STATEMENT OF WORK
DRILLING PROGRAM FOR GROUNDWATER/TEMPERATURE INTERACTION INVESTIGATION

I. INTRODUCTION

This drilling program is being conducted to determine the effects of temperature variations relating to groundwater interactions adjacent to two Floridan aquifer wells. One well is located adjacent to the C-13 Canal in Broward County, and the other is located in Labelle in Hendry County. **Figure 1** shows the location of both well sites. The field data obtained from the well drilled under this contract will be used to help quantify density stratification within the aquifer. Each well shall be completed to 30 feet in depth and the bottom 10 feet shall be well screen.

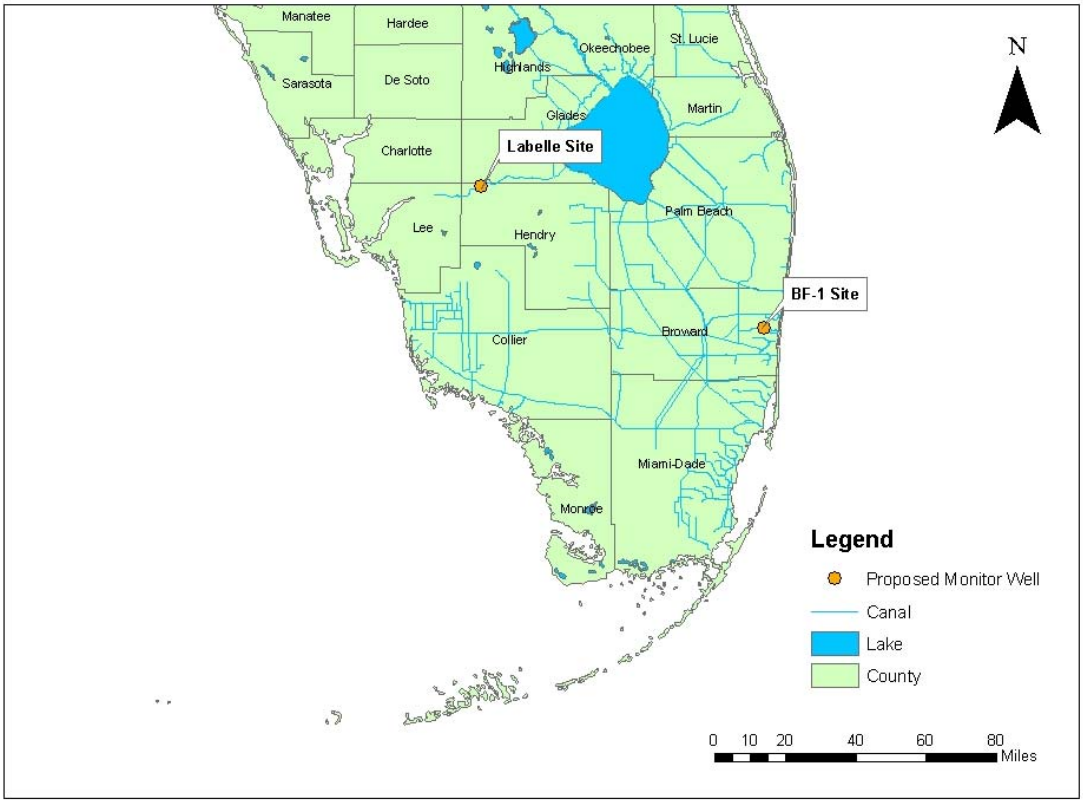

Figure 1. Monitor well location map.

II. GENERAL INFORMATION AND OVERVIEW

2.1 Scope of Work

This drilling project will provide data for the South Florida Water Management District (DISTRICT) to help delineate the interaction between groundwater temperature and density stratification adjacent to the two Floridan aquifer wells shown in **Figure 1**. This program involves drilling and constructing two monitor wells to a depth of 30 feet below land surface (bls). These wells will be constructed using a 2-inch polyvinyl chloride (PVC) casing with a 10-foot screen from 20 to 30 feet bls.

It is recommended that the CONTRACTOR visit the site prior to mobilization to become familiar with the access routes, site conditions, and any equipment/rig restrictions such as trees or power lines. The DISTRICT will provide an on-site geologist during drilling operations to oversee well construction operations. Based on the availability of funds, the DISTRICT may only complete a portion of the work. The DISTRICT reserves the right to terminate the contract without any further restitution other than payment for services rendered and material installed**. Figures 2** and **3** are site-specific maps for the two monitor well sites.

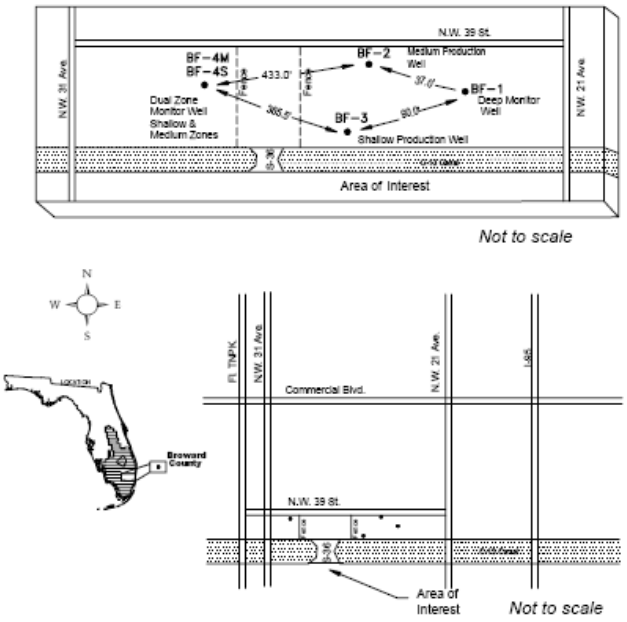

Figure 2. C-13, Broward County site map.

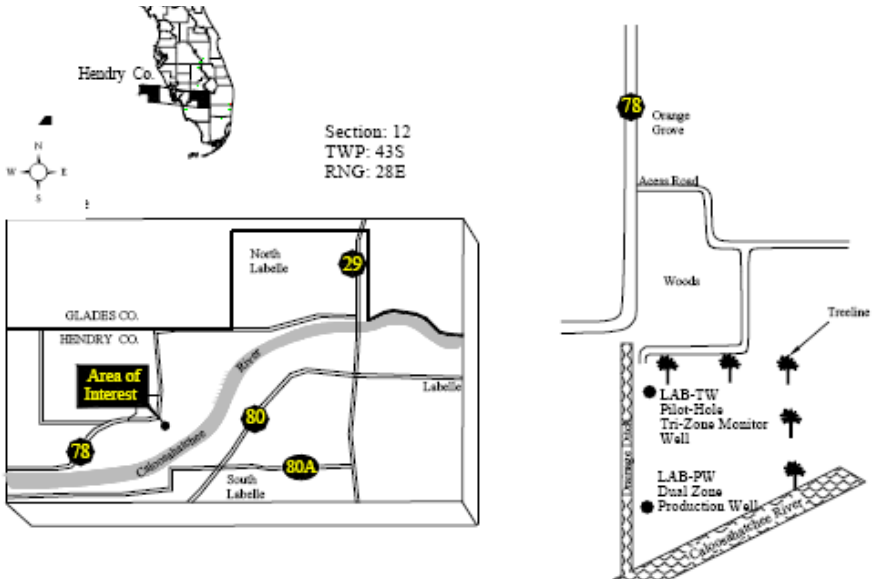

Figure 3. Labelle, Hendry County site map.

2.2 Permits and Utility Clearance

The DISTRICT will acquire all land access agreements to enter onto and construct these wells on both public lands and/or private property. The CONTRACTOR shall be responsible to obtain any other local, state, or federal drilling permits or occupational licenses, to obtain clearance from all applicable utilities, and to provide notification to local municipalities prior to the start of drilling operations. All site visits with a utility clearance company are the responsibility of the CONTRACTOR. The CONTRACTOR shall also conform to any local or county ordinances pertaining to noise levels and working hours, etc., to avoid any unnecessary delays. Should any unanticipated delays occur due to permit acquisition, the DISTRICT reserves the right to postpone the start of this contract.

2.3 Project Schedule and Time Constraints

The site is located on a DISTRICT canal right-of-way adjacent to private, residential property. As such, care must be taken to minimize the impact (physical and sound intrusion) to the property owners and nearby residents. Wells shall be constructed in a timely manner to minimize impacts to the sites. Once work on a borehole has begun, it must proceed until the total depth of the borehole is reached. Drilling should be completed within two weeks after contract execution. Drilling (and other loud tasks) should not begin before 8 a.m. each day unless permission is given by the DISTRICT site geologist. The workweek will be Monday through Friday. The work must be completed within two weeks of the NTP.

2.4 Equipment and Personnel

The DISTRICT requires that a Water Well CONTRACTOR, licensed in the State of Florida or the appropriate Water Management District, be responsible for work performed under this Contract**. A copy of the current Florida Water Well Contractor license must be submitted with the proposal.** All equipment utilized by the CONTRACTOR and any subcontractor(s) must be in good working order. The CONTRACTOR shall provide and operate drilling and support equipment with adequate load/weight capacity for the projected drilling depths. There will be no compensation for downtime incurred due to equipment failure or personnel problems. Unnecessary delays or work stoppages because of equipment or personnel problems will not be accepted nor considered a valid reason for extending the length of the contract.

2.5 Final Deliverables

Deliverables to the DISTRICT shall include:

A.) Successful installation, construction, and development of all monitor wells described in this document within the time frame stated in Section 2.3.
B.) No geologic samples are required from the 30 ft. well.
C.) Restoration of all drill sites prior to beginning work on the next site (unless specifically agreed to by the DISTRICT site geologist).
D.) Submission of drilling logs at the completion of each site.

Payment shall be made according to the schedule in Section IX.

III. SITE INFORMATION AND ENVIRONMENTAL REQUIREMENTS

3.1 Site Description

The project is located adjacent to two DISTRICT Floridan wells; BF-1 in Broward County (**Figure 2**) and LAB-TW in Hendry County (**Figure 3**).

3.2 Minimizing Impacts of Drilling

Negative impacts to the property owners and the site property as a result of the drilling activities must be minimized.

- The staging areas must be secured in order to prevent mishaps with the general public and to prevent vandalism to equipment and supplies. The CONTRACTOR is responsible for securing the drill sites.

- Activity at the drill site is restricted to specified, small areas, to be determined during a pre-mobilization site visit by the CONTRACTOR and project manager or site geologist.

- No vegetation will be cut without permission from the project manager or site geologist.

- If dry weather conditions make the risk of wildfires high, personnel must refrain from smoking or use of potential ignition sources. At other times, smoking is permitted if all cigarette butts are properly disposed of. At no time shall they be thrown on the ground.

- At all sites, drilling (and other loud tasks) shall not begin before 8 am (or in accordance with local or county codes) each day unless permission is given by the DISTRICT's site geologist.

3.3 Mobilization, Demobilization and Site Cleanup and Staging Area Security

Mobilization shall include costs for all materials, equipment, and labor required to prepare the site for drilling operations, install appropriate pit or surface casing, and conduct any other measures that the CONTRACTOR feels is necessary to protect and secure their equipment during drilling operations. Part of the mobilization/set-up and demobilization costs entail meeting several environmental requirements. The cost for providing the following equipment/facilities and services shall be part of the mobilization/demobilization unit price.

A.) The CONTRACTOR may use the drill sites as a staging area for equipment, supplies, and equipment cleaning. Care must be taken to secure the site to protect equipment and supplies and to avoid mishaps in regards to the general public. The CONTRACTOR shall maintain the site and staging area in an orderly and functional manner during all drilling and well construction operations. Inoperable equipment or equipment that will not be used should not be stored or remain on the site.

B.) The CONTRACTOR shall be responsible for removing debris and trash from the drill sites daily.

C.) The CONTRACTOR will spread and grade all well cuttings along the canal levee. Drilling fluids may be discharged to land surface only. **No discharge of cuttings or drilling fluids will be permitted into proximal surface waters.**

D.) The CONTRACTOR shall comply with all Occupational Safety and Health Administration (OSHA)/United States Environmental Protection Agency (EPA) requirements regarding heavy equipment, electrical and mechanical operations, storage of compressed and flammable gases, and storage and handling of hazardous materials. Necessary personal safety equipment and containments and absorbent materials will be required on site for the duration of drilling operations. If conditions exist that may be in violation of either OSHA or EPA standards, a site visit from the appropriate representative may be requested by the DISTRICT.

E.) Once all drilling and well construction operations have ceased, the CONTRACTOR is required to remove all equipment and restore the sites to original grade and condition. This price quote shall include all material and labor required for removing all construction equipment and debris and site restoration. **The site restoration will be completed, at each site, as soon as the well construction is complete.** To assure complete site restoration, we recommend the CONTRACTOR take appropriate photographs prior to placing equipment on the site. **A DISTRICT representative must approve site restoration prior to mobilizing to the next site.**

3.4 Equipment Cleaning

The wells will be used for long-term monitoring. As such, extreme care must be taken in the installation process to prevent any cross-contamination from any other drill sites and from general contamination.

A.) The CONTRACTOR shall provide sawhorses or small bench(s) to support the risers and screens prior to installation, and plastic wrap to protect the cleaned components from new contamination.

B.) The CONTRACTOR should use city water for cleaning and drilling operations.

IV. GENERAL DRILLING AND WELL CONSTRUCTION REQUIREMENTS

4.1 Well Casing (PVC) and Slotted Screen and Filter Pack

Each well will consist of 10 feet of PVC slotted well screen and 20 feet of solid PVC riser pipe. The CONTRACTOR shall provide a Schedule 40 PVC Tri-Loc riser and screens (or equivalent). The well screen shall be a 0.010-inch slotted screen in 10-foot sections. Well casing and screen joints shall be connected by threaded connections with manufacturer-supplied "O" rings, cleaned and sealed in plastic at the factory. The DISTRICT will only authorize payment for casing installed to the actual depth and grouted into place back to land surface. All casing and slotted screens shall be of new, first quality material and free of defects in manufacturing and handling.

The CONTRACTOR will install an 8/20 silica sand filter pack in the annular space around the well screen. The filter pack should extend at least three (3) feet above the top of the well screen. This will account for any filter pack settling during well development. Two (2) feet of bentonite pellets should be placed above the filter pack and hydrated to provide a seal

between the filter pack and the cement grout. **Figure 4** is a diagram showing the proposed well construction at each of the two sites.

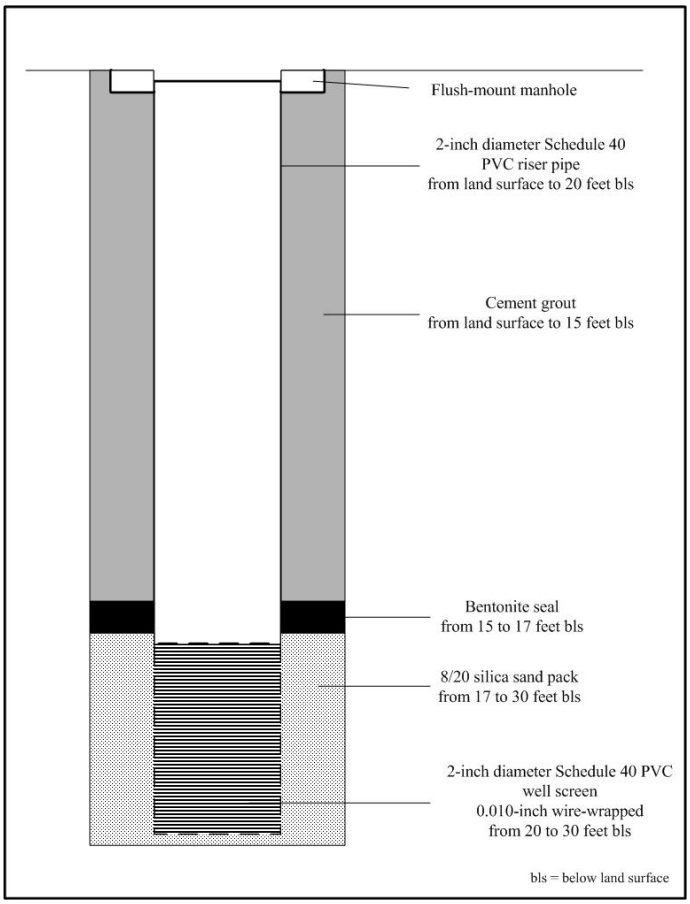

Figure 4. Proposed well construction diagram.

4.4 Cement Grouting

All work performed shall conform to State of Florida well drilling practices and to AWWA standards. The CONTRACTOR shall be responsible for calculating volumes pumped during grouting operations. The DISTRICT's geologist will review methods and volumes prior to the commencement of pumping cement grout. The method used must completely fill grout from the bottom of the annular space to land surface. If more than one (1) stage of cement is required, a minimum of eight (8) hours setting time is required between successive cement lifts. All subsequent cement lifts shall be tagged by the tremie method prior to installing an additional stage.

4.5 Wellhead Completion

All wells shall be recessed below grade and enclosed in a 'meter' type protective box (see **Figure 5**) with bolting lids. These boxes must be made of steel or cast iron and dipped in primer once and in Rustoleum® brand red paint (or equivalent) twice before installation. The well recesses will have one a 1 inch diameter drain hole to remove excess water. Additionally, the CONTRACTOR will install a 2-inch 90° sweeps made of gray electrical conduit that extends one inch above the concrete and extends several inches below and beyond the outside edge of the concrete pad. This will provide access for a

pressure transducer cable. The CONTRACTOR shall ensure that this pipe is higher than the drain pipe inside the manhole. The drain pipe should be set flush with the cement base inside the manhole recess. The well will be completed and sealed at the surface with a 30"x 30"x 6" rebar-reinforced cement pad that slopes slightly away from the well. The rebar used to reinforce the cement pad shall be 1/2-inch in diameter.

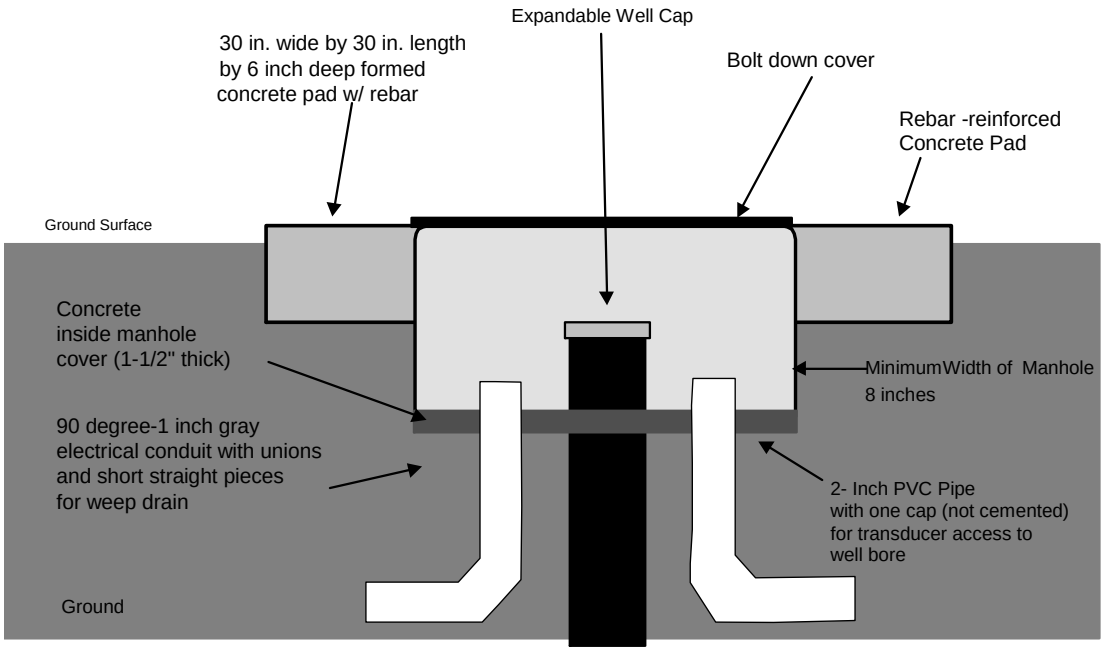

Figure 5.Well head completion diagram.

4.6 Well Development

The DISTRICT requires all monitor wells to be developed by overpumping with a centrifugal pump until all visible particulate matter has been removed from the formation waters and the water quality field parameters (pH, temperature, specific conductivity, and dissolved oxygen) are stable. The CONTRACTOR shall furnish all equipment, pumps, oil/water separators for use on the compressors, piping, and appurtenances required to successfully develop each well.

The DISTRICT will use a YSI (or similar type) water quality sensor to monitor field parameters during development. A DISTRICT geologist will be on site to provide and use the water quality sensor. (If the centrifugal method does not achieve the desired results, other methods (air lift, swabbing, etc. will be required). Well development is considered to be successful when maximum flow is obtained and water quality field parameter measurements become stable, as determined by the on-site DISTRICT geologist. At a minimum, the well shall be developed for one hour. The discharge water from well development will be poured onto land surface so that it drains away from the C-13 Canal.

5. RECOMMENDED PROCEDURES

Listed below is the summary of the well drilling and construction procedures and proposed sequence of activities to be conducted at each site.
A.) The CONTRACTOR will drill to 30 feet bls at each site.

B.) Once the CONTRACTOR has installed the PVC pipe to the appropriate depth, the 8/20 silica sand pack, bentonite seal, and grout can be emplaced. All sand packs must be pumped into the borehole via a 1-inch tremie pipe and placed to a level at least three (3) feet above the well screen. Placement of the sand pack will be confirmed by a hard tag. A two (2)-foot bentonite seal shall be placed on top of the sand pack and then grouted to land surface using a 4% bentonite-cement slurry. All grouting work performed shall conform to State of Florida well drilling practices and AWWA standards. The CONTRACTOR shall be responsible for calculating volumes pumped during grouting operations. A minimum of eight (8) hours setting time shall be required between successive cement lifts. All subsequent cement lifts shall be tagged by the tremie method prior to installing an additional stage.

C.) At a minimum, the well shall be developed for one hour.

VII. WELL ABANDONMENT

Should a borehole or well be determined by the DISTRICT geologist to be unacceptable, the CONTRACTOR shall abandon the hole by grouting the hole from bottom to surface, following DISTRICT abandonment procedures. A well may be declared unacceptable due to the CONTRACTOR's failure to complete the drilling, incorrect casing placement, a lost tool, or for any other CONTRACTOR failures to complete the well in a satisfactory manner. Under these circumstances, no payment will be made to the CONTRACTOR for the abandonment operations and the CONTRACTOR must provide a new well, meeting the original specifications, at no cost to the DISTRICT.

VIII. STANDBY TIME

During the normal progression of work, the CONTRACTOR will be authorized standby time when it is necessary for DISTRICT personnel to perform work or conduct tests that are not specified in the Contract. The CONTRACTOR will be notified in advance and the amount of time authorized will be mutually agreed upon and noted in the CONTRACTOR's daily logs.

IX. PAYMENT SCHEDULE

The CONTRACTOR shall provide unit prices for each well in the proposal form in Section XI. The payment will be remitted upon completion of each well.

PAYMENT SCHEDULE

The deliverables are described in detail in Section 2.5. Total duration of this project is two weeks.

Task and Deliverable	**Duration** (from start date)	Payment
Installation of 30-foot monitor well at Broward County Site	One week	100% of specific line item
Installation of 30-foot monitor well at Hendry County Site	One week	100% of specific line item

XI. FINAL LINE ITEM FORMAT

DETAILED COST INFORMATION FOR WELLS
(Estimated Quantities)

The quote shall include all necessary equipment, materials, and subcontractor services required to properly drill, construct, and cement the casing as described in this statement of work.

ITEM DESCRIPTION	ESTIMATED QUANTITY Item/Sites/Total	UNIT	UNIT PRICE	EXTENDED PRICE
1. Installation on 30 foot monitor well at Broward County site	1	Lump Sum		
2. Installation on 30 foot monitor well at Broward County site	1	Lump Sum		
Total Estimated Cost				