mud-rotary method shall be employed for all drilling through the final casing setting depth for the production wells and total depth for the monitoring well. Portable mud

systems shall be used by the CONTRACTOR during mud rotary drilling. No in-ground pits will be allowed. All drilling below the base of the final casing of the production wells shall be done by the direct-air rotary method or other approved method by the Engineer. During all reaming operations, the CONTRACTOR shall either incorporate the use of a lead bit or stinger and staged drilling assembly to facilitate the tracking of the pilot holes or install a stabilizer assembly with the lead bit having the same nominal diameter as the pilot hole bit.

For production wells, the direct-air method shall be employed for all drilling below the final casing setting depth. Cleaning the borehole of cuttings is of upmost importance during this phase of drilling and the returns of cuttings shall be demonstrated by the CONTRACTOR before drilling is allowed to proceed below the casing. Drilling mud will not be permitted to be used in the open hole drilling of the production wells. The CONTRACTOR shall provide adequate size and capacity of drill pipe, airline, and air compressor to insure complete cuttings removal during drilling. The CONTRACTOR will be required to make at least two wiper passes of the previously drilled section of borehole and demonstrate that cuttings are fully removed before proceeding to make a drill pipe connection and resuming drilling.

3.3 CEMENTING PROCEDURES

Cementing shall be performed using a collarless tremie pipe. Prior to all stages of cementing, the CONTRACTOR shall circulate drilling fluid through the tremie pipe until at least one annular borehole volume of fluid has been circulated to insure that the annulus is free of sediment. During all stages of cementing, the CONTRACTOR shall pump a pre-flush or spacer. Cement shall be placed in such a manner that no voids shall exist between the outer well casing and formation.

For the casing cementing operations for production wells, the first stage shall be pressure grouted in a manner consistent with the American Water Works Association (AWWA) Standard for Water Wells (AWWA A100-84), Section B.4 (or the most recent version) by the Interior Method – Without Plug. The CONTRACTOR shall wait for the cement to cure for a minimum of 12 hours after the completion of each pressure-grout cementing operation before conducting a second cementing event on the same casing.

After the initial pressure-grout stage, the annular space outside of well casing shall be cemented in a manner consistent with the AWWA Standard for Water Wells (AWWA A100-84), Section B.3 (or the most recent version) by the Positive Placement - Exterior Method. All stages of cementing to install the monitoring well casing shall be performed by the Positive Placement - Exterior Method. After each stage of cementing (except when returns are observed at the land surface), and before the next stage, the CONTRACTOR shall tag the top of the cement with a collarless tremie pipe. This method of cementing applies to all cementing procedures on all casings.

Cementing procedures shall be continuous for each stage after cementing begins. If loss of circulation or no return of cement occurs , the ENGINEER shall be notified immediately of what remedial measures are underway to re-establish the circulation and complete the cementing

program according to the well design and specifications. The CONTRACTOR shall submit cement-mix designs to the ENGINEER for approval, including Technical Specifications for the pre-flush and the cementing procedures with calculations, prior to the commencement of cementing operations for each stage of cementing.

All cement blends shall be approved by the ENGINEER in advance of placement, and the CONTRACTOR shall, upon request by the ENGINEER, make provisions to pump more or less cement during specific stages as directed by the ENGINEER. The CONTRACTOR shall also submit to the ENGINEER cement plans for each stage of cement mixture to be emplaced; the cementing plan shall contain the cement slurry density, the proposed volume of cement to be emplaced, and the theoretical lift in linear feet of the cement stage based on the annular borehole volume measurements provided by the caliper logging of the reamed hole.

After cementing the final casing, a minimum of 24 hours shall elapse before drilling or any other work in the well resumes, to allow the cement to harden without disturbance. No standby time shall accumulate during this time period. When casing is being set and cemented in place, it is the CONTRACTOR's responsibility to ensure that these operations are conducted in such a manner that the collapse and burst strengths (with safety factor) are not exceeded and the casing is not caused to fail.

3.4 FORMATION AND WATER SAMPLES

A representative of the CONTRACTOR shall collect formation and water samples during drilling for ENGINEER's review. Formation samples shall be collected continuously and bagged every 5 feet. Clear water samples shall be collected every 10 feet during open hole drilling from the discharge point and at the time of connection of each drill rod. The CONTRACTOR shall provide an appropriate sampling port in the discharge line for collection of water samples by the ENGINEER.

3.5 WELL PLUMBNESS AND ALIGNMENT

The completed well shall be sufficiently plumb and straight so that there will be no interference with installation, alignment, operation, or removal of the test pump. Plumbness and alignment testing shall be at the discretion of the ENGINEER. The testing, should it be required, will be according to AWWAA 100-06 Standards for Plumbness and Alignment.

Should the ENGINEER request, the alignment shall be tested by lowering into the well to a depth of at least 40 feet, a section of pipe 20 feet long or a dummy of the specified pump length. The outer diameter of the test pipe or dummy shall not be more than 1-inch smaller than the inside diameter of that part of the casing or hole being tested. The lowered unit shall pass freely through the entire tested depth.

3.6 WELL TOP TERMINATIONS

At all times during the progress of the work and at completion, the CONTRACTOR shall use reasonable precautions to prevent either tampering with any of the wells or the entrance of foreign material into any of the wells. At the end of each work day, each well shall be sealed to prevent introduction of any foreign material. Refer to Figures 1 to 3 for well location and construction details. The final flange elevation shall be at a height of 1.0 foot above the hundred-year flood elevation, final elevation to be provided by the ENGINEER.

3.7 WELL DEVELOPMENT

A. DEVELOPMENT WITH AIR

The CONTRACTOR shall air develop each well, using direct air in the open-hole, until, to the satisfaction of the ENGINEER, the discharge water is free of sediment. The CONTRACTOR shall utilize an air compressor with a minimum capacity of 375 cubic feet per minute at 125 pounds per square inch (psi). The CONTRACTOR shall place the drill stem in the open-hole section and vary this height during air development to enhance development of the entire open-hole section. The CONTRACTOR shall frequently and regularly surge the well.

B. DEVELOPMENT WITH PUMP

The CONTRACTOR shall install a test pump capable of 1000 gpm at a depth of between 40 to 50 feet below top of casing at the direction of the ENGINEER and conduct high rate pump development for up to 8 hours. The contractor shall frequently and regularly surge the well using the test pump. The CONTRACTOR will supply, install, and operate all of the equipment required for sand content and turbidity testing during pump development. An acceptable criteria for a developed well includes a sand level of less than 5 milligrams/liter and a turbidity level of less than 5 NTU when pumped; however, the ENGINEER has the discretion to decide when the development should stop. Refer to Section 13015 WELL TESTING for the testing requirements.

END OF SECTION

SECTION 13010
GEOPHYSICAL LOGGING

PART 1 – GENERAL

1.1 REQUIREMENTS

The CONTRACTOR shall provide all work, materials, and equipment necessary to prepare the borehole/well for geophysical logging.

If a geophysical logging company is utilized as a subcontractor, the CONTRACTOR may be required to provide documents to show that the geophysical logging specialist has adequate experience to perform the specified logging and shall be approved in advance by the ENGINEER. When the boreholes have been drilled to depths described below, they shall be prepared for geophysical logging. Borehole preparation shall include, but not be limited to: 1) continuation of circulation until drill cuttings have been removed from the borehole; and 2) during mud rotary drilling, circulation of the drilling mud in the borehole until it is uniform. The CONTRACTOR shall make all reasonable efforts to leave the borehole free from obstructions in preparation for geophysical logging. The log(s) shall be printed immediately following the completion of borehole preparation unless otherwise stipulated by the ENGINEER.

The following sequence of logging shall be performed by the geophysical logging company for the production wells:

1. Following the 12-inch diameter pilot hole drilling to 70 feet BLS, perform the following geophysical logs:

    - Dual Induction
    - Gamma Ray
    - Caliper

2. Following the 22-inch diameter borehole reaming to 60 feet BLS and immediately prior to the final casing installation, perform the following geophysical logs:

    - Caliper

3. Following the final casing installation and 11-inch diameter open hole drilling to 80 feet BLS, perform the following geophysical logs:

    - Dual Induction
    - Gamma Ray
    - Caliper
    - Flowmeter (Static and Dynamic)

- Fluid Resistivity (Static and Dynamic)
- Temperature (with differential plot)
- Sonic (Borehole Compensated)
- Television Survey (Static and Dynamic)

The following sequence of logging shall be performed by the geophysical logging company for the monitoring well:

1. Following the 6-inch diameter drilling of the borehole to 110 feet BLS, perform the following geophysical log:

    - Caliper
    - Gamma Ray
    - Dual Indiction

2. Following the 14-inch diameter borehole reaming to 100 feet BLS and prior to installation of casing, perform the following geophysical logs:

    - Caliper

The CONTRACTOR shall be responsible for the preparation of the borehole/well for geophysical logging.

The CONTRACTOR shall assist the ENGINEER during geophysical logging and data collection as needed.

PART 2 – PRODUCTS

The CONTRACTOR shall provide all equipment necessary for logging of borehole/well complete.

The CONTRACTOR shall provide the ENGINEER with two (2) original and five (5) hard copies of each geophysical log completed and electronic versions of the logs as required by the ENGINEER. Electronic copies of logs will be provided to the ENGINEER in both pdf and ASCII format. The pdf formatted logs shall be formatted to print on multiple 8.5 x 11” pages.

PART 3 – EXECUTION

3.1 LOGGING

Geophysical logging shall be done as soon as possible after the drilling and preparation of the pilot hole. The logging interval shall be the total depth of the pilot hole or as determined by the ENGINEER. All logging shall be done during daylight hours unless approved by the ENGINEER. The CONTRACTOR shall notify the ENGINEER 24 hours in advance of any logging event.

The CONTRACTOR shall remove all drill cuttings in the borehole and condition the hole to prevent the formation from collapsing. The CONTRACTOR shall be responsible for keeping the borehole open and free from obstruction during geophysical logging and shall remove any obstruction to the logging tools at his/her own expense. In the event that the logging tools do not reach to within five feet of the hole, as measured by the length of the drill pipe, the CONTRACTOR shall then clean the hole to the original depth at his/her own expense. The logs shall then be rerun at the CONTRACTOR's expense.

The CONTRACTOR shall provide access down the well for data collection and geophysical logging, if requested by the ENGINEER. This may require the test pump to be removed and reinstalled to facilitate static and dynamic logging.

All television surveys refer to radial surveys using a camera tool equipped with a side-view rotating lens. The means and methods of obtaining a clear television image is at the discretion of the CONTRACTOR, subject to good construction practices and existing regulations. The CONTRACTOR should anticipate and allocate a sufficient period of time to achieve the water clarity necessary to obtain a television survey.

END OF SECTION

SECTION 13015
WELL TESTING

PART 1 – GENERAL

1.1 TEST REQUIREMENTS

The CONTRACTOR shall furnish and install the necessary appurtenances and pumping equipment capable of pumping 1000 gpm with flow control so that the discharge may be reduced to 200 gpm. The CONTRACTOR shall furnish a gate valve and flowmeter (or orifice plate and manometer), to control and measure discharge. The CONTRACTOR shall provide access ports on the well for use of an electrical water level meter and install pressure transducers capable of collecting barometrically compensated data for step-drawdown testing. The discharge rate may be varied at the ENGINEER'S direction. Discharged water shall be conveyed from the pumped well to the nearest stormwater drainage or ditch, as approved by the ENGINEER and as permitted by an applicable NPDES permit. Storm drains shall be protected by sediment screens and hay bales.

PART 2 – PRODUCTS

2.1 EQUIPMENT REQUIRMENTS

A. ROSSUM SAND TESTER

The CONTRACTOR shall provide, install, and operate a Rossum Sand Tester or equal during pump development and during step drawdown testing.

B. TURBIDITY METER

The CONTRACTOR shall provide and operate a turbidity meter during pump development and during step drawdown testing. The meter shall be capable of reading turbidity in nephelometric turbidity units (NTUs) in a range between 0 and 100 NTUs. The meter equipment shall include factory calibration standards including 0 and 100 NTU samples which shall be within the manufactures expiration dates.

C. ELECTRONIC WATER LEVEL MEASURING TAPE

The CONTRACTOR shall provide an electronic water level tape to manually measure the water level in the well from the top of the casing. The measuring tape shall have markings in increments of 1 foot, $1/10^{th}$ foot, $1/100^{th}$ foot and shall have an audible signal and a light to indicate the probe is in contact with water.

D. DATA LOGGER

The CONTRACTOR shall provide an In-Situ Level Troll 700 data logger or equal to measure the barometrically compensate drawdown in the well. The data logger shall be capable of programming data collection frequency in an incremental series and at differing collection intervals. The data logger shall be capable of providing the data in Excel format.

E. FLOW METER

The CONTRACTOR shall provide an inline flowmeter capable of measuring instantaneous flow and providing totalized readings on the discharge line.

F. TEST PUMP

The CONTRACTOR shall use a submersible test pump capable of pumping between 200 and 1000 gpm. The CONTRACTOR shall provide the necessary power for the test pump with an appropriate generator and all necessary electric controls for safe operation of the test pump. The CONTRACTOR shall submit the pump manufacturer specifications and pump curve to the ENGINEER for approval prior to installation of the test pump. The test pump shall be installed on 6-inch diameter riser pipe to a depth of between 40 and 50 feet below land surface. The test pump shall be equipped with a minimum ¼ inch diameter stainless steel support cable connected to the wellhead at the surface and to the pump body.

PART 3 – EXECUTION

A. SAND CONTENT TESTING

Prior to initiating pumping development, the CONTRACTOR shall install a Rossum Sand Tester on the pump discharge piping at an accessible location and according to manufacturer's guidelines. The sand tester shall be installed at a location of turbulent flow immediately (within 1 foot) downstream of a 90 degree elbow or other flow restriction. The mounting location and configuration of the sand tester shall be approved by the ENGINEER prior to installation. There shall be adequate backpressure on the sand content tester to achieve a minimum of ½ gallon per minute flow through the device and there shall be a control valve between the tester and the discharge piping. Sand content tests will be conducted on an hourly frequency during pumping development.

B. TURBIDITY TESTING

The CONTRACTOR shall provide a calibrated turbidity meter as specified and shall collect grab samples for turbidity at ½ hour intervals during pump development.

C. STEP DRAWDOWN TESTING

The step-drawdown shall consist of 5 one-hour steps to be run at rates to be determined by the ENGINEER (range is expected to be between 200 gpm and 1000 gpm). The CONTRACTOR shall collect background water level data for a minimum of 12 hours prior to the test using the datalogger. The test will be conducted to incrementally increase the well discharge rate for the five steps. After a 12 hour rest period, the step rate test will commence with the pump operated to maintain a constant pumping rate specified for each interval. Water levels in the pumping well shall be measured and recorded by the driller using an electric water level measuring tape and a data logger. Manual water levels measurements shall be made at a minimum of once every minute during the first 5 minutes of each step and every 5 minutes for the remainder of each step. Upon completion of the test, recovery measurements shall be made for a period of 12 hours using the datalogger. The datalogger shall be programmed to measure and record water level readings at 1-minute intervals for the duration of background, pumping, and recovery phases of the test..

D. WATER QUALITY TESTING

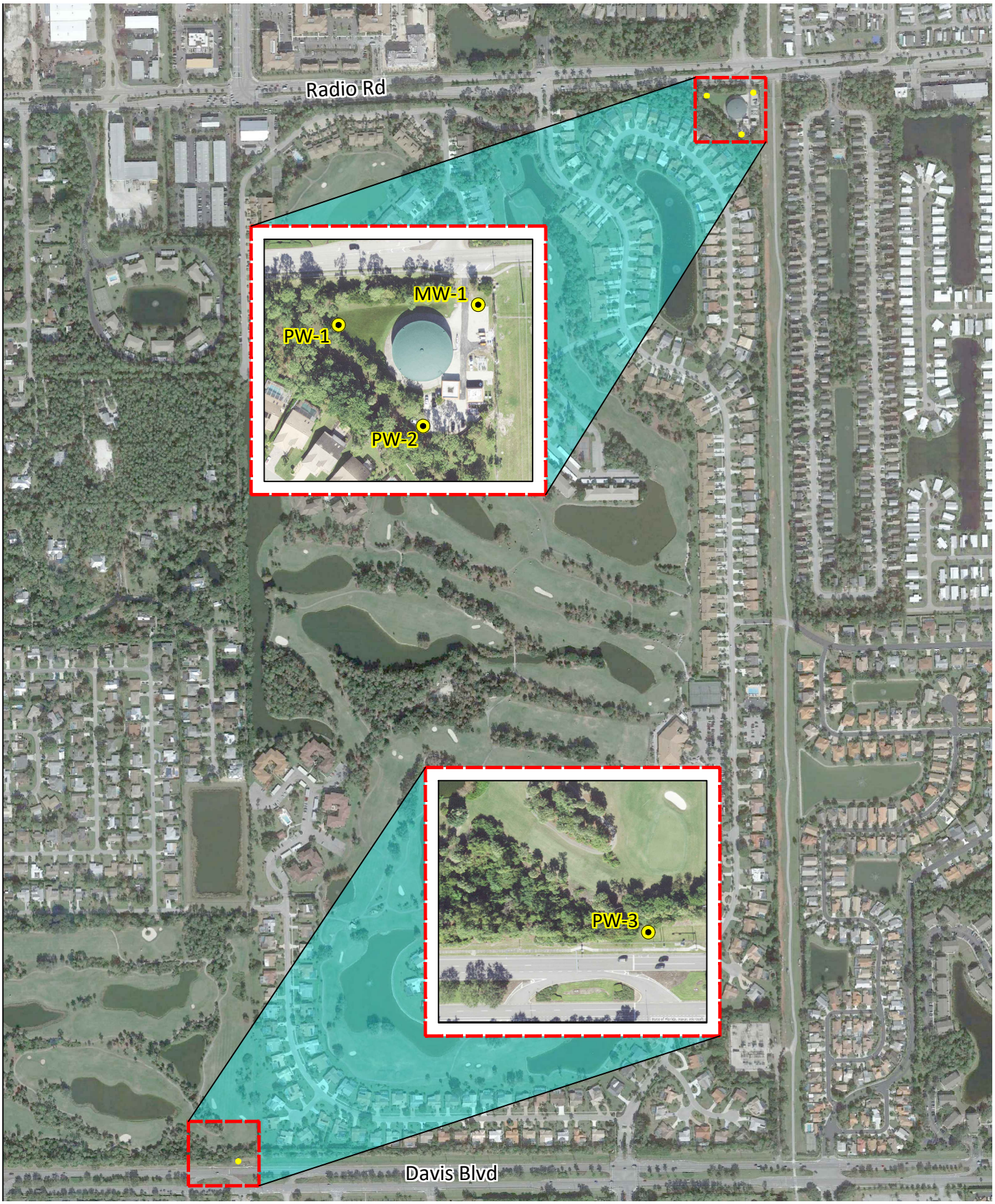
The CONTRACTOR shall contract with a laboratory approved by the Florida Department of Health to collect and analyze the required Primary and Secondary drinking water standard samples according to FDEP SOP *FS 2200 Groundwater Sampling*. The CONTRACTOR will ensure that the laboratory representative performs the required stabilization parameter measurements prior to sampling. The CONTRACTOR shall collect open hole water samples and utilize a licensed laboratory for analysis of selected water quality parameters as follows.

1. During open hole drilling a water sample shall be collected from the well every 10 feet for analysis of dissolved chlorides and conductivity. The CONTRACTOR shall provide the results of laboratory analysis of these samples.

2. At the end of the step-drawdown test (or well development for the monitoring well), the well shall be sampled and analyzed for Primary and Secondary drinking water standards listed in F.A.C 62-550, including the radiological parameters.

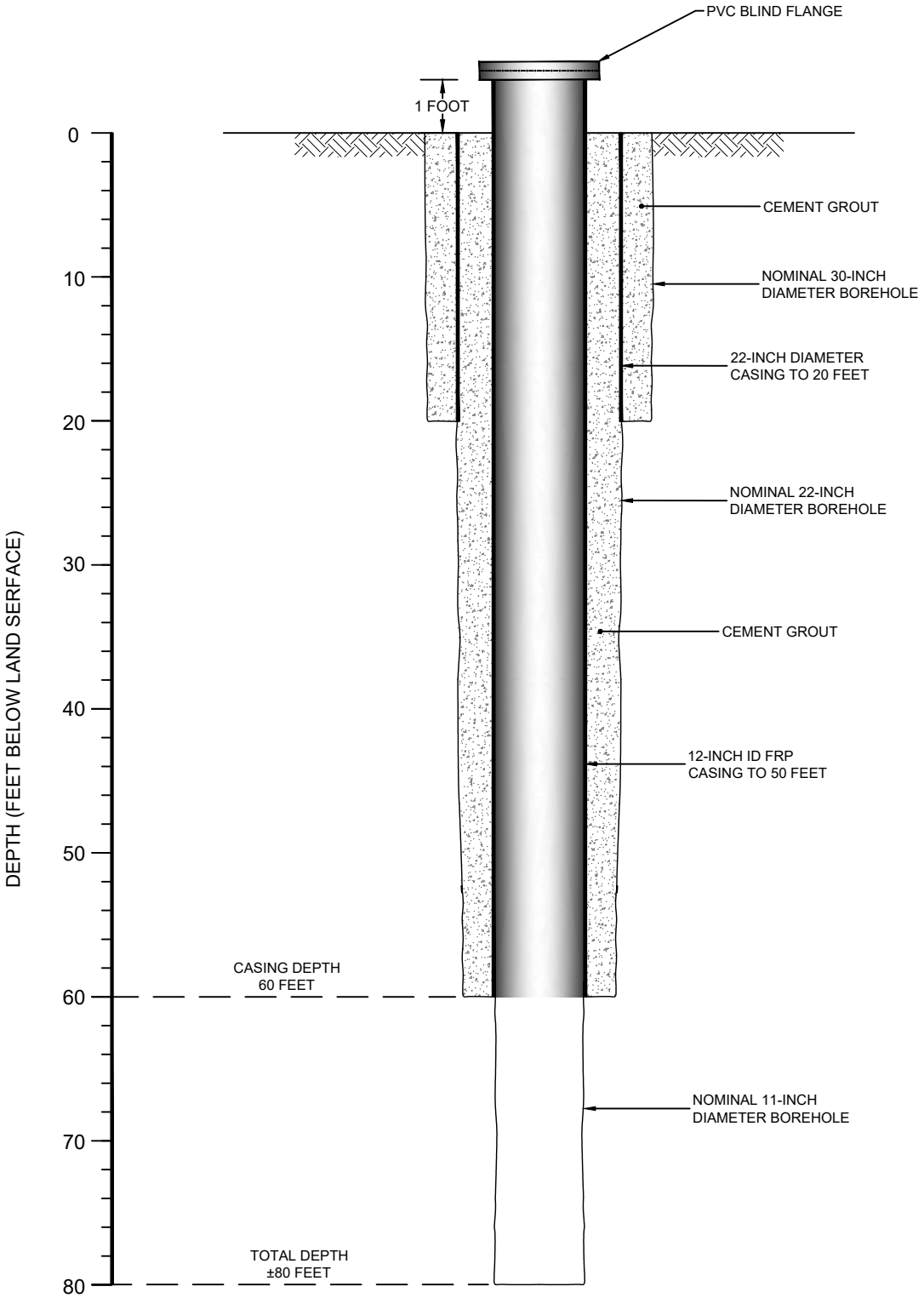
END OF SECTION

FIGURES



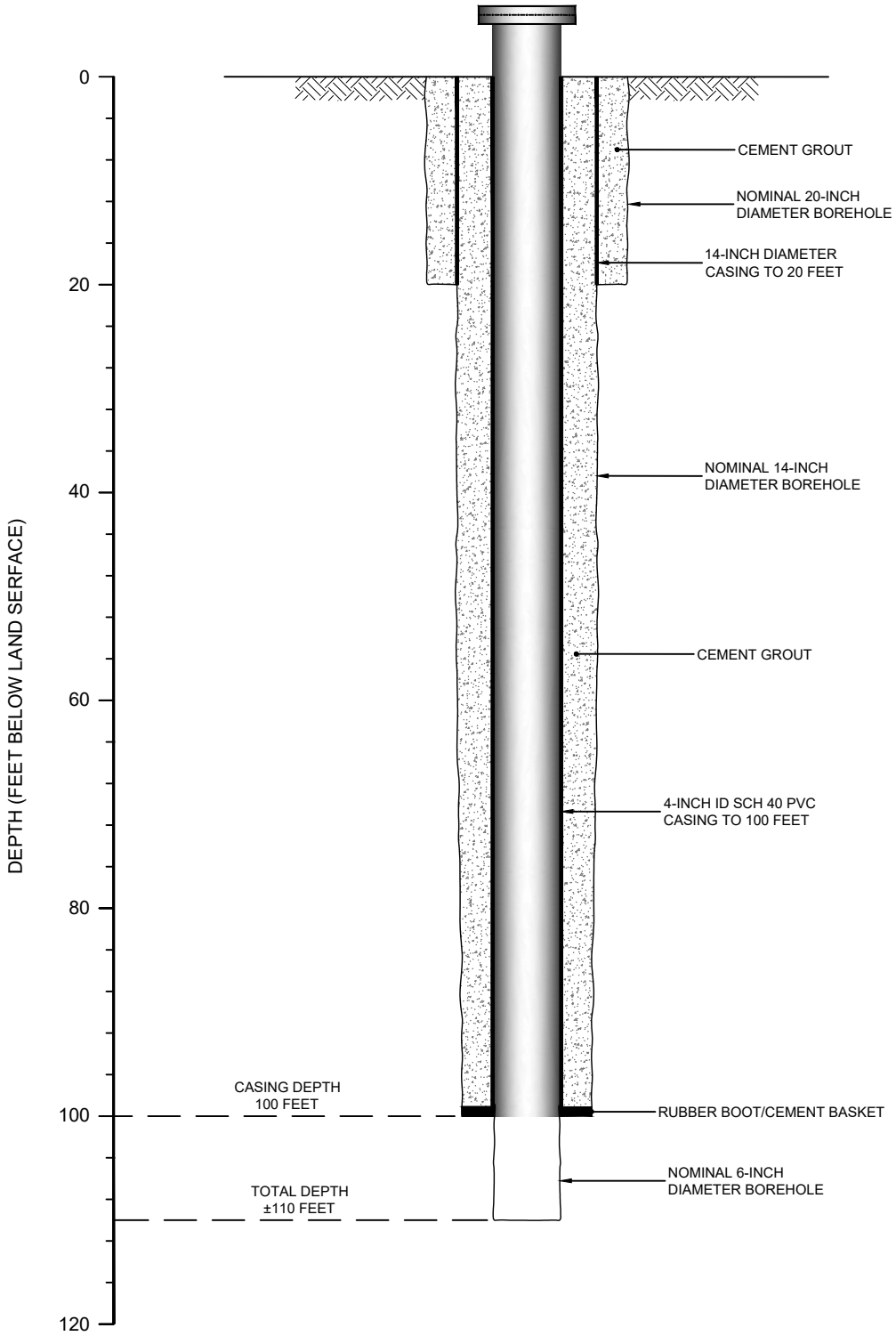
Water Science Associates	PROJECT NAME: FOXFIRE WELLS	COA30437	N 0 250 500 APPROXIMATE SCALE IN FEET
	PROJECT NUMBER: 17721-05	MARCH 2022	

FIGURE 1. MAP SHOWING WELL LOCATIONS.



Water Science Associates	PROJECT NAME: FOXFIRE WELLS	COA30437	NOT TO SCALE
	PROJECT NUMBER: 17721-05	NOVEMBER 2022	

FIGURE 2. CONSTRUCTION DETAILS OF NEW PRODUCTION WELL.



Water Science Associates	PROJECT NAME: FOXFIRE WELLS	COA30437	NOT TO SCALE
	PROJECT NUMBER: 17721-05	MARCH 2022	

FIGURE 3. CONSTRUCTION DETAILS OF MONITOR WELL MW-1.