



GOLDEN VALLEY IMPROVEMENT DISTRICT WELL #3B Technical Specifications

Prepared for:

Mohave County Public Works Department, Arizona

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The technical material in these specifications was prepared by or under the supervision and direction of the undersigned, whose seal as a Professional Geologist is affixed below.

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SECTION 1: GENERAL INFORMATION

These technical specifications are for the drilling, borehole testing, construction, development, aquifer testing, and sampling of the proposed the Golden Valley Improvement District (GVID) Well #3B (the proposed well), which will be a new public water supply well for Mohave County Public Works Department (Mohave County).

1.1 LOCATION AND BACKGROUND INFORMATION

Background information for the existing GVID Well #3, GVID Well #3 Replacement and the proposed GVID Well #3B are provided in the following sections. Figures 1 through 3 show the locations of the proposed GVID Well #3B and existing GVID Well #3 and GVID Well #3 Replacement.

1.1.1 Existing GVID Well #3 and Well #3 Replacement

The existing GVID Well #3 is located within the Sacramento Valley Groundwater Basin in Mohave County and was drilled through alluvial sediments and interbedded basalt flows. The existing well is located at 3525 North Laguna Road in Golden Valley, Arizona near the northwest corner of Chino Drive and Laguna Road (**Figures 1 and 2**).

The Arizona Department of Water Resources (ADWR) well registration number for the existing GVID Well #3 is #55-515669 and is located within the SE $\frac{1}{4}$ of the SE $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 02, Township 21 North, Range 19 West, of the Gila and Salt River Baseline and Meridian [also referenced as B(21-19)02DDD]. Although the cadastral location is recorded properly in the ADWR imaged record which is provided for reference in **Appendix A**, the cadastral location is incorrectly recorded as B(17-19)02DDD in the ADWR Wells 55 database. The Mohave County Assessors' Parcel Number (APN) for the 0.63 acre-property is #306-55-063.

Rehabilitation efforts on the existing GVID Well #3 were performed in 2020 where it was discovered that the bottom 200 feet of perforated well casing had collapsed prior to rehabilitation, rendering the well inoperable.

GVID Well #3 was drilled and installed in 1986 with 8-inch diameter steel casing to 1,251 feet below ground surface (bgs). Perforations (3/16 inches wide by 3 inches long) were installed in the steel well casing with a total of 12 perforations per linear foot. The perforations were located at the following depth intervals:

- 1,050 to 1,150 feet
- 1,170 to 1,190 feet
- 1,210 to 1,230 feet

Records indicate that the static water level depth was 1,030 feet at the time of installation in 1986. The pump completion report indicates that a 20 horsepower electric submersible pump was installed in 1987 and tested at a pumping rate of 31 gallons per minute (gpm) with 118 feet of drawdown, which equated to a specific capacity of 0.26 gallons per minute per foot of drawdown (gpm/ft).

Publicly available water level data from ADWR's Groundwater Site Inventory (GWSI) database shows that the water level depths measured by ADWR in 1995 and 2006 were approximately 1,021 feet.

The GVID Well #3 Replacement (Well #3R) is located within the Sacramento Valley Groundwater Basin in Mohave County and is located at the Mohave County tank site located at 4405 North Teddy Roosevelt Road in Golden Valley, Arizona near the northwest corner of Sunset Vista Drive and Teddy Roosevelt Road in Golden Valley (**Figures 1 through 3**). Well #3 Replacement was drilled through alluvial sediments and interbedded basalt flows to a depth of approximately 1,156 feet. Lost circulation conditions were encountered at a depth of approximately 1,020 feet. Eighteen-inch diameter casing was installed to a depth of 1,020 feet and grouted in place with neat cement. A 17.5-inch diameter borehole was drilled below the casing to a depth of 1,156 feet and possible lost circulation conditions were encountered again. A downhole video inspection was performed after removal of the drill string assembly, and it was discovered that the 18-inch diameter casing had collapsed at depths of approximately 665 to 682 feet. The borehole filled with formation material and residual drilling fluid up to a depth of 1,025 feet. The static water level at the site is estimated to be at a depth of approximately 1,100 feet. A lithologic log for GVID Well #3 Replacement is presented in **Appendix B**. Mohave County has since decided to drill another well (Well #3B) at the Well #3 Replacement site.

1.1.2 GVID Well #3B

Proposed GVID Well #3B is located at the Mohave County tank site located as described above (**Figures 1 through 3**). The well is located within the SE $\frac{1}{4}$ of the NE $\frac{1}{4}$ of the NE $\frac{1}{4}$ of Section 36, Township 22 North, Range 19 West, of the Gila and Salt River Baseline and Meridian [also referenced as B(22-19)36AAD]. The Mohave County APN for the northern 1 acre of the tank site property is #339-04-050 and the APN for the southern 1 acre of the tank site is #339-04-060.

The GVID Well #3B shall be drilled using flooded-reverse-circulation rotary methods. Other rotary drilling methods may be used if warranted. The proposed well is planned to be completed to a depth of approximately 1,465 feet in alluvial sediments and interbedded basalt flows and constructed with 16-inch diameter surface casing that extends to a depth of approximately 1,020 feet and a nominal 10-inch diameter casing and screen assembly that extends to a depth of approximately 1,460 feet. Well development, aquifer testing and water quality sampling will be performed afterwards to evaluate well yield, efficiency, and recommended pump setting depth. The anticipated yield for the proposed well is 100 to 200 gpm. **Figure 4** presents the preliminary design for proposed GVID Well #3B.

1.2 GENERAL DEFINITIONS

Throughout these technical specifications, the term “OWNER” shall be understood to represent Mohave County. The term “CONSULTANT” shall be understood to represent the hydrogeological firm, who may be retained by the OWNER to assist with the execution of the scope of work and provide consulting and construction management services as needed during drilling, installation, development, and testing. The term “CONTRACTOR” shall be understood to represent the drilling contractor retained by the OWNER for this scope of work.

The term “SUBCONTRACTOR” will apply to any person, firm, or corporation with whom the CONTRACTOR executes a secondary agreement for a portion of the scope of work. In any such secondary agreements, the CONTRACTOR shall include the portions of these technical specifications applicable to the SUBCONTRACTOR and shall make these terms binding on the SUBCONTRACTOR. The CONTRACTOR shall also include in its secondary agreements a provision that binds the SUBCONTRACTOR to include in its subcontracts the portions of these technical specifications applicable to any services performed by parties the SUBCONTRACTOR would engage to perform a portion of the scope of work.

1.3 SCOPE OF SERVICES

The scope of work covered by these technical specifications consists of the following activities:

- Drill borehole for, install, and seal minimum 24-inch diameter conductor casing to depth of approximately 40 feet
- Drill borehole for, install, and seal 16-inch diameter surface casing to a depth of approximately 1,020 feet
- Drill a pilot borehole to a depth of approximately 1,460 feet and geophysically log the borehole
- Perform zone tests on the pilot borehole utilizing airlift methods to assess the potential yield and water quality of the aquifer
- Ream the borehole to a diameter of 14.75 inches and install a nominal 10-inch diameter casing and screen assembly
- Install gravel pack
- Develop the well
- Conduct a downhole video survey
- Conduct aquifer testing and assist with sampling
- Conduct a downhole video survey and a plumbness and alignment survey on the well

- Perform other tasks as directed by the CONSULTANT or OWNER and described in these Technical Specifications.

Depending on subsurface conditions encountered during drilling, the CONSULTANT and OWNER reserve the right to request that the borehole/well be drilled beyond the depth specified, drilled to a lesser depth, constructed to a lesser depth, or abandoned.

1.4 PERFORMANCE OF WORK

The prerequisite contractor qualifications, operation requirements, and responsibilities of the drilling CONTRACTOR are presented in the sections below.

1.4.1 Contractor Qualifications

The drilling CONTRACTOR must provide the following information with the bid submittal:

- A valid ADWR Well Driller's License in the following category:
 - Flooded-Reverse-Circulation
- An Arizona Registrar of Contractors (ROC) License Type A (General Engineering), A-4 (Drilling), A-16 (Waterworks), or CR-53 (Water Well Drilling)
- All other licenses required by Federal, State, County, and local rules and regulations

Other SUBCONTRACTORS may also hold a valid ADWR Well Driller's License in addition to that of the drilling CONTRACTOR, but not in lieu of the drilling CONTRACTOR'S ADWR Well Driller's License.

1.4.2 Operations

The CONTRACTOR shall employ only competent employees for the execution of work. All operations shall be performed under the direct and personal supervision of an Arizona-licensed well driller. The CONTRACTOR shall assign a foreman (tool pusher) who has been approved by the CONSULTANT or OWNER to oversee all work required by this specification. The CONTRACTOR foreman shall provide to the CONSULTANT or OWNER a written certification that they have read and fully understand these technical specifications prior to mobilization to the proposed drilling site.

The CONTRACTOR shall drill and install the production well in accordance with Arizona Administrative Code (AAC) Title 12, Chapter 15, Article 8 (R12-15-801 et seq.) regulating Well Construction and Licensing of Well Drillers in Arizona. The drilling and well construction operations shall also comply with all other applicable Federal, State, County, and local regulations and industry standards.

Rejection of any materials, work, or equipment by the CONSULTANT or OWNER shall be at the CONTRACTOR'S expense, and at no cost to the OWNER. Replacement of materials due to

rejected materials, work, or equipment (that is in accordance with these specifications and approved by the CONSULTANT or OWNER) will be paid for by the CONTRACTOR.

1.4.3 Contractor Responsibilities

Should the new GVID Well #3B be lost due to any negligent action on the part of the CONTRACTOR (as determined by the CONSULTANT or OWNER), the well shall be abandoned in accordance with AAC R12-15-816 (Abandonment) and at no cost to the OWNER, and a new replacement well shall be drilled and installed in the immediate area. The new replacement well location will be selected by the CONSULTANT or OWNER. The new replacement well shall be completed in accordance with all the terms and conditions stated herein.

The CONTRACTOR shall credit the OWNER for any and all costs associated with the lost well, and this credit shall be applied against any additional CONTRACTOR and CONSULTANT or OWNER fees associated with the drilling and completion of the replacement well.

If the loss of the new GVID Well #3B was not due to any negligent action of the CONTRACTOR, the OWNER may designate a new replacement well location and the OWNER shall provide reimbursement for the new replacement well on the basis of the lump sum cost determined by the CONTRACTOR.

If a work delay, deficiency of work performance and/or a material's deficiency is caused by the CONTRACTOR failing to comply with any item of these technical specifications, the CONTRACTOR shall bear the burden of additional expenses, including any additional CONSULTANT or OWNER fees assessed to the OWNER as a direct result of the delay or deficiency. This includes delays due to equipment failure.

1.5 PROJECT CONFIDENTIALITY

The CONTRACTOR shall not disclose any information relating to this project or the drilling site to anyone other than the CONSULTANT or OWNER without written permission from the OWNER, except as may be required by law. At all times during the performance of the CONTRACTOR'S services, the CONTRACTOR and its employees, SUBCONTRACTORS, and agents shall treat the work conducted by the CONTRACTOR and its SUBCONTRACTORS and the results thereof as confidential and proprietary to the OWNER.

Any questions regarding the purpose or scope of work that are directed to the CONTRACTOR from individuals or entities other than representatives of the CONSULTANT or OWNER while work is being conducted for this project, shall be directed by the CONTRACTOR to the CONSULTANT or OWNER.

The CONTRACTOR shall inform its employees of this confidentiality requirement and if requested by the OWNER, shall obtain non-disclosure agreements from all SUBCONTRACTORS who will have involvement in the performance of any of the work and provide the CONSULTANT or

OWNER with copies of the executed non-disclosure agreements. This provision shall survive the termination of the contracted work tasks.

1.6 METHOD OF DRILLING

The borehole shall be drilled using flooded-reverse-circulation methods. Other drilling methods may be allowed as necessary depending on subsurface geologic conditions, but will not be allowed without prior written consent from CONSULTANT or OWNER.

The CONTRACTOR shall coordinate access to drilling make-up water, and shall provide the necessary storage tanks, pump(s), air compressor(s), and all other equipment required for its drilling operations.

The CONTRACTOR is responsible for designing and controlling a drilling program that conforms to these specifications.

1.7 UNDERGROUND UTILITIES

The CONTRACTOR shall comply with Mohave County's guidelines regarding clearing the site for underground utilities utilizing Blue Stake services. The CONTRACTOR will be responsible for conducting the Blue Stake services and providing documentation of clearance prior to any ground penetration.

1.8 NOISE CONTROL AND WORK HOURS

It is the CONTRACTOR'S responsibility to meet all OWNER and local requirements regarding noise and noise control during all drilling, testing, well installation, development, and aquifer testing. Since the drilling site is located in a sparsely populated area of Golden Valley, the need for noise control is not anticipated.

1.9 PERMITTING

The CONTRACTOR will be responsible for coordinating with the OWNER to obtain the required drilling permits:

- **Notice of Intent (NOI) to Drill, Deepen, Replace or Modify a Well (DWR Form 55-40)**
– prior to drilling proposed GVID Well #3B

The CONTRACTOR will also be responsible for coordinating with the OWNER to file these ADWR completion documents within the stated regulatory timeframes:

- **Well Driller Report and Well Log (DWR Form 55-55)** – within 30 days of completing GVID Well #3B

The OWNER will be responsible for filing these ADWR submittals with the stated regulatory timeframes:

- **Pump Installation Completion Report (DWR Form 55-56)** – within 30 days after a pump is installed in GVID Well #3B

Either the CONSULTANT or OWNER will be responsible for submitting and obtaining authorization from the Arizona Department of Environmental Quality (ADEQ) for the temporary discharge of groundwater to a nearby wash during testing under the Arizona Pollutant Discharge Elimination System (AZPDES) De Minimis General Permit (DMGP):

- **NOI for AZPDES DMGP single source coverage** – at least 30 days prior to the anticipated discharge from GVID Well #3B
- **Notice of Termination (NOT) of AZPDES DMGP coverage** – after the GVID Well #3B testing has been completed
- **Discharge Monitoring Report (DMR)** – generally required within 30 days after the GVID Well #3B testing has been completed

1.10 VISITATION AND INSPECTION

The CONSULTANT and OWNER representatives shall, at any reasonable time during the term of work, be entitled to review the CONTRACTOR'S facilities, its program operation, and the records that pertain to the program.

The CONTRACTOR agrees that the CONSULTANT and OWNER, or any of their duly authorized representatives, shall have access to the CONTRACTOR'S facilities and have the right to examine books, documents, and records of the CONTRACTOR involving transactions related to these specifications.

The CONTRACTOR further agrees to include in all subcontracts hereunder, if any, a provision that the SUBCONTRACTOR agrees that the CONSULTANT and OWNER, or any of their duly authorized representatives, shall have access to the SUBCONTRACTOR'S facilities and have the right to examine any books, documents, and records of the SUBCONTRACTOR involving transactions related to the subcontract and these specifications.

END OF SECTION

SECTION 2: DRILLING SITE PROTECTION

The requirements for drilling site protection are described in the following sections.

2.1 SITE ACCESS AND SIZE

The dimensions of the drilling site will be approximately 100 feet by 100 feet. The drilling site will be staked in the field by the CONSULTANT or OWNER before any equipment is mobilized to the site.

The drilling site will be designated with a sign provided by the CONTRACTOR indicating that only authorized personnel are allowed to access the site. This is to prevent other personnel or crews from entering the work area without receiving the safety induction.

2.2 SPILL PREVENTION AND CONTROL

A plastic tarp and berm shall be placed beneath the drilling rig during mobilization to protect the site against oil or hydraulic fluid spills or leaks and will remain beneath the rig until demobilization. A plastic tarp and berm shall also be placed beneath other stationary equipment such as air compressors and fuel tanks.

Compressed air introduced into the borehole during drilling must be treated by passage through a carbon or coalescing filter to remove organic contaminants (e.g., compressor lubrication oil).

2.3 DUST AND TRAFFIC CONTROL

The CONTRACTOR shall control dust with frequent application of water on-site, and shall meet all Federal, State, County, and local air quality regulations. The frequency and extent of water application to the site and roadways for dust control must be approved by the OWNER.

The CONTRACTOR is also responsible for any traffic control measures, if necessary.

2.4 DRILLING FLUID TANKS

The CONTRACTOR shall utilize only above-ground drilling fluid storage tanks. Excavated drilling fluid pits are prohibited.

2.5 DISCHARGE WATER

Water pumped from the borehole during airlift testing, swab and airlift development, pump and surge well development, and during aquifer testing shall be conveyed via temporary pipeline to a designated discharge location located within approximately $\frac{1}{4}$ of a mile from the drilling site.

2.6 DRILL CUTTINGS DISPOSAL

For the purpose of bidding, the CONTRACTOR shall assume that the drill cuttings will be hauled offsite and disposed of accordingly.

2.7 SITE CLEANUP

The CONTRACTOR will be responsible for replacing or repairing any damage to the well site.

After completion of the work, the CONTRACTOR shall remove and properly dispose of any and all debris, waste, trash, oil-stained dirt, and unused materials or supplies, any soil contaminated with any hydrocarbon fluid spills, and stockpiles of excess or waste materials, and shall restore the site, as nearly as practicable, to its original condition.

The site cleanup must be approved by the CONSULTANT or OWNER and will be subject to inspection by the OWNER.

END OF SECTION

SECTION 3: DRILL SITE EQUIPMENT

The requirements for the drill rig, ancillary equipment, and decontamination are described in the following section.

3.1 EQUIPMENT DECONTAMINATION

Prior to the start of drilling, the CONTRACTOR shall decontaminate the drill rig and downhole tools by steam cleaning. The method and extent of steam cleaning must be approved by the CONSULTANT or OWNER. The CONTRACTOR shall provide a letter of certification of the decontamination of the CONTRACTOR'S equipment, prior to utilization. All necessary steam cleaning shall be conducted at the CONTRACTOR'S expense at an off-site location.

3.2 DRILL RIG REQUIREMENTS

The CONTRACTOR shall furnish and maintain in safe and efficient working condition all equipment necessary to perform the specified work, including a drilling rig capable of:

- Performing the specified operation to the specified depth;
- Pump testing and sampling equipment; and
- Auxiliary equipment as specified or required to complete the described tasks.

The drilling rig used for the installation of the project shall have a mast capacity no less than 1.5 times the string weight of the well casing and screen, and the well shall be installed without use of a float plate.

The drill rig and ancillary equipment used for this project must be well maintained and meet all current OSHA standards. Walkways and stairways for the drill rig and other equipment shall be guarded with rails to prevent falls, and CONTRACTOR personnel shall utilize a safety harness at all times when ascending the rig derrick. All high-pressure hoses shall be equipped with a safety chain to protect against the event of hose failure.

All equipment requirements specified in this section shall be provided at the CONTRACTOR'S expense.

3.3 ADDITIONAL EQUIPMENT

The equipment supplied by the CONTRACTOR shall include, but not be limited to:

- Wireline depth indicator capable of measuring depths equal to the total depth of the borehole, and equipped with a counter device that provides for a depth measurement accuracy of ± 1 foot
- Specified devices for measurement of drilling mud viscosity and weight, and all other applicable devices for the measurement of drilling mud properties

- Gauges that indicate the hydraulic pressure of the mud pumps
- Appropriate air compressor with pressure gauges or submersible pump, eductor pipe, and inductor pipe capable of airlifting cuttings from various depths during drilling
- Sampling valve or hose bib attached to the discharge line to be used during airlifting and sampling operations
- Operating and accurate inclinometer tool
- Operating and accurate penetration rate indicator (Geolograph or equivalent)
- Operating and accurate gauges that indicate the hook load (weight) and torque of the drill string
- First aid kit
- Fully charged and operable type ABC dry chemical fire extinguisher and round nosed shovel on all equipment
- Commonly used fishing tools such as overshots, wall hooks, junk baskets, etc. (in the event that lost tools in the borehole require fishing operations)

END OF SECTION

SECTION 4: UTILITIES

The requirements for site utilities are described in the following sections.

4.1 WATER

The CONTRACTOR shall coordinate with the OWNER to secure access to drilling make-up water, and shall be responsible for providing any additional piping, connections, storage tanks or ancillary equipment required to store water at the site (if needed), and for use of the water.

Makeup water for drilling will be made available by the OWNER at no additional cost from the tank at the site. The CONTRACTOR shall be responsible for obtaining an adequate flow rate of construction water for all operations under these specifications.

4.2 ELECTRICITY AND POWER

The CONTRACTOR shall provide, at its own cost, all fuel and power required for its operations under these specifications.

4.3 SITE LIGHTING

The CONTRACTOR shall be responsible for providing site lighting as necessary if there is night work. This is to include illuminating the drilling work area, the sampling work area, and any normal foot travel paths used by personnel during the execution of their tasks.

Lighting shall provide a minimum illumination of five-foot candles at two feet above ground and at workstations. Lighting shall be positioned in such a manner that all lighting is directed toward the work area and not toward the surrounding area.

4.4 RESTROOMS

The CONTRACTOR shall provide, at its own cost, a portable restroom facility at the drilling site during all operations of this project. The restroom shall be adequately maintained and shall be made available to the CONSULTANT and OWNER for reasonable use.

END OF SECTION

SECTION 5: REPORTS, LOGS, AND RECORDS

The forms for the penetration rate log, the daily driller's report, and the drilling fluid control log are described in the following sections. All forms must be approved by the CONSULTANT or OWNER.

5.1 PENETRATION RATE LOG

During the drilling of the borehole, a time log shall be kept showing the actual penetration time required to drill each foot of the borehole.

The types of bits used in each interval of the borehole shall be noted on this log and whether designed for soft, medium, or hard formations, including approximate weight on the bit, the rotation speed (rpm) of the bit, and any other information that may be requested by the CONSULTANT or OWNER.

These logs shall be available for review by the CONSULTANT or OWNER throughout the drilling program and a copy shall be delivered to the CONSULTANT or OWNER daily.

5.2 DAILY DRILLER'S REPORT

The CONTRACTOR shall keep an accurate and legible daily log and record of all drilling, testing, and construction operations including the following information:

- all geologic materials encountered during drilling
- the depths at which changes in formation occur
- number of feet drilled
- number of hours on the job
- any shutdowns due to breakdown
- any occurrence of lost circulation conditions in accordance with **Section 6.4 (Lost Circulation Conditions)** of these specifications
- any occurrence of hard drilling conditions in accordance with **Section 6.5 (Low Penetration Rate Conditions)** of these specifications
- drilling fluid additives used
- length and type of casing set
- volumes of annular materials installed
- other pertinent data as may be requested by the CONSULTANT or OWNER

- any difficulties or unusual conditions encountered

During the drilling of the borehole, a detailed driller's report shall be maintained and provided daily to the CONSULTANT or OWNER at the drilling site.

5.3 ADWR WELL DRILLER REPORT AND WELL LOG

During the drilling of the GVID Well #3B borehole, the CONTRACTOR shall prepare a detailed Well Driller Report and Well Log (DWR Form 55-55) for submittal to ADWR, in accordance with **Section 1.9 (Permitting)** of these specifications.

The submittal shall include the reference point for all depth measurements, a generalized description of each formation encountered, the depth at which each formation is encountered and the thickness of each formation.

The lithologic log and the GPS location of the well will be made available to the CONTRACTOR to assist in the preparation of the Well Driller Report and Well Log. A copy of the Well Driller Report and Well Log shall be furnished to the CONSULTANT and OWNER at the time of submittal to ADWR.

5.4 DRILLING FLUID RECORD

During the drilling of the borehole, a log of drilling fluid properties shall be maintained by the CONTRACTOR. The drilling fluid record shall be recorded on an American Petroleum Institute (API) approved form and shall document all items listed in **Section 6.2 (Drilling Fluid Testing)** of these specifications.

The drilling fluid record shall be available for review by the CONSULTANT and OWNER throughout the course of drilling, and the log shall be delivered to the CONSULTANT or OWNER upon completion of each day's work activities.

END OF SECTION

SECTION 6: DRILLING FLUID CONTROL PROGRAM

A drilling fluid control program will be required for GVID Well #3B and is described in the following sections.

6.1 DRILLING FLUID CONTROL PLAN

The CONTRACTOR shall provide a drilling fluid control plan to the CONSULTANT or OWNER prior to the use of any drilling fluids. The plan shall outline specific drilling fluid additives the CONTRACTOR plans to use, how anticipated changes in the drilling conditions will affect the drilling fluid control plan, fluid testing procedures, and equipment that will be used. The drilling fluid control plan must be approved by the CONSULTANT or OWNER.

All drilling fluid additives shall be certified by the National Sanitation Foundation (NSF).

6.2 DRILLING FLUID TESTING

The CONTRACTOR shall retain an experienced drilling fluid specialist and shall be available within a 3-hour travel time of the drilling site during all drilling and well construction operations. The CONTRACTOR'S selection of a drilling fluid specialist will be subject to approval by the CONSULTANT or OWNER.

Drilling fluid tests will be required during periods when any drilling fluid additives are being circulated in the borehole. Physical and chemical properties of the drilling fluid are to be measured in accordance with the procedures of the API Standard RP 13B, "Standard Procedures for Testing Drilling Fluids."

Drilling fluid tests shall be conducted at a minimum of:

- Every 24 circulating hours
- When significant changes to the drilling fluid are made
- Whenever conditions appear to have changed or when problems arise
- At the request of the CONSULTANT or OWNER

A Marsh-type viscosity funnel and a mud scale will be available at the drilling site during all drilling and construction operations and, upon request, will be made available to the CONSULTANT or OWNER.

The CONTRACTOR shall maintain current records at the site at all times to show:

- The time, depth, and results of all drilling fluid tests
- All materials added to the system, (i.e., kind, amount, time, and depth)

- Variances or modifications from the agreed upon fluid program such as time, depth, reason, and authorization

The CONTRACTOR is responsible for maintaining an adequate supply of drilling fluid additives at the drilling site and for the removal of all drilling fluids and additives from the borehole.

The drilling fluid tank for the well shall have a total volume no less than that of the three times the borehole volume, which is approximately 9600 cubic feet (ft³) or 72,000 gallons.

The tank shall contain at least one baffle, to assist with the separation of cuttings and suspended solids from the drilling fluid. The specific dimensions and design of the drilling fluid tank must be approved by the CONSULTANT or OWNER.

6.3 GENERAL REQUIREMENTS

During the drilling of the well borehole and the installation of the well, the CONTRACTOR shall be responsible for minimizing the chemical and biological disturbance of the vadose zone and saturated matrix.

The use of certain organic drilling fluid materials such as starch, guar, or cottonseed hulls will not be accepted for drilling, although some organic polymer additives may be allowed.

Safety Data Sheets (SDS) from the manufacturer for all drilling fluid additives must be provided to the CONSULTANT or OWNER for review prior to their use. The CONSULTANT and OWNER reserve the right to reject any and all proposed additives.

The CONTRACTOR shall be responsible for maintaining the quality of the drilling fluid to ensure:

- Protection of water-bearing and potential water bearing formations exposed to the borehole
- Representative samples of the formation materials
- Inhibition of the formation and prevention of formation-caused drilling problems (e.g., heaving sands, swelling clays, lost circulation)
- Protection of the integrity of the borehole during drilling and well installation operations
- Complete and accurate geophysical logging of the borehole

6.4 LOST CIRCULATION CONDITIONS

“Lost Circulation Conditions” under this Section shall apply only when there is a loss of drilling fluid to the formation that exceeds the maximum available discharge rate of water into the borehole, to the extent that the fluid level cannot be maintained to a level above the base of the surface casing for at least two hours, due to no fault of the CONTRACTOR.

The CONTRACTOR is responsible to notify the CONSULTANT or OWNER immediately upon the occurrence of Lost Circulation Conditions, and to document the times, quantities, and circumstances of Lost Circulation Conditions during each occurrence. Failure of the CONTRACTOR to promptly notify the CONSULTANT or OWNER of Lost Circulation Conditions will void the CONTRACTOR’S opportunity to implement this clause but will not affect the CONTRACTOR’S responsibility to maintain the integrity of the borehole, as required in **Sections 1.4.3 (Contractor Responsibilities)** and **6.3 (General Requirements)** of these specifications.

The conditions of this Section shall apply from the beginning of the period of Lost Circulation Conditions and shall continue only until such time that the drilling fluid level can be maintained within the surface casing. After an initial Lost Circulation Condition event has occurred, should circulation be lost again, the conditions of this Section will go into effect immediately, and continue until such time as drilling fluid circulation is regained, as described in this Section.

If Lost Circulation Conditions are invoked by the CONTRACTOR and approved by the OWNER during pilot borehole drilling or reaming operations, then the OWNER will modify the lump sum contracted agreement amount to include the Lost Circulation Conditions amount. The OWNER will compensate the CONTRACTOR for the period of time drilling under Lost Circulation Conditions and for drilling fluid materials and additives used during the period of Lost Circulation Conditions, as a lump sum adjustment to the original lump sum contracted agreement. The Lost Circulation Conditions approved adjustment amount shall be based on the CONTRACTOR’S proposed Lost Circulation Conditions hourly rate, which shall be calculated so that it includes costs for any anticipated drilling fluids materials and additives that would be used during these conditions.

If lost circulation conditions are the result of the CONTRACTOR’S operations or activities (e.g., excessive fluid weight), all costs to regain circulation shall be borne by the CONTRACTOR.

6.5 LOW PENETRATION RATE CONDITIONS

During drilling or reaming operations and for all drilling methods, if a formation is encountered that results in a penetration rate of less than 4.0 feet per hour for a period of at least two continuous hours, while at least 1,500 pounds per diameter inch is applied to the drill bit, then the CONTRACTOR shall request to invoke Low Penetration Rate Conditions.

The CONTRACTOR is responsible for contacting the CONSULTANT or OWNER immediately upon the occurrence of these conditions to request Low Penetration Rate Conditions, and to

document the times, quantities, and circumstances of Low Penetration Rate Conditions during each occurrence. Failure of the CONTRACTOR to promptly notify the CONSULTANT or OWNER of Low Penetration Rate Conditions will void the CONTRACTOR'S opportunity to implement this clause. The conditions of this Section shall apply from the beginning of the time period of Low Penetration Rate Conditions (less than 4.0 feet per hour) and shall continue only until such time as drilling is resumed at a rate of 4.0 feet per hour or greater.

Upon invocation of this Section, the CONTRACTOR will trip the drill string out of the hole for inspection of the drill bit by the CONSULTANT or OWNER. The conditions of this Section shall apply only if the CONSULTANT'S or OWNER'S inspection of the drilling bit does not indicate excessive bit wear that would substantially decrease the penetration rate. In the event that the drill bit inspection indicates that this Section applies, the time expended for drilling bit removal will be paid by the OWNER under the conditions of this Section.

If Low Penetration Rate Conditions are invoked by the CONTRACTOR and approved by the OWNER during pilot borehole drilling or reaming operations, then the OWNER will modify the lump sum contracted agreement amount to include the Low Penetration Rate Conditions amount. The OWNER will compensate the CONTRACTOR for the period of time drilling under Low Penetration Rate Conditions and for any additional drilling bits used during the period of Low Penetration Rate Conditions, as a lump sum adjustment to the original lump sum contracted agreement. The Low Penetration Rate Conditions approved adjustment amount shall be based on the CONTRACTOR'S proposed Low Penetration Rate Conditions hourly rate, which shall be calculated so that it includes costs for any anticipated additional drilling bits that would be used during these conditions.

If the CONSULTANT or OWNER is not notified during the initial 2-hour period of low penetration, or if bit inspection reveals excessive wear, the provisions of this clause will not be invoked.

END OF SECTION

SECTION 7: CONDUCTOR CASING

Conductor casing shall be installed and sealed in place prior to drilling the surface casing borehole for the proposed well. Conductor casing installation methods and materials are specified below. All drilling and well construction will be conducted 24-hours per day, 7 days per week, unless otherwise approved by the OWNER.

7.1 CONDUCTOR CASING BOREHOLE DRILLING

Drilling of the conductor casing borehole shall be performed using a rotary drilling method or by use of a bucket auger (solid stem auger) drilling method. Any other method recommended by the CONTRACTOR will not be allowed unless approved by the CONSULTANT or OWNER.

Conductor casing drilling and installation shall be conducted under the observation of the CONSULTANT or OWNER. The surface casing borehole shall be drilled to a minimum 28-inches in diameter and to a depth of approximately 40 feet.

During the drilling of the borehole, the CONTRACTOR shall collect and preserve for the CONSULTANT or OWNER samples of the drill cuttings collected at 10-foot intervals. The samples shall be placed in 4½-inch x 6-inch cloth sacks (Hubco Inc. or equivalent) furnished by the CONTRACTOR.

The CONSULTANT or OWNER reserves the right to direct the drilling of the conductor casing borehole to a greater depth depending on geologic formations and other subsurface conditions. Any variation from the stated conductor casing borehole diameter must be approved by the CONSULTANT or OWNER.

7.2 CONDUCTOR CASING MATERIALS

The conductor casing specifications and cement grout seal are described below.

7.2.1 Conductor Casing Steel

Prior to casing installation, the CONTRACTOR shall submit certified test reports to the CONSULTANT or OWNER to demonstrate compliance with the physical and chemical properties of the casing steel that are specified herein.

The casing shall be of new conditions and constructed of low carbon steel (LCS) and manufactured in accordance with ASTM Specification A53 Grade B steel or ASTM Specification A139 Grade B steel.

The conductor casing shall have a minimum 24-inch outside diameter (O.D.) and have a minimum 0.312-inch wall thickness. The minimum length of the conductor casing shall be 41 feet, to allow for a minimum 1-foot stickup above ground surface (ags), as shown on **Figure 4**.

The conductor casing must contain either one longitudinal seam (for A53 Grade B) or one spiral seam (for A139 Grade B) along the axis and will not contain more than one circumferential seam per ten linear feet, unless otherwise approved by the CONSULTANT or OWNER.

7.2.2 Conductor Casing Cement Grout Seal

The CONTRACTOR must provide the specific constituents of the cement grout to the CONSULTANT or OWNER prior to placement of the grout. The cement grout slurry shall be mixed thoroughly and must be free of lumps to the satisfaction of the CONSULTANT or OWNER. Cement grout that does not comply with this specification will be rejected.

The neat or Pozzolan cement grout seal material shall consist of cement slurry containing 5.2 to 6.0 gallons of water per 94-pound sack of Portland cement. The Portland cement shall conform to ASTM Standard C150, Type II/V (sulfate resistant). The cement grout slurry may contain pozzolanic material (fly ash) as an additive, which complies with ASTM Standard C618, and which shall not exceed 50 percent by volume of the cement. No non-pozzolan aggregate or sand may be added to the cement grout.

The cement grout weight must be measured prior to installation, as an indicator of the cement-water ratio. Neat cement grout slurry shall not exceed 15.6 pounds per gallon (lb/gal), or approximately 117 pounds per cubic foot (lb/ft³). Pozzolan cement grout slurry shall not exceed 14.7 lb/gal, or 110 lb/ft³. For information purposes, examples of cement mix designs are presented in **Appendix C**.

Bentonite may be used as an additive but must be in powder form and shall not exceed 4 percent by volume of the cement, or cement and sand. Water added for bentonite shall not exceed 1.3 gallons per 1.88 pounds of bentonite (2 percent by weight in cement). Accelerator additives, such as calcium chloride, shall not exceed 2 percent by weight of the cement. Water used for preparing the grout slurry shall be obtained from the same makeup water source used to supply the makeup water for drilling. The water source and specific constituents of the cement grout must be approved by the CONSULTANT or OWNER.

7.3 CONDUCTOR CASING INSTALLATION

The procedures for conductor casing installation are described below.

7.3.1 Conductor Casing Installation

Conductor casing material, conforming to **Section 7.2.1 (Conductor Casing Steel)**, shall be furnished and placed a minimum of one foot stickup ags to a depth of 40 feet bgs.

The conductor casing shall be lowered into the borehole by a method which will always allow for the control of the rate of fall of the casing into the borehole. The casing shall not be dropped or allowed to fall uncontrolled into the borehole.

To accommodate flooded-reverse-circulation rotary drilling, a temporary opening may be cut into the surface casing to allow flow of drilling fluids. After drilling is complete, it is the CONTRACTOR'S responsibility to repair the surface casing to its original condition after drilling has been completed.

7.3.2 Conductor Casing Cement Grout Installation

Cement grout slurry conforming to the specification in **Section 7.2.2 (Conductor Cement Grout Seal)** shall be placed in the annular space from the base of the surface casing to the ground surface. The CONTRACTOR shall be responsible for maintaining an equalization of pressures to the extent necessary to prevent collapse of the casing during cement grout installation. The grout seal shall completely fill the annular space and form a continuous seal between the conductor casing and the wall of the borehole.

The conductor casing grout seal shall be installed to completely extend from the base of the casing to the ground surface to accommodate drilling. The grout shall be installed by pumping through a tremie pipe. Prior to pumping, the cement grout shall be passed through a ½-inch slotted bar strainer to remove any unmixed lumps. During the cement grout installation, the discharge end of the tremie pipe shall be continuously submerged in the grout until the interval to be grouted is completely filled.

The CONTRACTOR is responsible for maintaining cement slurry hydraulic pressures and pumping pressures that will not reach excessive levels and cause casing collapse during cement seal installation operations. A minimum curing time for the conductor casing grout seal is 12 hours, with the cement grout obtaining a compressive strength of at least 500 pounds per square inch (psi). The conductor casing shall be maintained centered in the borehole during and after cement grout installation. The CONSULTANT or OWNER must approve the method of cement grout installation.

END OF SECTION

SECTION 8: SURFACE CASING

Surface casing shall be installed and sealed in place prior to drilling the production borehole for the proposed well. Surface casing installation methods and materials are specified below. All drilling will be conducted 24-hours per day, 7 days per week, unless otherwise approved by the OWNER.

8.1 SURFACE CASING BOREHOLE DRILLING

Prior to the start of drilling, the CONTRACTOR shall submit details of the proposed formation sampling method to the CONSULTANT or OWNER, including any specific sampling equipment to be used. The sampling program and equipment must be approved by the CONSULTANT or OWNER.

A minimum 22-inch diameter borehole will be drilled to a depth of approximately 1,020 feet. The borehole shall be drilled using the methods described in **Section 1.6 (Method of Drilling)**, and in compliance with the drilling fluid control program described in **Section 6.0 (Drilling Fluid Control Program)**.

During the drilling of the borehole, the CONTRACTOR shall collect and preserve for the CONSULTANT or OWNER samples of the drill cuttings collected at 10-foot intervals. The CONTRACTOR shall provide an acceptable means of sampling the drill cuttings at the discharge ditch or pipe. Each cuttings sample shall be carefully collected from the sampling point, and the sample catching device shall be cleaned of all cuttings after each sample is taken.

The cuttings samples shall be placed in 4½-inch x 6-inch cloth sacks (Hubco Inc. or equivalent) furnished by the CONTRACTOR. In addition, as an on-site visual record of the borehole stratigraphy, cuttings samples shall also be laid out in a sample storage area on a waterproof tarp or ground cloth. The storage area and ground cloth must allow samples to be maintained in sequence and unmixed with surface material or other samples until they have been examined and logged by the CONSULTANT or OWNER.

During borehole drilling, plumbness and alignment tests shall be performed by the CONTRACTOR using an inclinometer (TOTCO tool or equal) at 100-foot intervals. A 3-degree unit shall be used with the inclinometer and it will be the responsibility of the CONTRACTOR to make adjustments to correct the plumbness and alignment of the borehole during drilling.

8.2 GEOPHYSICAL LOGGING OF SURFACE CASING BOREHOLE

If requested by the CONSULTANT or OWNER, the borehole shall be geophysically logged from the bottom of the conductor casing (approximate depth of 40 feet) to the total depth of the borehole. The geophysical logging company will be subcontracted by the CONTRACTOR. The geophysical logging will be conducted under the observation of the CONSULTANT or OWNER.

For bidding purposes, assume the borehole geophysical logging suite will include all of the following logs or as requested by the OWNER or CONSULTANT:

- Spontaneous Potential and Resistivity Logs (Electric Logs)
- Natural Gamma Ray Log
- Caliper Log
- Temperature Log
- Gyroscopic Log

The CONTRACTOR shall keep the boring full of drilling fluid at all times during geophysical logging, to stabilize the borehole and provide log integrity. The CONTRACTOR shall assist the geophysical logger in rigging of the geophysical survey equipment. The CONTRACTOR shall ensure that the logging tools can be run to the total depth of the borehole without interference by obstructions or tight sections in the borehole.

At the request of the CONSULTANT or OWNER, the geophysical logging contractor will conduct repeat sections of geophysical logs in intervals of the borehole selected by the CONSULTANT or OWNER. The repeat logging intervals will not exceed 50 feet.

The geophysical logging company will provide a copy of the geophysical log to the CONSULTANT or OWNER and CONTRACTOR upon completion of logging.

8.3 SURFACE CASING MATERIALS

The surface casing specifications and cement grout seal are described below.

8.3.1 *Surface Casing Steel Material*

Prior to surface casing installation, the CONTRACTOR shall submit certified test reports to the CONSULTANT or OWNER to demonstrate compliance with the physical and chemical properties of the surface casing steel that are specified herein.

The surface casing shall be constructed of new LCS and manufactured in accordance with ASTM Specification A53 Grade B steel or ASTM Specification A139 Grade B steel. The surface casing must contain either one longitudinal seam (for A53 Grade B) or one spiral seam (for A139 Grade B) along the axis and will not contain more than one circumferential seam per ten linear feet, unless otherwise approved by the CONSULTANT or OWNER.

The surface casing shall have a minimum 16-inch O.D. and have a minimum 0.375-inch wall thickness.

8.3.2 Surface Casing Cement Grout Seal

The CONTRACTOR must provide the specific constituents of the cement grout to the CONSULTANT or OWNER prior to placement of the grout. The cement grout slurry shall be mixed thoroughly and must be free of lumps to the satisfaction of the CONSULTANT or OWNER. Cement grout that does not comply with this specification will be rejected.

The neat or Pozzolan surface casing cement grout seal material shall consist of cement slurry containing 5.2 to 6.0 gallons of water per 94-pound sack of Portland cement. The Portland cement shall conform to ASTM Standard C150, Type II/V (sulfate resistant). The cement grout slurry may contain pozzolanic material (fly ash) as an additive, which complies with ASTM Standard C618, and which shall not exceed 50 percent by volume of the cement. No non-pozzolan aggregate or sand may be added to the cement grout.

The cement grout weight must be measured prior to installation, as an indicator of the cement-water ratio. Neat cement grout slurry shall not exceed 15.6 lb/gal, or approximately 117 lb/ft³. Pozzolan cement grout slurry shall not exceed 14.7 lb/gal, or 110 lb/ft³. For information purposes, examples of cement mix designs are presented in **Appendix C**.

Bentonite may be used as an additive but must be in powder form and shall not exceed 4 percent by volume of the cement, or cement and sand. Water added for bentonite shall not exceed 1.3 gallons per 1.88 pounds of bentonite (2 percent by weight in cement). Accelerator additives, such as calcium chloride, shall not exceed 2 percent by weight of the cement. Water used for preparing the grout slurry shall be obtained from the same makeup water source used to supply the makeup water for drilling. The water source and specific constituents of the cement grout must be approved by the CONSULTANT or OWNER.

The surface casing cement grout seal shall be installed from approximate depths of 1,020 to 900 feet and 40 feet up to ground surface.

8.3.3 Formation Stabilizer Material

A sample of the formation stabilizer material shall be provided to the CONSULTANT or OWNER for approval no less than 3 days prior to installation.

The formation stabilizer shall consist of clean aggregate or sediment material. The formation stabilizer material must be composed of inert materials, containing no organic or hazardous materials. For bidding purposes, an acceptable formation stabilizer would consist of clean siliceous pea gravel with 10-foot bentonite seals installed at 100-foot intervals that will be installed from 40 to 900 feet bgs. The specific formation stabilizer material must be approved by the CONSULTANT or OWNER.

8.3.4 Bentonite Seal Material

A sample of the bentonite material shall be provided to the CONSULTANT or OWNER for approval no less than 3 days prior to installation.

The bentonite seal material shall consist of sodium bentonite pellets or bentonite chips. The bentonite seal material shall contain no hazardous materials or gypsum. For bidding purposes, 10-foot bentonite seals shall be installed within the formation stabilizer at 100-foot intervals.

8.4 SURFACE CASING INSTALLATION

The procedures for surface casing installation are described below.

8.4.1 Surface Casing Installation

Surface casing material, conforming to **Section 7.3.1 (Surface Casing Steel)**, shall be furnished and installed to an anticipated depth of 1,020 feet.

LCS casing centralizers that have been approved by the CONSULTANT or OWNER shall be secured to the well casing and screen at intervals of not greater than 40 feet.

The surface casing shall be lowered into the borehole by a method which will always allow for the control of the rate of fall of the casing into the borehole. The casing shall not be dropped or allowed to fall uncontrolled into the borehole.

8.4.2 Surface Casing Cement Grout Installation

Cement grout slurry conforming to the specification in **Section 7.3.2 (Surface Cement Grout Seal)** shall be placed in the annular space from the base of the surface casing (anticipated depth of 1020 feet) up to a depth of 900 feet. The CONTRACTOR shall be responsible for maintaining an equalization of pressures to the extent necessary to prevent collapse of the surface casing during cement grout installation. The grout seal shall completely fill the annular space and form a continuous seal between the surface casing and the wall of the borehole.

The surface casing grout seal shall be installed to completely extend from the base of the surface casing to the ground surface to accommodate drilling. The surface casing grout shall be placed by pumping through a tremie pipe. Prior to pumping, the cement grout shall be passed through a ½-inch slotted bar strainer to remove any unmixed lumps. During the cement grout installation, the discharge end of the tremie pipe shall be continuously submerged in the grout until the interval to be grouted is completely filled.

The CONTRACTOR is responsible for maintaining cement slurry hydraulic pressures and pumping pressures that will not reach excessive levels and cause casing collapse during cement seal installation operations. A minimum curing time for the surface casing grout seal is 12 hours, with the cement grout obtaining a compressive strength of at least 500 psi. The surface casing shall be maintained centered in the borehole during and after cement grout installation. The CONSULTANT or OWNER must approve the method of cement grout installation.

8.4.3 Formation Stabilizer Installation

Formation stabilizer material complying with **Section 8.3.2 (Formation Stabilizer Material)** shall be installed in the annulus within the interval from the top of the annular bentonite seal at

approximately 1,000 feet bgs up to 40 feet bgs (see **Figure 5**). Additional 5-foot bentonite seals shall be installed within the formation stabilizer at 100-foot intervals. The CONSULTANT or OWNER must approve the specific method of bentonite and formation stabilizer installation.

END OF SECTION

SECTION 9: PILOT BOREHOLE DRILLING AND TESTING

Pilot borehole drilling and testing methods are described below. All drilling will be conducted 24-hours per day and 7 days per week, unless otherwise approved by the OWNER.

9.1 PILOT BOREHOLE DRILLING

Prior to the start of drilling, the CONTRACTOR shall submit details of the proposed formation sampling method to the CONSULTANT or OWNER, including any specific sampling equipment to be used. The sampling program and equipment must be approved by the CONSULTANT or OWNER.

A minimum 9.875-inch diameter pilot borehole will be drilled from the bottom of the surface casing to an approximate total depth of 1,460 feet. The borehole shall be drilled using the methods described in **Section 1.6 (Method of Drilling)**, and in compliance with the drilling fluid control program described in **Section 6.0 (Drilling Fluid Control Program)**.

During the drilling of the borehole, the CONTRACTOR shall collect and preserve for the CONSULTANT or OWNER samples of the drill cuttings collected at 10-foot intervals. The CONTRACTOR shall provide an acceptable means of sampling the drill cuttings at the discharge ditch or pipe. Each cuttings sample shall be carefully collected from the sampling point, and the sample catching device shall be cleaned of all cuttings after each sample is taken.

The samples shall be placed in 4½-inch x 6-inch cloth sacks (Hubco Inc. or equivalent) furnished by the CONTRACTOR. Each sample shall also be laid out in a sample storage area on a waterproof tarp or ground cloth. In addition, as an on-site visual record of the borehole stratigraphy. The storage area and ground cloth must allow samples to be maintained in sequence and unmixed with surface material or other samples until they have been examined and logged by the CONSULTANT or OWNER.

During pilot borehole drilling, plumbness and alignment tests shall be performed by the CONTRACTOR using an inclinometer (TOTCO tool or equal) at 100-foot intervals. A 3-degree unit shall be used with the inclinometer and it will be the responsibility of the CONTRACTOR to make adjustments to correct the plumbness and alignment of the borehole during drilling.

9.2 GEOPHYSICAL LOGGING

If requested by the CONSULTANT or OWNER, the pilot borehole shall be geophysically logged from the bottom of the surface casing to the total depth of the borehole. The geophysical logging company will be subcontracted to the CONTRACTOR. . The geophysical logging will be conducted under the observation of the CONSULTANT or OWNER.

For bidding purposes, the assumed pilot borehole geophysical logging suite will include the following logs, as requested by the CONSULTANT or OWNER:

- Spontaneous Potential and Resistivity Logs (Electric Log)
- Natural Gamma Ray Log
- Caliper Survey Log
- Laterolog3 (Guard Log)
- Temperature Log
- Gyroscopic Log

The CONTRACTOR shall keep the boring full of drilling fluid at all times during geophysical logging, to stabilize the borehole and provide log integrity. The CONTRACTOR shall assist the geophysical logger in rigging of the geophysical survey equipment. The CONTRACTOR shall ensure that the logging tools can be run to the total depth of the borehole without interference by obstructions or tight sections in the borehole.

At the request of the CONSULTANT or OWNER, the geophysical logging contractor will conduct repeat sections of geophysical logs in intervals of the borehole selected by the CONSULTANT or OWNER. The repeat logging intervals will not exceed 50 feet.

The geophysical logging company will provide a copy of the geophysical log to the CONSULTANT or OWNER and CONTRACTOR upon completion of logging.

9.3 ZONAL SAMPLING AND TESTING

After the completion of geophysical logging, the CONTRACTOR shall collect zonal (depth-specific) groundwater samples from depth intervals designated by the CONSULTANT or OWNER. It is anticipated that **three zonal samples** will be collected from the well, although the CONSULTANT or OWNER may add or omit samples based on subsurface conditions encountered. After each zonal sample is collected, the CONTRACTOR shall obtain a measurement of the static water level. The specific zonal sampling procedure, the duration of pumping at each sample interval, and the point of discharge for purged water must be approved by the CONSULTANT or OWNER. The zonal samples need not be free of sand grains, but must be reasonably clear.

The CONTRACTOR will then standby while the CONSULTANT or OWNER performs a falling head test for that sample interval. Each falling head test is anticipated to require approximately two additional hours per test interval. The required method of zonal water sample collection is:

1. The borehole below each sample interval will be filled with clean gravel or sand, which must be approved by the CONSULTANT or OWNER. The portion of the borehole immediately beneath the interval to the sampled shall be sealed with no less than 5 feet of bentonite pellets or chips. The bentonite shall be installed to the appropriate depth, which shall be measured (tagged) with a wire line or other measurement device that has been approved by the CONSULTANT or OWNER.
2. A minimum 4-inch inside diameter (I.D.) steel eductor pipe shall be installed to the sample depth. The eductor pipe shall have a bottom cap and be perforated in the bottom 10 feet.
3. An envelope of clean pea gravel shall be installed around the eductor pipe, to the top of the interval to be sampled. The gravel envelope will be capped with another layer of bentonite pellets or chips (minimum 5 feet in thickness).
4. The sample interval of the borehole shall be purged by airlifting for an adequate period to evacuate the drilling fluid from the borehole to the extent that a representative zonal sample can be obtained. The equipment used during purging and sampling operations must be approved by the CONSULTANT or OWNER, and shall be capable of providing a discharge of no less than 5 gpm of water from the sampling interval (subject to the limitations of the formation being sampled). As directed by the CONSULTANT, the CONTRACTOR shall monitor and record the air pressure during airlifting operations.
 - a. The bentonite seals above and below the sample interval must remain intact throughout the purging and sampling period for each zonal sample interval, to the satisfaction of the CONSULTANT or OWNER. If it is determined that the bentonite seals were breached during purging, all time spent purging prior to the breach will be at the CONTRACTOR'S own expense.
 - b. Additionally, if the zone is improperly set, the CONTRACTOR will be required to remove the sampling tool and clean out the borehole back down to the base of the sample interval at the CONTRACTOR'S own expense. The CONTRACTOR may also be required to reimburse additional CONSULTANT or OWNER fees that are the direct result of breached seals and/or improperly set zones. If drilling fluid additives are used for drilling, the zonal interval shall be dosed with either a 50 parts per million (ppm) slug of chlorine or dispersant to break up any drilling fluids, allowing for easier cleanup. The additive must be allowed to sit for at least 30 minutes prior to beginning any purging and the additive must be approved by the CONSULTANT or OWNER prior to installation.
 - c. It is anticipated that approximately 8 hours of airlifting will be required prior to collection of each zonal sample. After the interval to be sampled has been purged to the satisfaction of the CONSULTANT or OWNER, the CONSULTANT or

OWNER will collect the water sample from the discharge line. There will be a total of 24 hours of airlifting for the anticipated 3 zonal sampling intervals.

5. A measurement of the static water level shall be obtained by the CONTRACTOR for the test interval. The CONTRACTOR then will stand-by while the CONSULTANT or OWNER performs a falling head test on the zone. This process will consist of installing an electronic pressure transducer below the water level, injecting a “slug” of water of known volume, and recording the change in water level until the water level has returned to static conditions. The source of the water to be injected must be approved by the CONSULTANT or OWNER prior to installation. The estimated standby time for each falling head test is approximately 2 hours, totaling 6 hours for the anticipated 3 zonal sampling intervals.
6. After zonal sampling and testing has been completed for each interval, the CONTRACTOR shall raise the eductor pipe to the next interval, and the procedure shall be repeated for each sample location.

END OF SECTION

SECTION 10: WELL CONSTRUCTION

The borehole reaming and well construction methods are described below. All drilling and construction will be conducted 24-hrs per day and 7 days per week, unless otherwise approved by the OWNER.

10.1 BOREHOLE REAMING

After the completion of zonal sampling and testing operations, it is anticipated that the pilot borehole shall be reamed to a diameter of 14.75 inches and a total depth of approximately 1,465 feet, as shown on **Figure 4**.

The pilot borehole shall be reamed using the methods described in this specification, and in compliance with the drilling fluid control program described in **Section 6.0 (Drilling Fluid Control Program)**. A 3-arm final reamed caliper log shall be conducted by a geophysical logger SUBCONTRACTOR after the boring has been reamed to its final diameter and depth. The caliper log of the reamed borehole will be subcontracted by the CONTRACTOR.

10.2 WELL CONSTRUCTION MATERIALS

The materials to be installed in proposed GVID Well #3B are described below. The CONTRACTOR shall be responsible for the timely delivery of the well casing, well screen, and other materials to the drilling site after the OWNER has decided the final well design to complete the well installation program. The well casing and well screen must be approved by the CONSULTANT or OWNER prior to installation.

The preliminary well design includes a nominal 10-inch diameter casing and screen assembly (**Figure 4**). The final length, and placement intervals of the well casing and screen will be finalized by the CONSULTANT or OWNER based on the evaluation of the lithological, geophysical logging, and zonal testing data collected from the pilot borehole. The CONSULTANT or OWNER shall have 7 days after conclusion of borehole reaming to submit the final well design to the CONTRACTOR under which no standby time or rig time rates shall apply.

The CONSULTANT or OWNER may, at its discretion, reject any materials that do not meet these specifications or tolerances thereof, as determined by the CONSULTANT or OWNER. Any additional standby time or other costs incurred by the CONTRACTOR as a result of the rejection of any specified materials provided by the CONTRACTOR or its suppliers shall not be compensated by the OWNER and shall be the sole responsibility of the CONTRACTOR.

10.2.1 Well Casing Material

Prior to well casing installation, the CONTRACTOR shall submit certified test reports to the CONSULTANT or OWNER to demonstrate compliance with the physical and chemical properties of the well casing that are specified herein.

The blank well casing shall be constructed of nominal 10-inch diameter LCS, conforming to ASTM Specification A53 Grade B steel or ASTM Specification A139 Grade B steel. The well casing shall

have a minimum 0.375-inch wall thickness and shall be new and without defects. The bottom 10-foot sump shall be equipped with a bullnose endcap consisting of the same material and wall thickness as the well casing and screen.

The well casing shall be factory-assembled in not less than 20-foot long sections (except for the casing sections used for the bottom sump and casing stickup). The well casing sections shall contain one spiral seam along the casing axis and shall contain no more than one circumferential seam per 10 linear feet, unless otherwise approved by the CONSULTANT or OWNER. Ends of casing lengths shall be as described in **Section 10.3.1 (Joints in the Well Casing)**.

The top of the nominal 10-inch diameter well casing and screen assembly shall be equipped with a centralizer and concentric reducer that shall be of the same wall thickness as the well casing and extend to a nominal diameter of 12-inches.

10.2.2 Well Screen Material

Prior to the well screen installation, the CONTRACTOR shall submit certified test reports to the CONSULTANT or OWNER to demonstrate compliance with the physical and chemical properties of the well screen, as specified herein.

The CONTRACTOR shall obtain from the well screen manufacturer, the screen tensile strength (pounds), collapse strength (psi), screen weight (pounds per linear foot), and maximum recommended hang weight (pounds). This information shall be provided to the CONSULTANT or OWNER prior to delivery of the well screen to the site.

The well screen shall be constructed of nominal 10-inch I.D. LCS, minimum 0.375-inch wall thickness, conforming to ASTM Specification A53 Grade B steel or ASTM Specification A139 Grade B steel. The screen openings shall be machine made, horizontal to the axis of the casing and of louver form with the aperture (slot) facing downward. Screen slot size will be determined by the CONSULTANT following collection and sieve (gradation) analyses of formation lithologic samples from the borehole. The screen shall be designed and manufactured with adequate collapse strength and tensile strength for a setting depth of 1,500 feet. The anticipated length of well screen shall be 200 feet (**Figure 4**), although the CONSULTANT or OWNER may choose a longer or shorter screened interval based on the subsurface conditions encountered during pilot borehole drilling and testing.

10.2.3 Filter Pack and Disinfectant Material

Samples of the filter pack sand and a sieve analysis (percent retained through U.S. standard sieve numbers 4, 8, 10, 16, 30, 40, 50, 100, and 200) of the filter pack material shall be submitted to the CONSULTANT or OWNER for approval, a minimum of 3 days prior to delivery of the filter pack to the well site. The filter pack material shall be contained in a temporary storage area at the well site in such a manner as to prevent contamination. The filter pack material shall be bagged in approximately 3,000-pound (about one cubic yard) "super sacks". Each bag must be labeled with its actual weight. Any filter pack material delivered unbagged or unlabeled will be rejected.

The filter pack shall consist of clean, highly siliceous, well-rounded grains that are smooth and uniform. The filter pack material shall be obtained from a source that has been approved by the CONSULTANT or OWNER. The filter pack material shall be free of shale, mica, clay, dirt, loam and organic impurities of any kind, and shall not contain iron or manganese in a form or quantity that will adversely affect the water quality. Filter pack size and gradation will be determined by the CONSULTANT following evaluation of sieve (gradation) analyses of formation lithologic samples from the borehole.

During installation of the filter pack, an NSF-approved granular hypochlorite or similar disinfectant shall be added to the filter pack sand at the rate of ½-pound per cubic yard of filter pack material, based on 70 percent chlorine content. If a lesser strength hypochlorite or other chlorine product is used, the quantity shall be adjusted accordingly.

10.2.4 Bentonite Seal Material

A sample of the bentonite material shall be provided to the CONSULTANT or OWNER for approval no less than 3 days prior to installation.

The bentonite seal material shall consist of sodium bentonite pellets or bentonite chips. The bentonite seal material shall contain no hazardous materials or gypsum. For bidding purposes, a 10-foot bentonite seal shall be installed directly above the filter pack material.

10.2.5 Cement Grout Material

The CONTRACTOR must provide a cement mix design, the mix water source, and the specific constituents of the cement grout to the CONSULTANT or OWNER prior to the start of cementing operations. The cement grout slurry must be mixed thoroughly and be free of lumps, to the satisfaction of the CONSULTANT or OWNER. Cement grout that does not meet the requirements of this specification, or is not adequately mixed, will be rejected.

The material for the cement grout seal shall consist of a neat cement slurry containing 5.2 to 6.0 gallons of water per 94-pound sack of Portland cement. The Portland cement shall conform to ASTM Standard C150, Type II/V (sulfate resistant). The cement grout slurry may contain pozzolanic material (fly ash) as an additive, which complies with ASTM Standard C618, and which shall not exceed 50 percent by volume of the cement. No non-pozzolanic aggregate or sand may be added to the cement grout.

The cement grout weight must be measured prior to installation, as an indicator of the cement-water ratio. Neat cement grout slurry shall not exceed 15.6 lb/gal, or approximately 117 lb/ft³. Pozzolan cement grout slurry shall not exceed 14.7 lb/gal, or 110 lb/ft³. For information purposes, examples of cement mix designs are presented in **Appendix C**.

Accelerator additives shall not be used unless approved by the CONSULTANT or OWNER. Water used for preparing the grout slurry shall be potable. The specific constituents of the cement grout must be approved by the CONSULTANT or OWNER.

10.3 WELL CASING AND SCREEN INSTALLATION

During the installation of proposed GVID Well #3B casing, the borehole shall be kept full of drilling fluid as specified in **Section 6.0 (Drilling Fluid Control Program)** and shall be free from any obstructions detrimental to completing the casing installation. The well casing and screen shall be set centered in the hole so as not to interfere in any way with the efficient operation of pumping equipment within the well casing or screen. The CONTRACTOR will be required to work continuously, on a 24-hour per day, 7-day week basis while installing and completing the well, unless otherwise approved by the OWNER.

The well casing and well screen shall be set by the CONTRACTOR at the depth intervals specified by the CONSULTANT or OWNER. LCS casing centralizers that have been approved by the CONSULTANT or OWNER shall be secured to the well casing and screen at intervals of not greater than 40 feet.

The casing shall be lowered into the borehole by a method which will always allow for the control of the rate of fall of the casing into the borehole. The casing shall not be dropped or allowed to fall uncontrolled into the borehole.

10.3.1 Joints in the Well Casing and Screen

An affidavit of compliance with the welding provisions of this section shall be provided to the CONSULTANT or OWNER prior to the acceptance of the well. The affidavit of compliance shall certify that all welding conducted during this project was performed in accordance with all applicable provisions of these specifications.

Joints in the LCS well casing and well screen shall be field welded in accordance with applicable provisions of the American Water Works Association (AWWA) Standard C206 for welded joints. A welding sequence shall be followed that will avoid excessive distortion. All well casing joints or overlaps shall be made water-tight to prevent the degradation of the water supply by the migration of poor-quality water. All welding shall be performed by an experienced welder.

If the casing or screen sections are butt-welded without the use of welding rings, the ends of the casing lengths shall be ground, or sufficiently scarfed, to remove sharp edges or burrs. The ends of each casing section shall not vary more than 0.010 inch at any point from a true plane at right angles to the axis of the casing. Each casing and screen end shall be beveled at one end to allow complete penetration of the welds.

If the casing or screen sections are joined with welding collars, the ends of the casing lengths shall be ground, or sufficiently scarfed, to remove sharp edges or burrs. One end of each casing section shall be furnished with a welding collar of the same wall thickness and have the same physical and chemical properties as the corresponding casing sections. The welding collars shall have a minimum 5-inch length and shall fit the outside diameter of the well casing within 0.0625-inch diametrical clearance. The welding collars shall be delivered to the well site connected to the casing sections at one end with factory-welded connections. The inside edge of

the welding collars shall be ground or sufficiently scarfed to remove sharp edges or burrs. Three alignment holes shall be provided in each welding collar (spaced at 120°), to ensure proper abutment of the casing sections. The alignment holes shall be no larger than 1 inch in diameter and shall be completely filled with fillet welding. The ends of each casing section shall not vary more than 0.010 inch at any point from a true plane at right angles to the axis of the casing.

10.4 ANNULAR MATERIALS INSTALLATION

Installation of the annular materials for proposed GVID Well #3B are described below.

10.4.1 Filter Pack and Disinfectant Installation

Filter pack material, conforming to the specifications of **Section 10.2.3 (Filter Pack and Disinfectant Material)**, shall be placed to completely fill the annulus from total depth (estimated to be an approximate depth of 1465) up to an approximate depth of 960 feet (see **Figure 5**). During the time of placement, fluid circulation shall be maintained through a CONSULTANT- or OWNER-approved swab block located approximately 40 feet below the fill depth of the filter pack material. The swab block shall be periodically reciprocated to remove fine-grained material, prevent bridging, and aid in settling the filter pack in the borehole. Drilling fluid shall be maintained throughout the full depth of the well to the ground surface and the well casing and screen shall be maintained in tension, until the filter material placement has been completed to the specified level. Care shall be taken to avoid bridging during installation of the sand.

The filter pack material shall be installed through a tremie pipe. At no time shall the bottom of the tremie pipe be located at a distance greater than 40 feet above the interval being filled during filter pack placement. The level of the filter pack shall be measured periodically during placement with a wireline sounder, as required by the CONSULTANT or OWNER. Placement of the filter pack shall be continuous, except when additional precautions are necessary to prevent bridging, or measurements of the filter pack level are being conducted.

The quantity of filter pack material placed in the annulus shall not be less than that of the computed volume. Upon completion of the filter pack placement, excess filter pack material will be judged an indication of voids in the filter pack envelope and corrective measures shall be undertaken at the CONTRACTOR'S expense. The specific method of filter pack placement and the filter pack material must be approved by the CONSULTANT or OWNER.

During installation, the filter pack shall be disinfected using granular hypochlorite or similar agent consistent with the specifications in **Section 10.2.3 (Filter Pack and Disinfectant Material)**. The CONTRACTOR is responsible for the uniform application of the disinfecting agent throughout the filter pack interval, without relying on subsequent mechanical surging action for dispersing the disinfectant. The specific method used to disinfect the filter pack must be approved by the CONSULTANT or OWNER.

10.4.2 Bentonite Seal Installation

A 10-foot bentonite seal complying with **Section 10.2.4 (Bentonite Seal Material)** shall be installed in the annulus immediately above the top of the filter pack from approximate depths of 960 to 950 feet (see **Figure 4**). The bentonite seal shall be installed simultaneously with the circulation of drilling fluid down the annulus, until such time that the annulus has been sealed and circulation can no longer be maintained.

10.4.3 Cement Grout Seal Installation

The well casing cement grout seal shall consist of a neat cement or Pozzolan cement slurry conforming to the specification in **Section 10.2.5 (Cement Grout Material)**. The cement grout shall be placed to completely fill the annular space between the 16-inch diameter surface casing and nominal 10-inch diameter casing and screen assembly from approximate depths of 950 to 910 feet (see **Figure 4**).

The cement grout shall be placed by pumping through a tremie pipe. Prior to pumping, the cement grout shall be passed through a ½-inch slotted bar strainer to remove any unmixed lumps. During the cement grout installation, the discharge end of the tremie pipe shall be continuously submerged in the grout until the zone to be grouted is completely filled. The CONTRACTOR is responsible for maintaining cement slurry hydraulic pressures and pumping pressures that will not reach excessive levels and cause casing collapse during cement seal installation operations.

A minimum curing time for each cement grout lift is 12 hours, with the cement grout obtaining a compressive strength of at least 500 psi before another lift may be installed. The casing shall be maintained centered in the borehole during and after cement grout installation. The CONSULTANT or OWNER must approve the method of cement grout installation.

END OF SECTION

SECTION 11: WELL DEVELOPMENT AND TESTING

Well development and aquifer testing, including plumbness and alignment testing and the well video survey are described below. The CONTRACTOR shall provide to the CONSULTANT or OWNER an SDS for all chemical additives used during well development at least 3 days prior to their use. The CONSULTANT or OWNER must approve the specific type and placement method of all chemical additives prior to their use. All work will be conducted 24-hours per day and 7 days per week, unless otherwise approved by the OWNER.

11.1 WELL DEVELOPMENT WITH DRILL RIG

The well shall be initially developed with the drill rig to remove residual drilling fluids from the well and borehole.

11.1.1 Swab and Airlift Development

Well development with the drill rig shall be accomplished by simultaneously swabbing and airlifting from the well. Well development shall first consist of a quick pass downward, after which well development shall proceed from the bottom of the screen to the top of the screen, at a rate of no less than 7.5 minutes per foot of screen, unless otherwise directed by the CONSULTANT or OWNER. Approximately 25 hours of swab and airlift development is anticipated.

Water produced during swabbing and airlifting shall be contained onsite. Excess water shall be pumped and conveyed via temporary pipeline to a designated discharge location, as specified in **Section 2.5 (Discharge Water)**. Re-use of discharge water will not be allowed. The specific methods, chemical additives, and equipment used for well development must be approved by the CONSULTANT or OWNER prior to commencement of development operations.

11.2 TEST PUMP EQUIPMENT

The CONTRACTOR shall furnish, install and remove a test pump and related equipment. The test pump shall be capable of delivering a minimum of 500 gpm with a minimum total dynamic head of 1,250 feet below ground level. The CONTRACTOR shall provide to the CONSULTANT or OWNER the pump curve for the test pump prior to installation of the test pump. The test pump shall be complete with an ample power source and shall be capable of being operated without interruption for a period of 24 hours.

The pumping equipment shall not be removed from the well until after the completion of the water-level recovery test. The CONSULTANT or OWNER must approve the test pump, motor, metering equipment, access tube, and accessories.

11.2.1 Test Pump Discharge

The CONTRACTOR shall operate the test pump at the discharge rate(s) directed by the CONSULTANT or OWNER. Discharge from the pump shall be controlled by a controller or gate valve. The discharge shall be controlled and maintained at the specified rate(s) during the tests with an accuracy of plus-or-minus 5 percent.

The pump discharge shall be measured with two in-line, magnetic inductive-type totalizing flow meters. All in-line flow meters shall be located in a straight portion of the discharge pipe without any bends, valves, or other obstructions that may interfere with the operation and/or accuracy of the meters for a distance of no less than 10 pipe diameters upstream, and for a distance of no less than 5 pipe diameters downstream (unless otherwise recommended by the manufacturer of the meter).

At all times during pumping, the discharge pipe shall be oriented in such a manner as to ensure that the pipe remains full of water at the locations of the flow meters and orifice plate. The discharge pipe shall be equipped with a CONSULTANT- or OWNER- approved spigot or valve for water sample collection.

The CONTRACTOR shall also furnish equipment for measurement of sand production during pumping. The sand measurement device shall be a Rossum Sand Sampler, or equal, in accordance with AWWA Standard A100. The discharge flow measurement device(s) and sand measurement device must be approved by the CONSULTANT or OWNER.

Water produced during the aquifer tests shall be conveyed via temporary pipeline directly to the designated discharge location, as specified in **Section 2.5 (Discharge Water)**.

The discharge piping shall be watertight and capable of conveying the specified flow rates for the specified pumping periods. The CONTRACTOR is responsible for providing adequate piping for the actual distances to the discharge points. The CONTRACTOR is responsible for coordination of any required permits, traffic control, and other considerations that may be required to address potential flooding or pipeline roadway crossings that result from the discharged water.

11.3 PUMP AND SURGE DEVELOPMENT

After swabbing and airlift development with the drill rig, the well shall be further developed by pumping and surging prior to performing aquifer testing. The specific pump-and-surge development method must be approved by the CONSULTANT or OWNER. The pump development program is anticipated to have up to a 12-hour duration, with pumping rates ranging from 50 to 500 gpm. Water produced during pumping and surging shall be conveyed via temporary pipeline directly to the designated discharge location, as specified in **Section 2.5 (Discharge Water)**.

11.4 AQUIFER TESTING

Well testing will consist of a 10-hour step-rate pumping test, a 24-hour constant-rate aquifer test, and an 8-hour water-level recovery period. The CONSULTANT and OWNER reserve the right to extend or shorten the test duration.

During the step-rate pumping test, the well shall be pumped at rates that range from about 50 to 500 gpm, as directed by the CONSULTANT or OWNER; each step shall be of a uniform duration ranging up to about 120 minutes each, and rates shall be held constant during each step.

During the 24-hour constant-rate test, the pumping rate shall be held constant at a rate specified by the CONSULTANT or OWNER after completion of the step-rate pumping test.

The CONTRACTOR shall be responsible for furnishing and operating the test pumping equipment, as described in **Section 11.2 (Pump Test Equipment)** and **Section 11.2.1 (Test Pump Discharge)**. The CONSULTANT or OWNER will be responsible for collecting the water level and discharge data during the tests, and for collecting water level data after cessation of pumping.

END OF SECTION

SECTION 12: FINAL TASKS

12.1 PLUMBNESS AND ALIGNMENT

Tests for plumbness and alignment shall be made by the CONTRACTOR during drilling, and after the construction of the well is complete. All plumbness and alignment tests performed during drilling operations will be at the CONTRACTOR'S expense. The final plumbness and alignment test is a bid item that shall be paid by the OWNER (if performed). If the well fails the final plumbness and alignment test, the CONTRACTOR must correct the plumbness and alignment to the satisfaction and approval of the CONSULTANT or OWNER. Plumbness and alignment correction costs shall be borne by the CONTRACTOR.

In accordance with AWWA Standard A100, the maximum allowable horizontal deviation (drift) from vertical shall not exceed 2/3 of the inside diameter of the well casing, per 100 feet of depth, which is equal to 8.0 inches per 100 feet of depth. The CONTRACTOR shall guarantee that when completed, the well shall be sufficiently straight and plumb to permit the free installation and operation an 8-inch diameter vertical turbine pump capable of pumping 100 to 200 gpm, with an anticipated static water level depth of 1,100 feet, and pump intake depth setting of approximately 1,250 feet.

To demonstrate compliance with this requirement, the CONTRACTOR shall furnish all labor, equipment, and materials to conduct plumbness and alignment tests to the satisfaction of the CONSULTANT or OWNER. Tests for plumbness and alignment must be approved by the CONSULTANT or OWNER.

12.2 WELL VIDEO SURVEY

After completion and testing of the well, the CONTRACTOR shall provide a color video survey of the well. The video survey camera shall include both downward-looking and side-view capabilities, and the video survey shall be conducted under the observation of the CONSULTANT or OWNER. Both the quality and clarity of the well video must be acceptable to the CONSULTANT or OWNER. Prior to acceptance of the well, one copy of the final well video shall be provided to the CONSULTANT or OWNER by the CONTRACTOR.

12.3 SURFACE COMPLETION

The well shall be temporarily capped with a LCS covering plate. The covering plate will be secured to the top of the well with a water-tight welded seam. Additionally, the covering plate will be equipped with a ½-inch diameter access port with a water-tight threaded cap, to allow for the measurement of water levels in the well.

The well shall be constructed so that the top of the LCS well casing extends approximately 2 feet ags. The wellhead shall be completed with the construction of a concrete pad and covering plate. The initial concrete pad to be installed by the CONTRACTOR shall measure 6 feet by 6 feet in width and will extend 0.5 feet bgs.

The CONTRACTOR shall cap the surface casing with a LCS covering plate with four threaded bolt holes, and the same composition and wall thickness as the surface casing. The covering plate will be secured to the top of the surface casing with a watertight welded seam. The covering plate must be approved by the CONSULTANT or OWNER.

END OF SECTION

SECTION 13: LINE ITEM AND UNIT DETAILS

Appendix D presents the Bid Schedule for GVID Well #3B. Compensation for all work specified to be performed under these specifications will be made on the lump sum grand total amount estimated by the CONTRACTOR.

13.1 ESTIMATED NUMBER OF UNITS FOR LUMP SUM BID DETERMINATION

A detailed description of each line item and estimated number of units for bid determination is presented below.

13.1.1 Item 1 – Mobilization / Demobilization

Item 1 includes the CONTRACTOR'S mobilization and demobilization to the GVID Well #3B site location, including moving and assembling all drilling, testing, and support equipment at the drilling site, removing the equipment from the drilling site when the work is completed, and drilling site cleanup.

13.1.2 Item 2 – Conductor Casing Material and Installation

Item 2 consists of all labor, equipment, and material costs associated with drilling one conductor casing borehole, and placement of the conductor casing and surface grout seal in accordance with **Section 7.0 (Conductor Casing Installation)**.

This item consists of drilling the minimum 28-inch diameter conductor casing borehole to a depth of 40 feet; furnishing and installing minimum 24-inch diameter LCS conductor casing (41 feet, including 1-foot of stickup); furnishing and installing the conductor casing cement grout seal. For bidding purposes, the length of the conductor casing is estimated to be 40 feet.

13.1.3 Item 3 – Surface Casing

Item 3 consists of all costs for drilling the surface casing borehole including standby time for geophysical logging, furnishing and installing the surface casing, cement grout seal, formation stabilizer and bentonite seals in accordance with **Section 8.0 (Surface Casing)**.

- Item 3A consists of all labor, equipment, and material costs associated with drilling the minimum 22-inch diameter surface casing borehole from the bottom of the surface casing (depth of 40 feet) to an approximate depth of 1,020 feet (980 total linear feet) in accordance with **Section 8.1 (Surface Casing Borehole Drilling)**. For bidding purposes, the length of the surface casing borehole below the surface casing is estimated to be 980 feet.
- Item 3B includes the cost of rig and crew standby time during geophysical logging and the geophysical logging subcontractor, in accordance with **Section 8.2 (Geophysical Logging of Surface Casing Borehole)**.

- Item 3C consists of the material costs of the surface casing as specified in **Section 8.3.1 (Surface Casing Material)**. For bidding purposes, the length of the surface casing is estimated to be 1,020 feet.
- Item 3D consists of all labor and equipment costs required for the installation of the surface casing and centralizers, including logs and records, as specified in **Section 5.0 (Reports, Logs, and Records)** and **Section 8.4.1 (Surface Casing Installation)**. For bidding purposes, the length of the surface casing is estimated to be 1,020 feet.
- Item 3E consists of all labor, equipment and material costs to furnish and install the surface casing cement grout seal from depths of 0 to 40 feet and 900 to 1,020 feet, in accordance with the requirements of **Section 8.3.2 (Cement Grout Material)** and **Section 8.4.2 (Surface Casing Cement Grout Seal Installation)**. For bidding purposes, the volume of cement grout to be installed around the surface casing is estimated to be 260 cubic feet.
- Item 3F consists of all labor, equipment and material costs to furnish and install the surface casing formation stabilizer from depths of 40 feet to 900 feet, in accordance with the requirements of **Section 8.3.3 (Formation Stabilizer Material)** and **Section 8.4.3 (Formation Stabilizer Installation)**. For bidding purposes, the weight of formation stabilizer to be installed around the surface casing is estimated to be 72 tons.
- Item 3G consists of all labor, equipment and material costs to furnish and install the bentonite seals within the surface casing formation stabilizer, in accordance with the requirements of **Section 8.3.4 (Bentonite Seal Material)** and **Section 8.4.3 (Formation Stabilizer Installation)**. For bidding purposes, the volume of bentonite to be installed around the surface casing is estimated to be 80 cubic feet.

13.1.4 Item 4 – Pilot Borehole Drilling and Testing

Item 4 includes all costs for the pilot borehole drilling, geophysical logging, and zonal sampling and testing in accordance with **Section 9.0 (Pilot Borehole Drilling and Testing)**.

- Item 4A consists of all labor, equipment, and material costs associated with drilling the minimum 9.875-inch diameter pilot borehole from the bottom of the surface casing (depth of 1020 feet) to approximately 1,460 feet (440 total linear feet), in accordance with **Section 9.1 (Pilot Borehole Drilling)**.
- Item 4B includes the cost of rig and crew standby time during geophysical logging and the geophysical logging subcontractor, in accordance with **Section 9.2 (Geophysical Logging)**.
- Item 4C includes the cost of all labor, equipment, and material costs associated with zonal sampling and standby time during falling head testing in the pilot borehole, in accordance

with **Section 9.3 (Zonal Sampling and Testing)**. For bidding purposes, the number of zone tests to be conducted in the borehole is estimated to be 3.

13.1.5 Item 5 – Borehole Reaming

Item 5 includes all costs for the borehole reaming and final caliper log as described below.

- Item 5A consists of all labor, equipment, material costs associated with drilling/reaming the pilot borehole to its final diameter of 14.75 inches, in accordance with **Section 10.1 (Borehole Reaming)**. For bidding purposes, the length of borehole to be reamed is estimated to be 445 feet.
- Item 5B consists of the cost of the final reamed caliper log, in accordance with **Section 10.1 (Borehole Reaming)**.

13.1.6 Item 6 – Well Casing and Screen Materials and Installation

Item 6 consists of all costs to furnish and install the well casing and screen, in accordance with **Section 10.2 (Well Construction Materials)** and **Section 10.3 (Well Casing and Screen Installation)**.

- Item 6A consists of the material costs of the blank production casing including the concentric reducer and bottom cap as specified in **Section 10.2.1 (Well Casing Material)**. For bidding purposes, the length of the production casing is estimated to be 360 feet, including the 10-foot sump and bottom cap.
- Item 6B consists of the material costs of the louvered well screen as specified in **Section 10.2.2 (Well Screen Material)**. For bidding purposes, the length of the well screen is estimated to be 200 feet.
- Item 6C consists of all labor and equipment costs required for the installation of the casing, screen and centralizers, including logs and records, as specified in **Section 5.0 (Reports, Logs, and Records)** and **Section 10.3 (Casing and Screen Installation)**. For bidding purposes, the length of the well casing and screen is estimated to be 560 feet.

13.1.7 Item 7 – Annular Materials and Installation

Item 7 consists of all costs to furnish and install the annular materials around the well casing and screen assembly, as specified in **Section 10.2 (Well Construction Materials)** and **Section 10.4 (Annular Materials Installation)**:

- Item 7A consists of all labor, equipment and material costs to furnish and install the filter pack and disinfectant material from depths of 960 feet to 1,465 feet, in accordance with the requirements of **Section 10.2.3 (Filter Pack and Disinfectant Material)** and **Section 10.4.1 (Filter Pack and Disinfectant Installation)**. For bidding purposes, the volume of filter pack to be installed is estimated to be 20 tons.

- Item 7B consists of all labor, equipment and material costs to furnish and install the bentonite seal on top of the filter pack from depths of 950 to 960 feet, in accordance with the requirements of **Section 10.2.4 (Bentonite Seal Material)** and **Section 10.4.2 (Bentonite Seal Installation)**. For bidding purposes, the volume of bentonite to be installed around the casing and screen assembly is estimated to be 8 cubic feet.
- Item 7C consists of all labor, equipment and material costs to furnish and install cement grout seal around the well casing and screen assembly from depths of 910 to 950 feet, in accordance with the requirements of **Section 10.2.5 (Cement Grout Material)** and **Section 10.4.3 (Cement Grout Seal Installation)**. For bidding purposes, the volume of cement grout to be installed around the well casing and screen assembly is estimate to be 25 cubic feet.

13.1.8 Item 8 – Well Development and Testing

Item 8 consists of all costs associated with well development and testing in accordance with **Section 2.0 (Drilling Site Protection)** and **Section 11 (Well Development and Testing)**.

- Item 8A consists of all labor, equipment, and materials costs associated with well development with the drill utilizing swab and airlift development methods, as specified in **Section 11.1 (Well Development with Drill Rig)**. For bidding purposes, the number of hours for swab and airlift development is estimated to be 25.
- Item 8B consists of all labor, equipment, and materials costs to furnish, install and remove the test pump and associated equipment, as specified in **Section 11.2 (Test Pump Equipment)**.
- Item 8C consists of all labor, equipment, and materials costs associated with pump and surge development, as specified in **Section 11.3 (Pump and Surge Development)**. For bidding purposes, the number of hours for pump and surge development is estimated to be 12.
- Item 8D consists of all labor, equipment, and materials costs associated with aquifer testing (step-rate and constant-rate test pumping), as specified in **Section 11.4 (Aquifer Testing)**. For bidding purposes, the estimated number of pumping hours is estimated to be 34.

13.1.9 Item 9 – Final Tasks

Item 9 consists of all costs associated with completing final remaining tasks for the well project.

- Item 9A consists of all labor, equipment, and materials costs associated with performing the final plumbness and alignment test in accordance with **Section 12.1 (Plumbness and Alignment)**.

- Item 9B consists of all labor, equipment, and materials costs associated with performing the final well video survey, as specified in **Section 12.2 (Well Video Survey)**.

13.1.10 Item 10 – Mohave County Taxes

Item 10 is for applicable Mohave County taxes.

13.2 ALLOWANCE ITEMS AND POTENTIAL LUMP SUM ADJUSTMENT ITEMS

A detailed description of the potential lump sum bid adjustment items and allowance items is presented below.

13.2.1 Item 11 – Lost Circulation Conditions (Potential Adjustment Item)

Item 11 consists of the period of time drilling under Lost Circulation Conditions and for drilling fluid materials and additives used during the period of Lost Circulation Conditions, as an adjustment to the original lump sum contracted agreement amount. The CONTRACTOR'S Lost Circulation Conditions hourly rate shall be calculated so that it includes costs for any anticipated drilling fluids materials and additives that would be used during these conditions, in accordance with **Section 6.4 (Lost Circulation Conditions)**.

Adjustment for Lost Circulation Conditions to the original lump sum contracted agreement amount is subject to the approval of the OWNER.

13.2.2 Item 12 – Low Penetration Rate Conditions (Potential Adjustment Item)

Item 12 consists of the period of time drilling under Low Penetration Rate Conditions and for any additional drilling bits used during the period of Low Penetration Rate Conditions, as an adjustment to the original lump sum contracted agreement amount. The CONTRACTOR'S Low Penetration Rate Conditions hourly rate shall be calculated so that it includes costs for any anticipated additional drilling bits that would be used during these conditions, in accordance with **Section 6.5 (Low Penetration Rate Conditions)**.

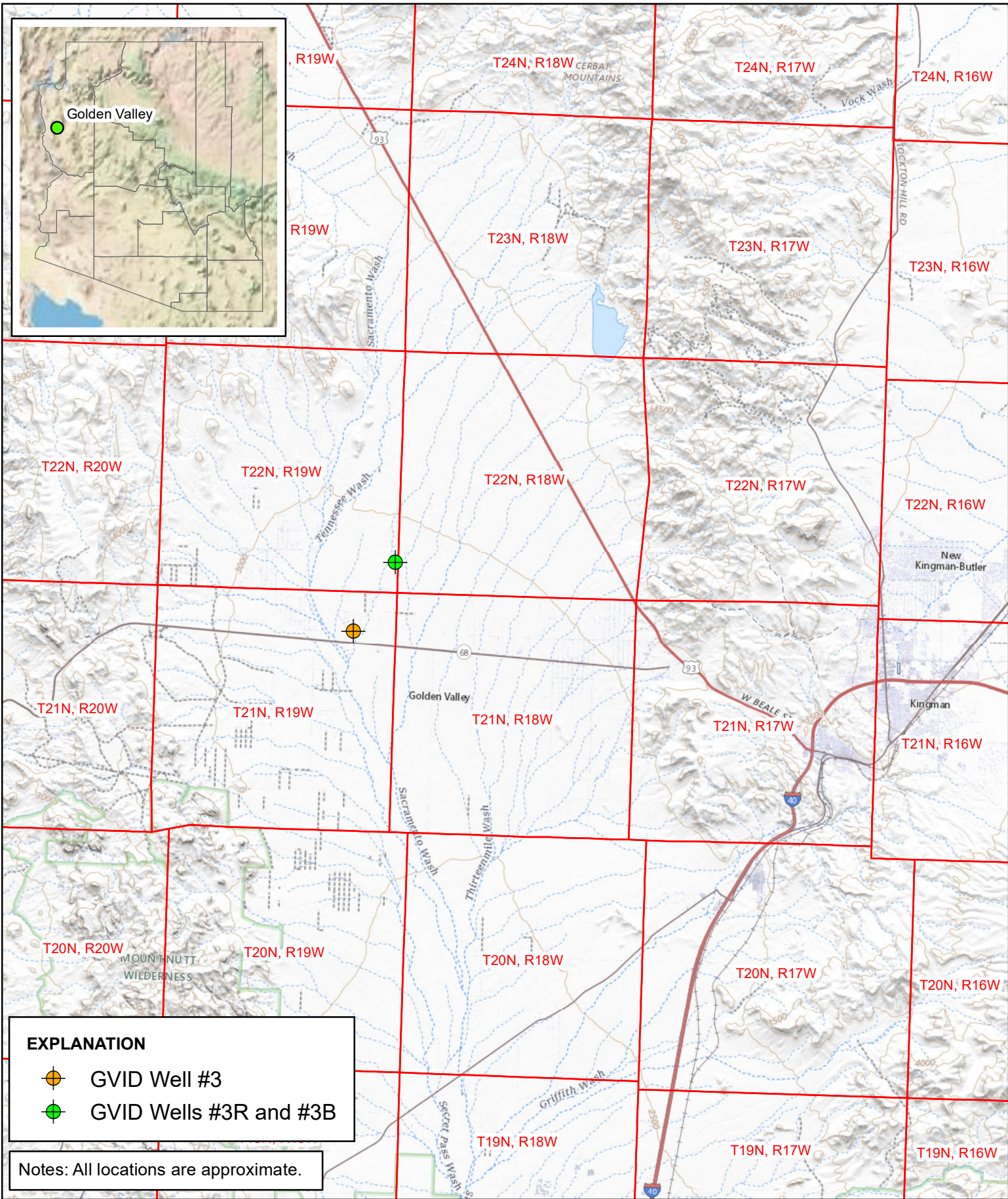
Adjustment for Low Penetration Rate Conditions to the original lump sum contracted agreement amount is subject to the approval of the OWNER.

13.2.3 Item 13 – Rig Hourly Rate (Allowance Item)

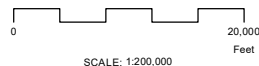
Item 13 consists of the cost of maintaining equipment and personnel if a work stoppage occurs, which is not due to any fault of the CONTRACTOR or SUBCONTRACTORS. Allowance for standby time adjustment to the lump sum contracted amount is subject to approval by the OWNER.

END OF SECTION

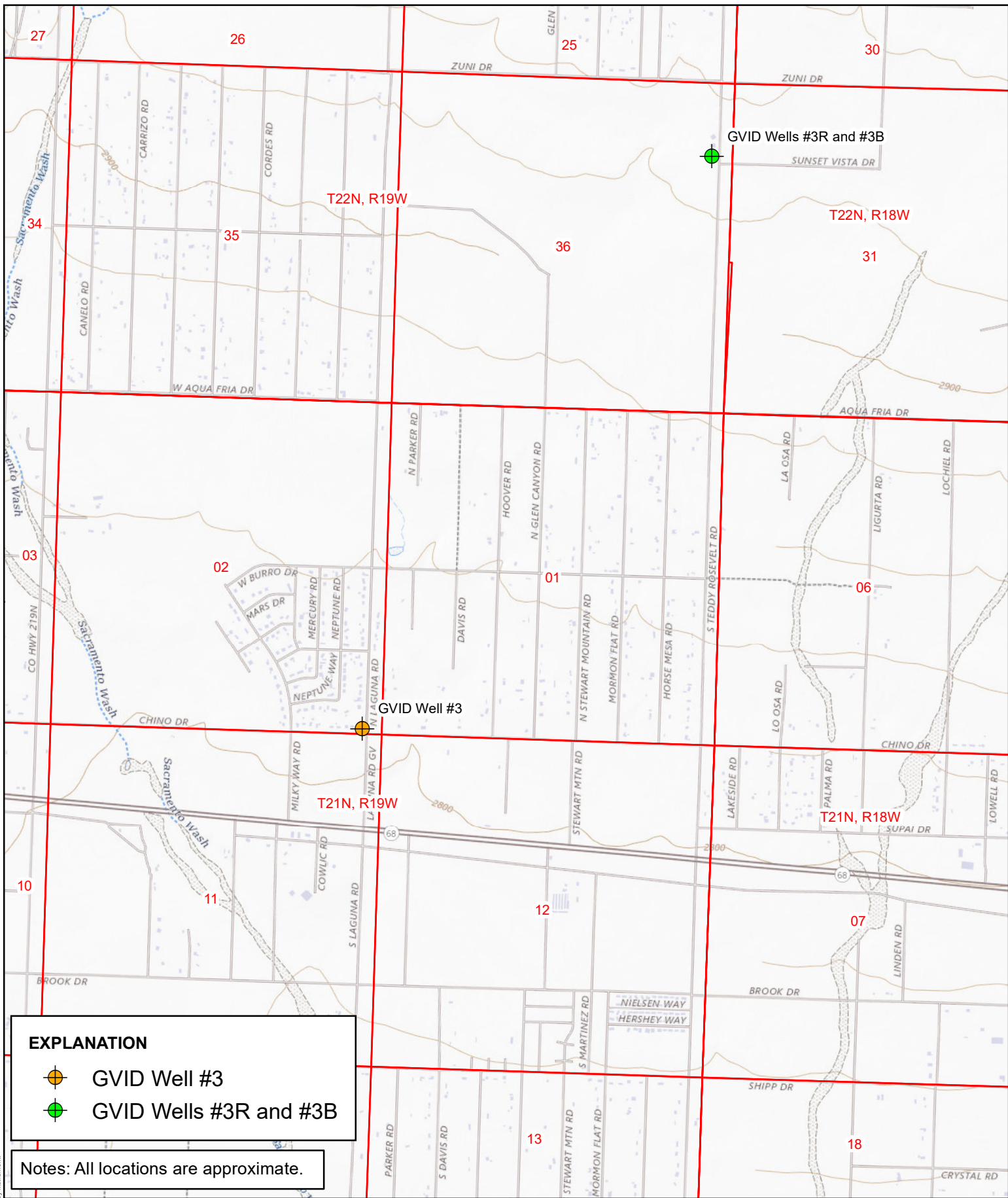
FIGURES





This product is for reference purposes only and is not to be construed as a legal document or survey instrument.



**GOLDEN VALLEY IMPROVEMENT DISTRICT
REGIONAL MAP
FIGURE 1**

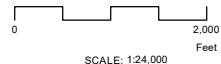


EXPLANATION

-  GVID Well #3
-  GVID Wells #3R and #3B

Notes: All locations are approximate.

This product is for reference purposes only and is not to be construed as a legal document or survey instrument.



**GOLDEN VALLEY IMPROVEMENT DISTRICT
TOPOGRAPHIC MAP
FIGURE 2**

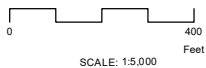


GVID Wells #3R and #3B

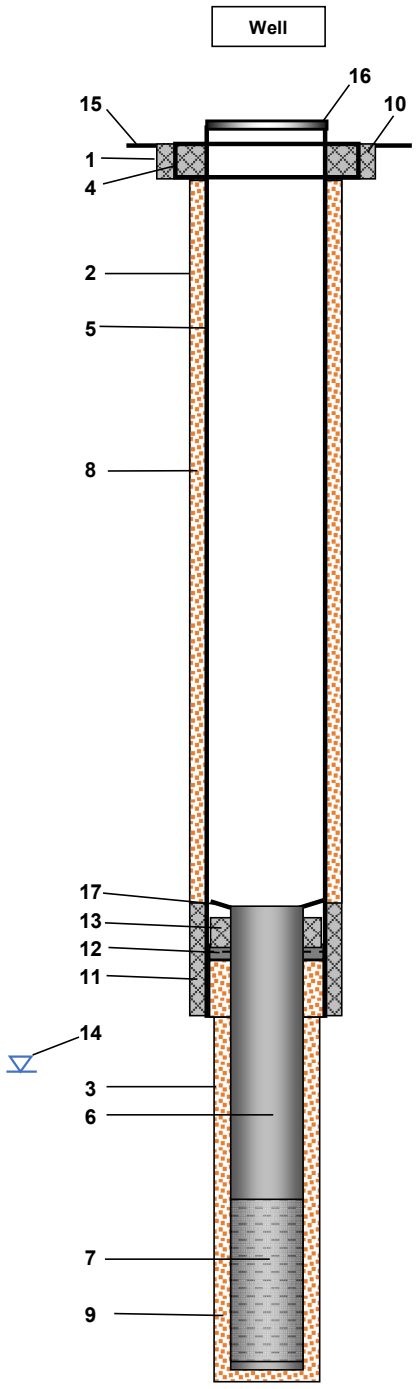
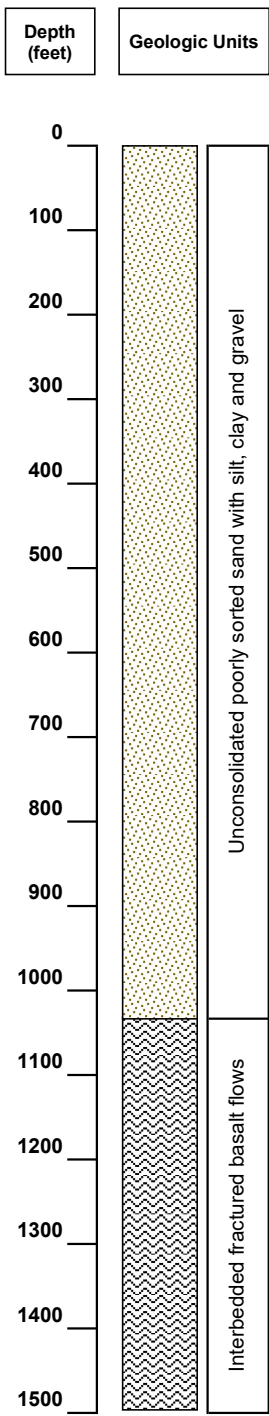


Notes: All locations are approximate.

This product is for reference purposes only and is not to be construed as a legal document or survey instrument.



**GOLDEN VALLEY IMPROVEMENT DISTRICT
LOCATION MAP
FIGURE 3**



Explanation

- Borehole Diameters**
- 1 - Minimum 28-inch diameter borehole (0 to 40 feet).
 - 2 - Minimum 22-inch diameter borehole (40 to 1020 feet).
 - 3 - 14.75-inch diameter borehole (1020 to 1465 feet).
- Blank Casing**
- 4 - Minimum 24-inch diameter, 0.312-inch wall thickness, low carbon steel conductor casing (+1 to 40 feet).
 - 5 - 16-inch diameter, 0.375-inch wall thickness, low carbon steel surface casing (+2 to 1020).
 - 6 - Nominal 10-inch diameter, 0.375-inch wall thickness, low carbon steel production casing assembly with bottom cap (900 to 1250 and 1450 to 1460).
- Well Screen**
- 7 - Nominal 10-inch diameter, 0.375-inch wall thickness, low carbon steel, louvered well screen, slot size to be determined (1250 to 1450 feet).
- Formation Stabilizer**
- 8 - Pea gravel with 10-foot bentonite seals every 100 feet (40 to 900 feet).
- Filter Pack**
- 9 - Filter pack around production casing and screen assembly; gradation to be determined (960 to 1465 feet).
- Well Seals**
- 10 - Neat cement or pozzolan cement grout around conductor casing (0 to 40 feet).
 - 11 - Neat cement or pozzolan cement grout around surface casing (900 to 1020 feet).
 - 12 - Bentonite seal around production casing assembly (950 to 960 feet).
 - 13 - Neat cement or pozzolan cement grout around 10-inch diameter production casing assembly (910 to 950 feet).
- Static Water Level**
- 14 - Static water level expected to be approximately 1100 feet below ground surface.
 - 15 - Ground surface elevation approximately 2930 feet.
- Other**
- 16 - Well head shall extend 2 feet above ground surface and have well cap and surrounding concrete pad.
 - 17 - Top of nominal 10-inch diameter production casing assembly shall be equipped with a centralizer and concentric reducer.

Notes

- A - Designed by Neil I. Burk, P.G.
- B - Subsurface conditions at the well site are uncertain.
- C - The CONTRACTOR shall drill and construct the well in accordance with Arizona Administrative Code (AAC) Title 12, Chapter 15, Article 8 (R12 15 801 et seq.).
- D - CONSULTANT will specify the total drilling depth and the final well design including gravel pack gradation and well screen slot size, placement of well casing, screen, gravel pack, cement grout well seal, and any other materials used to construct the well.

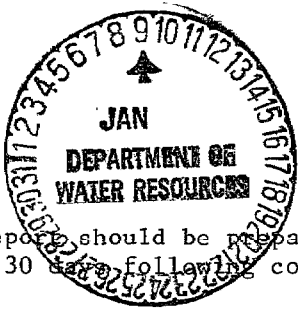
DRAWING NOT TO SCALE



GOLDEN VALLEY IMPROVEMENT DISTRICT
 PRELIMINARY DESIGN
 WELL #3B
 FIGURE 4

APPENDICES

APPENDIX A – GVID Well #3 Information



STATE OF ARIZONA
DEPARTMENT OF WATER RESOURCES
99 EAST VIRGINIA AVENUE
PHOENIX, ARIZONA 85004

WELL DRILLER REPORT

This report should be prepared by the driller in all detail and filed with the Department within 30 days following completion of the well.

- Owner SUN CAPITAL INC.
Name
1015 COUNTRY CLUB KINGMAN, ARIZONA 86401
Mailing Address
- Driller PENTROD DRILLING CO.
Name
3020 JAGERSON AVE. KINGMAN, ARIZONA 86401
Mailing Address
- Location of well TWP 21N RGE 19W SEC 2 SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$
- Permit No. 55-515660
(if issued)

DESCRIPTION OF WELL

- Total depth of hole 1251 ft.
- Type of casing STEEL
- Diameter and length of casing 8 in. from 0 to 1251, in from _____ to _____.
- Method of sealing at reduction points _____
- Perforated from 1050 to 1150, from 1170 to 1190, from 1210 to 1230.
- Size of cuts 3/16" X 3 Number of cuts per foot 12
- If screen was installed: Length _____ ft. Diam _____ in. Type _____
- Method of construction DRILLED
drilled, dug, driven, bored, jetted, etc.
- Date started 10 Month 2 Day 1986 Year
- Date completed 12 Month 30 Day 1986 Year
- Depth to water 1030 ft. (If flowing well, so state.)
- Describe point from which depth measurements were made, and give sea-level elevation if available GROUND LEVEL
- If flowing well, state method of flow regulation: _____
- Remarks: _____

DO NOT WRITE IN THIS SPACE
OFFICE RECORD
Registration No. 55-515669
Received _____ By _____
Entered **ENTERED JAN 14 1987**
File No. B(17-19)2 ddd

LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

From (feet)	To (feet)	Description of formation material
0	5	TOP SOIL
5	32	CONGLOMERATE, SAND & GRAVEL & SMALL Boulders
32	41	CONGLOMERATE, SAND & GRAVEL & SMALL Boulders
41	50	SAND GRAVEL & SOME CLAY
50	160	SILTY CLAY & SAND MIXED
160	175	GRAVEL SAND & SOME CLAY
175	401	BASALT, GRAVEL, SMALL Boulders, BROWN CLAY MIXED
401	504	BASALT, GRAVEL, SAND, BROWN CLAY MIXED
504	648	HELL BASALT, GRAVEL SAND & BROWN CLAY MIXED
648	705	LARGE BASALT, GRAVEL, SAND & CLAY WITH Boulders
705	795	HELL BASALT, SAND WITH SAND & BROWN CLAY
795	860	HELL BASALT, GRAVEL, SAND & BROWN CLAY
860	870	LARGE Boulders, SAND & GRAVEL
870	1028	COARSE GRAVEL, SAND & LIGHT BROWN CLAY MIXED
1028	1060	SAND GRAVEL (WATER) SOME CLAY
1060	1130	SAND, COARSE GRAVEL & SOME CLAY
1130	1160	COMPACTED SAND, SMALL GRAVEL, VERY LITTLE CLAY
1160	1170	SANDY
1170	1210	BENTONITE RED, GRAVEL MIXED
1210	1251	WHITE BENTONITE, GRAVEL MIXED

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein contained are true to the best of my knowledge and belief.

Driller *Peter F. Perrod*
 Name PERIOD DRILLING CO

3020 JAGERSON AVE
 Address

NIJGHAU ARTZ 66401
 City State Zip

Date 1 6 1967

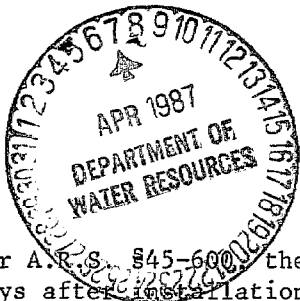
DEPARTMENT OF WATER RESOURCES

99 East Virginia
Phoenix, Arizona 85004

Registration No. 55-515669

Owner of Well Site SUN CAPITAL INC.

File No. B(17-19)2 ddd



COMPLETION REPORT

1. Per A.R.S. §45-600 the Completion Report to be filed with the Department within 30 days after installation of pump equipment by the registered well owner.
2. Drawdown of the water level for a non-flowing well should be measured in feet after not less than 4 hours of continuous operation and while still in operation and for a flowing well the shut-in pressure should be measured in feet above the land or in pounds per square inch at the land surface.
3. The static groundwater level should be measured in feet from the land surface immediately prior to the well capacity test.
4. The tested pumping capacity of the well in gallons per minute for a non-flowing well should be determined by measuring the discharge of the pump after continuous operation for at least 4 hours and for a flowing well by measuring the natural flow at the land surface.

LOCATION OF THE WELL:

T21N 19W 2 SE SE SE
Township Range Section $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$

EQUIPMENT INSTALLED:

Kind of pump Submersible
Turbine, centrifugal, etc.

Kind of power Electric H.P. Rating of Motor 20
Electric, natural gas, gasoline, etc.

Pumping Capacity 31 GPM Date installed _____
Gallons per minute

WELL TEST:

Test pumping capacity 31 GPM Date Well Tested 3-25-87
Gallons per minute

Method of Discharge Measurement meter
Weir, orifice, current meter, etc.

Static Groundwater Level 1016' ft. Drawdown 118' ft.

Total Pumping Lift 1134' ft. Drawdown _____ lbs
(Flowing Well)

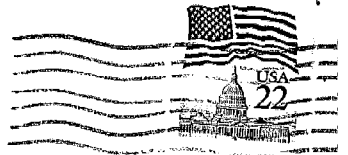
I HEREBY CERTIFY that the above statements are true to the best of my knowledge and belief.

4/6/87, 19____
DATE

Charles...
Signature
Statestate Utility Service
P.O. Box 1177
Address
Bullhead City, AZ 86430
City State Zip

ENTERED APR 8 1987

Interstate Utility Service
P. O. BOX 1178
BULLHEAD CITY, ARIZONA 86430

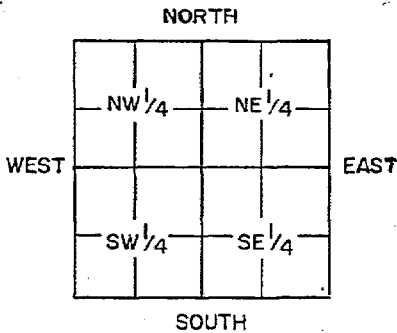


Department of Water Resources
99 E. Virginia
Phoenix, Az. 85004

FILING FEE \$10.00

DEPARTMENT OF WATER RESOURCES (DWR)
NOTICE OF INTENTION TO DRILL OR DEEPEN A WELL
OUTSIDE OF AN ACTIVE MANAGEMENT AREA

Section 45-596, Arizona Revised Statutes, provides: In an area subject to Active Management, a person may not drill or cause to be drilled any well or deepen an existing well without first filing a Notice of Intention to Drill with the Department.



INDICATE WELL LOCATION BY X
(Above diagram represents one 640 acre section.)

WELL/LAND LOCATION:

- 1. Township 17 N/S
2. Range 19 E/W
3. Section 2
4. SE 1/4, SE 1/4, SE 1/4
10 acre subdivision
5. County MARICOPA

6. Owner of well:
ConCapital Inc
Name
1015 Country Club Dr
Address
Kingman AZ 86401
City State Zip
Telephone 253-1629

7. Owner of land:
MAX BEVINS
Name
1015 Country Club Dr.
Address
Kingman Az 86401
City State Zip

DESCRIPTION OF WELL:

- 8. Diameter 12 inches
Depth 1200 feet
9. Type of casing Steel 8 1/8
10. Design pump capacity:
100 gallons per minute
11. Estimate of total annual pumping: acre feet

- 12. Principal use of water:
SUBDIVISION
(Be Specific)
13. Other uses intended:
NA
(Be Specific)

- 14. If for irrigation, state the number of acres to be irrigated:
acres

- 15. Construction will start about:
9 1986
Month Year

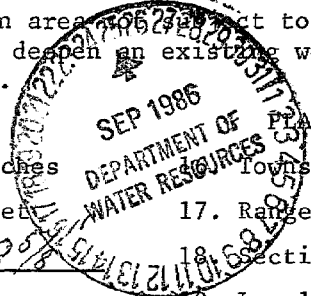
DO NOT WRITE IN THIS SPACE
OFFICE RECORD
FILE NO. B(17-19)2 ddd
FILED 9-25-86 BY S.V
INPUT ENTERED SEP 30 1986
DUPLICATE
MAILED 9-29-86 BY S.V.
REGISTRATION NO. 55-515669
INA
W/S 02 S/B

GENERAL INSTRUCTIONS

- 1. Fill out this form in duplicate and send to 99 East Virginia, Suite 100, Phoenix, Az. 85004.
2. For specific instructions, limitations and conditions, see the reverse side of this form.
3. This form is to be used to drill, deepen or replace a well outside of an Active Management Area
4. If the well is a replacement or deepening of an existing well, state the registration number of the existing well in Item 21.
5. Construction standards for new and replacement wells and the deepening and abandonment of existing wells shall be in accordance with Department Rules and Regulations.

I state that this Notice is filed in compliance with ARS §45-596 and is complete and correct to the best of my knowledge and belief and that I understand the limitations under which I must operate this well set forth on the reverse side of this form.

DATE 9-23-86 Signature of Person Filing [Signature]



PLACE OF USE:

- Township 21 N/S
17. Range 19 E/W
18. Section 2
19. Legal description of land

- 20. Type well:

Exempt
Non-Exempt

- 21. Action Requested:

Drill Deepen Replace
55-

- 22. This notice filed by:

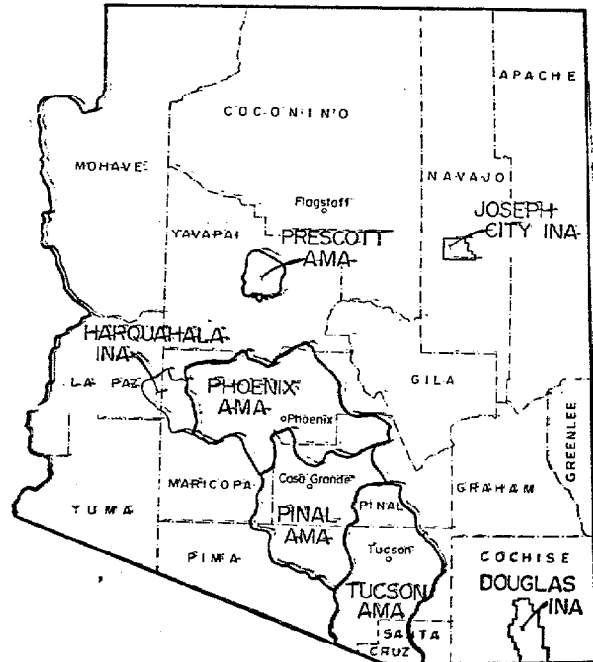
Owner Lessee
MAX BEVINS
Name
1015 Country Club Dr
Address
Kingman Az 86401
City State Zip
Telephone 253-1629

- 23. Driller's Name:

PENROD DRILLING CO
Name
3200 JAGGERSON AVE
Address
Kingman Az 86401
City State Zip
DWR License Number 30322

SPECIFIC INSTRUCTIONS, LIMITATIONS AND CONDITIONS

1. Upon receipt of the return of this annotated Notice, the owner is authorized to proceed in drilling or deepening the well as set forth on this Notice.
2. An exempt well means a well having a pump with a maximum capacity of not more than thirty-five (35) gallons per minute and may include the application of water to less than two (2) acres of land to produce plants or parts of plants for sale, human consumption or for use as feed for livestock, range livestock or poultry.
3. Only one exempt well may be drilled or used to serve the same use at the same location.
4. A non-exempt well is any well which exceeds the limitations, as indicated in paragraph 2 above. However, water from a non-exempt well located in an Irrigation Non-Expansion Area, may not be withdrawn to irrigate any acres which are not eligible to be irrigated pursuant to ARS §45-434 or §45-437. Also, owners of non-exempt wells located in Irrigation Non-Expansion Areas, are subject to the measuring device and annual report requirements of ARS §45-437.
5. The drilling or deepening of this well shall be completed within one (1) year of the date of this Notice.
6. Within thirty (30) days after the installation of pumping equipment on this well, the registered well owner shall file the prescribed Completion Report. A form for this purpose will be furnished to the registered owner with the return of an annotated copy of this Notice.
7. The person to whom a well is registered shall notify the Department of a change in ownership or a change in data relating to this well. The prescribed form for these purposes will be furnished to the registered owner with the return of the annotated copy of this Notice.
8. A sketch map showing the general boundaries of the Active Management Areas and Irrigation Non-Expansion Areas is shown at the right. Maps of greater detail are available on request.



PENROD DRILLING

3020 Jagerson Avenue
Kingman, Arizona 86401



*Department of Water Resources
99 E Virginia Suite 100
Phoenix, Arizona 85004*

State of Arizona

DEPARTMENT OF WATER RESOURCES

99 E. Virginia Avenue, Phoenix, Arizona 85004



BRUCE BABBITT, Governor
KATHLEEN FERRIS, Director

SUN CAPITAL INC.
1015 Country Club
Kingman, Arizona 86401

SEPTEMBER 29, 1986

File No. B(17-19)2 ddd
Registration No. 55-515669

Dear Well Owner:

Enclosed for your records is a copy of the Notice of Intention to Drill a well which was recently filed with this Department. This is returned to you as evidence of compliance with ARS §45-596. Also enclosed is a Completion Report to be submitted when pump equipment is installed. Your driller has been mailed separately a Well Drilling Card and a Well Drilling Report form. Your driller may not begin to drill your well until he has received the Well Drilling Card, and is required to display the Drilling Card on his rig while drilling. If you elect to change drillers, you are required to notify this Department of that fact and who the new driller is. Please ensure that any driller you elect to use is properly licensed to drill the type of well you require since licensed well drillers must pass an examination that proves they understand professional well drilling methods and they are familiar with the laws and regulations which govern well construction in Arizona.

In the event that you determine it necessary to change the location of the proposed well, you should obtain the written permission of the Department of Water Resources before proceeding with the drilling. A properly signed amended Drilling Card must be in the possession of the driller before drilling commences at a different location than originally authorized.

ARS §45-600 requires the registered well owner to submit a Completion Report within 30 days after the installation of pumping equipment. It also requires the driller to furnish this Department a complete and accurate log of the well within 30 days after completion of drilling. You should insist and ensure that both of these are done.

For your future use, a Change of Well Information form is enclosed should it become needed. Per ARS §45-593, the person to whom a well is registered shall notify this Department of a change in ownership of the well and/or information pertaining to the physical characteristics of the well in order to keep the well registration file current and accurate.

Sincerely,

A handwritten signature in black ink, appearing to read "R. A. Gessner".

Richard A. Gessner
Chief, Operations Division

RAG: sv
Enclosures

Think Conservation!

DWR-55-1-10/84 (Revised)

Office of Director 255-1554

Administration 255-1550, Water Resources and Flood Control Planning 255-1566, Dam Safety 255-1541,

Flood Warning Office 255-1548, Water Rights Administration 255-1581, Hydrology 255-1586.

PENROD DRILLING COMPANY
 3020 Jaggerson Ave.
 Kingman, Arizona 86401

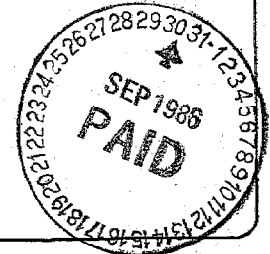
STATE OF ARIZONA
 DEPARTMENT OF WATER RESOURCES
 WATER RIGHTS ADMINISTRATION
 99 EAST VIRGINIA
 PHOENIX, ARIZONA 85004

RECEIPT

KIND ENTRY	FILE REFERENCE NO.
55	515669
	THRU

FOR: Sun Capital Inc.

FUND SOURCE	ACCOUNT NO.			INT. ACCT.	ITEM DESCRIPTION	RATE	\$ AMOUNT
	AGENCY	CHAPTER	DIV.				
					FILING FEE FOR NOTICE OF INTENT TO DRILL	10.00	10.00
					OR DEEPEN 1 NON-EXEMPT OUTSIDE OF AN		
					ACTIVE MANAGEMENT AREA		
					REG. NO. 55-515669		
					FILE NO. B(17-19)2 ddd		
					CHECK NO. 4517	9-29-86 sv	



TOTAL \$ 10.00

APPENDIX B – GVID Well #3 Replacement Lithologic Log

LITHOLOGIC LOG

Project/Client Name <i>Mohave County</i>	Location (NAD 83 GPS Latitude/Longitude) <i>N 35° 15' 16.12" W 114° 15' 14.67"</i>	Project No. <i>7018MOH01</i>
Drilling Co. <i>KP Ventures</i>	Elevation (ft amsl) <i>2931 ft</i>	Date Started <i>4/17/2021</i>
Lithology Described By <i>ST/AC</i>	Drilling Equipment	Date Finished
Total Depth (ft)	Drilling Method/Drilling Fluid <i>Reverse Circulation</i>	*based on visual estimates of volume -not for bedrock intervals
Well Reg. # <i>55-925656</i>	Conductor Casing (type; diameter; depth)	
Comments		<div style="display: flex; align-items: center; margin-bottom: 5px;"> <div style="width: 20px; height: 20px; background-color: black; margin-right: 5px;"></div> Relative % fines (F<0.074mm) </div> <div style="display: flex; align-items: center; margin-bottom: 5px;"> <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px;"></div> Relative % sand (S>0.074<4.8mm) </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; border: 1px solid black; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px); margin-right: 5px;"></div> Relative % gravel (G>4.8mm) </div>
*Classification System (for soils only)		Unified Soil Classification System (ASTM)

Depth (ft)	Description	F S G (%)	Drill Rate (ft/hr)	Remarks
40	Well graded sand with silt and gravel 10/70/20 Sand grains of mixed lithology (felsic-mafic) angular fine gravels		3	mud visc @ 33 sec/ft mud pH @ 9.5
50	Well graded sand with silt and gravel 10/70/20 Felsic-mafic sands fine-coarse angular gravels of mixed lithology		8	
60	Well graded sand with silt and gravel 10/70/20 Felsic-mafic sands Fine-coarse angular gravels of mixed lithology		4	
70	Same as above 10/70/20		4	
80	Same as above 10/70/20		5	
90	Same as above 10/70/20		4	

LITHOLOGIC LOG

Depth (ft)	Description	FSG (%)	Drill Rate (ft/hr)	Remarks
100	Well graded sand with silt and gravel angular fine gravels of mixed lithology	10/70/20	4	
110	Well graded sand with silt and gravel mixed lithology, folsic-matrix sands angular fine gravels	10/70/20	3	
120	Silty sand with gravel clays with low plasticity folsic-matrix sands angular fine gravels	20/55/25	4	mud visc @ 34 mud pH @ 9.5
130	Same as above with increasing gravel size gravels up to 1.5 in Ø	20/55/25	2	
140	Same as above	20/55/25	3	sure shot @ 145' 0°
150	Same as above	20/55/25	3	mud visc @ 33 mud pH @ 9.5
160	Same as above	20/55/25	5	mud visc @ 35 mud pH @ 9.5
170	Clayey sand with gravel finos are a mix of clay and silt fine gravels coarse sands	25/50/25	6	
180	Same as above	25/50/25	4	mud visc @ 34 mud pH @ 9.0

LITHOLOGIC LOG

Depth (ft)	Description	F S G (%)	Drill Rate (ft/hr)	Remarks
190	Clayey sand with gravel Fines are a mix of silt and clay coarse grained sands, fine gravels	25/50/25	4	mud visc @ 34 mud pH @ 9.5
200	Same as above angular gravels of mixed lithology angular - subangular sands	25/50/25	5	
210	Clayey sand fine sands in a matrix of lean clay	35/55/10	5	
220	Same as above 10 YR 5/4 yellowish brown	35/55/10	4	mud visc @ 35 mud pH @ 9.5
230	Same as above subround - subangular sands	35/55/10	4	sure shot @ .5°
240	Clayey sand with gravel coarse sands and fine gravel in a lean clay matrix	30/30/40	3	
250	Well graded sand with silt and gravel angular med-coarse grained sands	10/80/10	3	mud visc @ 33 mud pH @ 9.5 10K on bit
260	Clayey sand coarse grained gravel silt and clay fines	40/40/20		
270	Same as above 10 YR 5/6 yellowish brown	40/40/20		

LITHOLOGIC LOG

Depth (ft)	Description	F S G (%)	Drill Rate (ft/hr)	Remarks
280	Clayey sand with gravel angular gravels with mixed lithology coarse grained sand in lean clay matrix	40/50/30	3	
290	Clayey sand coarse grained sand silt & clay fines 10YR 5/4 yellowish brown	40/40/20	3	
300	well graded sand with silt and gravel angular gravels, sub angular-sub rounded sands	10/70/20	9	New 16" long tooth bottom bit attached
310	well graded sand with silt and gravel	10/70/20	9	
320	well graded sand with silt and gravel sands coarse grained subangular gravels angular	10/70/20	9	
330	well graded sand with silt and gravel med-coarse grained sands with fine gravels dominating, some gravels up to <10mm	10/60/30	8	
340	well graded sand with silt and gravel Same as above gravels angular sands angular-subangular	10/60/30	8	
350	well graded sand with silt and gravel Same as above	10/60/30	10	mud visc @ 34 mud plt @ 9.5 sure shot @ 0°
360	Same as above increase gravel size to medium ~15mm	10/60/30	8	

LITHOLOGIC LOG

Depth (ft)	Description	F S G (%)	Drill Rate (ft/hr)	Remarks
370	Well Graded Sand with silt and gravel med-coarse sands gravels medium ~15mm	10/60/30	10	
380	Same as above gravels angular sands angular	10/60/30	8	mud visc @ 36 mud pH @ 9.5
390	Clayey Sand with gravel Gravels med-coarse angular sands.	15/55/30	8	
400	Clayey Sand with gravel	20/50/30	8	mud visc @ 33 mud pH @ 9.5
410	Clayey Sand with gravel 10YR 5/4 Yellowish brown	20/50/30	10	
420	Same as above	20/50/30	10	mud visc @ 34 pH mud @ 9.5
430	Well Graded Sands with silt and gravel fine-medium sand grains subround-subangular gravels angular <10mm	10/60/30	5	
440	Well Graded sands with silt and gravel	10/60/30	5	sure shot @ 0°
450	Same as above subround-subangular sands medium-coarse grained	10/60/30	7	mud visc @ 33 mud pH @ 9.5

LITHOLOGIC LOG

Depth (ft)	Description	FSG (%)	Drill Rate (ft/hr)	Remarks
460	Well Graded sand with silt and gravel gravel size 0.34" 10/60/30		4	mud visc @ 34 mud pH @ 9.5
470	Same as above Subrounded-subangular med-coarse sands gravel subrounded <11mm 10/60/30		5	
480	Well Graded Sands with silts and gravels 10/60/30		5	mud visc @ 33 mud pH @ 9.0
490	Well Graded Sands and gravels with silt 10/60/40		5	
500	Well Graded sands and gravels with silt coarse sands angular gravels <12mm 10/60/40		5	mud visc @ 32 mud pH @ 9.0
510	Clayey sand with gravel 20/60/30 10 YR 6/3 pale brown		6	
520	Well Graded Sands with silts and gravels 10/60/30		6	
530	Well Graded Sands with silts and gravels angular sands and gravels 10/60/30		6	sure shot @ 0°
540	Same as above 10/60/30		5	mud visc @ 34 mud pH @ 9.5

LITHOLOGIC LOG

Depth (ft)	Description	F S G (%)	Drill Rate (ft/hr)	Remarks
550	Well graded sands with silts and gravels coarse sands, angular gravels	10/60/30	3	mud visc @ 34 mud pH @ 9.5
560	Same as above med-coarse sand grains	10/60/30	4	
570	Same as above gravel < 12mm	10/60/30	4	
580	Well graded sand with silt coarse grained sands of mixed lithology	10/80/10	4	mud visc @ 32 mud pH @ 9.5
590	Same as above sub angular, coarse grained sands	10/80/10	4	
600	Silt with sand low plasticity med-fine sands gravels < 12mm 10YR 5/3 Brown	60/30/10	5	mud visc @ 33 mud pH @ 9.5
610	Same as above gravels sub angular < 16mm	60/30/10	4	
620	Silty sand with gravel subangular - angular medium grained sands	30/50/20	4	
630	Poorly graded sand with silt medium grained sand subangular - angular	10/90/trace	5	mud visc @ 32 mud pH @ 9.5

LITHOLOGIC LOG

Depth (ft)	Description	FSG (%)	Drill Rate (ft/hr)	Remarks
640	Poorly graded sand with silt light HCl reaction medium grained sand sub angular - angular grains	10/85/5	4	
650	Silty sand small - med sand grains, subangular - angular	20/75/5	5	sure shot @ 0°
660	clayey sand 10YR 5/4 yellowish brown	45/50/5	5	mud visc @ 32 mud pH @ 9.5 weight 9.1 solids .25 filtrate 14
670	clayey sand carbonate nodules present	45/50/5	5	cake 2/32
680	clayey sand gravels angular < 20mm	40/50/10	4	mud visc @ 34 mud pH @ 9.0
690	Same as above strong HCl reaction fine - med sands angular - subangular	40/50/10	5	
700	Same as above 10YR 5/3 brown	40/50/10	5	mud visc @ 32 mud pH @ 9.5
710	Same as above sands med - coarse angular - subangular Gravels < 12mm subrounded	40/50/10	5	
720	Sandy lean clay angular basalt grains present 7.5YR 5/4 brown	50/45/5	4	

LITHOLOGIC LOG

Depth (ft)	Description	FSG (%)	Drill Rate (ft/hr)	Remarks
730	Sandy lean clay angular basalt grains present	50/45/5	5	
740	Same as above	50/45/5	4	sure shot @ 0°
750	7.5 YR 6/4 light brown Same as above increasing gravel content	50/40/10	6	
760	Silty sand increasing basaltic gravels, angular	40/45/15	5	mud visc @ 33 mud pH @ 9.5
770	Sandy silt Sub angular fine-medium grained sands	50/45/5	7	
780	Sandy lean clay medium plasticity fine-medium sands 10 YR 5/4 yellowish brown	50/45/5	6	mud visc @ 34 mud pH @ 9.5
790	Silty sand fine-medium sands	40/50/10	6	mud visc @ 32 mud pH @ 9.5 weight 9.0
800	Same as above	40/50/10	5	Solids 25 filtrate 14 cake 2/32
810	Similar to above increasing silt, fine grained sands	45/50/5	5	

LITHOLOGIC LOG

Depth (ft)	Description	F S G (%)	Drill Rate (ft/hr)	Remarks
820	Clayey Sand subrounded sand grains medium	40/60/trace	6	Same shot @ 0° mud visc @ 33 mud plt @ 9.5 weight - 9.0 Sand - .25 Filtrate - 14 cake - 1/32
830	Same as above increasing clay/silt	45/60/trace	5	
840	Sandy lean clay fine-medium subangular sand grains 10 YR 5/4 Yellowish brown	55/45/trace	7	
850	Lean clay medium plasticity fine sands	85/15/trace	5	
860	Same as above 10 YR 5/4 Yellowish brown	85/15/trace	4	
870	Lean clay with sand fine-medium sand with subrounded grains	75/25/trace	4	
880	Same as above subround-subangular grains	75/25/trace	4	mud visc - 32 mud plt - 9.0 weight - 9.2 solids - trace
890	Clayey sand fine-medium sand grains subangular-subround 10 YR 5/3 brown gravel angular < 8mm	40/55/5	4	Filtrate - 14 cake - 2/32
900	Clayey sand medium-coarse grained sand < 4mm mixed lithology sub angular	30/60/10	5	

LITHOLOGIC LOG

Depth (ft)	Description	FSG (%)	Drill Rate (ft/hr)	Remarks
910	Sandy fat clay 60/35/5 10YR 6/4 light yellowish brown		6	
920	Fat clay with sand 60/35/5 angular sand grains of mixed lithology		7	
930	Sandy lean clay with gravel 60/20/20 gravel subangular up to 1/2 inch fine-medium grained sands subround-subangular		5	
940	Sandy lean clay 60/35/5 sub rounded sand grains of mixed lithology		5	
950	Lean clay 80/15/5 Some subrounded sands < 2mm 10YR 4/4 dark yellowish brown		6	Sure shot @ 60
960	Well graded sand with gravel 5/70/25 angular gravels < 1mm mixed lithics fine sand grains		6	mud visc @ 32 mud plt @ 9.0
970	Same as above 5/70/25 fine-medium subrounded-subangular sands		5	
980	Well graded sand + silt and gravel 10/60/30 subangular gravel < 20mm mixed lithology		5	mud visc @ 33 mud plt @ 9.5
990	Poorly graded sand with silt 10/80/10 coarse grained sands of mixed lithology angular-subangular		5	

LITHOLOGIC LOG

Depth (ft)	Description	FSG (%)	Drill Rate (ft/hr)	Remarks
1000	well graded sand with clay and gravel 10/79/20 coarse grained sands, gravel < 17mm mixed lithology		5	mud visc @ 33 mud pH @ 9.0
1010	No Sample Collected			-1018' Lost circulation notice
1020	No Sample Collected		4	mix high visc mud
1030	Basalt with some vesicles No HCl reaction. Angular pieces minimal fines.		2	mix pills bend down with n seal
1040	Basalt with some vesicles white precipitate present signs of fractures noted solid basalt layer w/ faults and/or caverns		1	
1050				

APPENDIX C – Cement Mix Design Examples

SAND CEMENT MIX DESIGN EXAMPLE

One (1) sack of cement = 1 bulk cubic foot (ft³)*
 = 94 pounds (lb)
 = 3.6 absolute gallons (gal)

*A sack of cement has a bulk volume of approximately one (1) cubic foot (ft³), which is composed of 0.52 cubic feet (ft³) of air and 0.48 cubic feet (ft³) of solids (the actual space occupied by the solids of one (1) sack of cement when mixed with water to form a slurry).

Calculations are based on the specific gravity of cement which is assumed to be equal to 3.15 grams per cubic centimeter (gm/cm³) and the specific gravity of sand aggregate which is assumed to be equal to 2.65 gm/cm³.

Specific Gravity Conversion: Specific gravity (gm/cm³) x 62.4 = pound per cubic foot (lb/ft³)

Volume Conversion: 1 ft³ of water = 7.481 gal of water

Material Type	Pounds of Material (lb)	Factor (Absolute ft ³ /lb)	Absolute Volume (ft ³)	Water Requirement (gal)
Cement	94	0.0051	0.48	6.0
Sand	80	0.0060	0.48	--
Water	50	0.0160	0.80	--
TOTALS	224	--	1.76	6.0

Slurry Weight = Pounds of Material (lb) / Absolute Volume (ft³)

$$= 224 \text{ lb} / 1.76 \text{ ft}^3 = 127 \text{ lb/ft}^3$$

$$= 127 \text{ lb/ft}^3 / 7.481 \text{ gal} = \mathbf{17 \text{ lb/gal}}$$

Slurry Yield = Absolute Volume (ft³) / sack of cement = 1.76 ft³

$$= 27 \text{ ft}^3 \text{ per cubic yard (yd}^3) / 1.76 \text{ ft}^3 \text{ per sack of cement}$$

$$= \mathbf{15.34 \text{ sacks of cement per yd}^3}$$

<u>For 1 yd³ of Sand Cement:</u>	<u>Material Type</u>	<u>Type Wgt x No. Sacks</u>	<u>Total Wgt x Factor</u>
	Cement	1,442 lb	7.36 ft ³
	Sand	1,227 lb	7.36 ft ³
	Water	767 lb	12.27 ft ³
		3,430 lb	26.99 ft³

POZZOLAN CEMENT MIX DESIGN EXAMPLE

One (1) sack of cement = 1 bulk cubic foot (ft³)*
 = 94 pounds (lb)
 = 3.6 absolute gallons (gal)

*A sack of cement has a bulk volume of approximately one (1) cubic foot (ft³), which is composed of 0.52 cubic feet (ft³) of air and 0.48 cubic feet (ft³) of solids (the actual space occupied by the solids of one (1) sack of cement when mixed with water to form a slurry).

Calculations are based on the specific gravity of cement which is assumed to be equal to 3.15 grams per cubic centimeter (gm/cm³) and the specific gravity of pozzolan which is assumed to be equal to 2.46 gm/cm³.

Specific Gravity Conversion: Specific gravity (gm/cm³) x 62.4 = pound per cubic foot (lb/ft³)

Volume Conversion: 1 ft³ of water = 7.481 gal of water

Material Type	Pounds of Material (lb)	Factor (Absolute ft ³ /lb)	Absolute Volume (ft ³)	Water Requirement (gal)
Cement	47	0.0051	0.24	3.00
Pozzolan**	37	0.0065	0.24	1.95
Water	41	0.0160	0.66	--
TOTALS	125	--	1.14	4.95

Slurry Weight = Pounds of Material (lb) / Absolute Volume (ft³)

$$= 125 \text{ lb} / 1.14 \text{ ft}^3 = 110 \text{ lb/ft}^3$$

$$= 110 \text{ lb/ft}^3 / 7.481 \text{ gal} = \mathbf{14.7 \text{ lb/gal}}$$

Slurry Yield = Absolute Volume (ft³) / sack of cement = 1.14 ft³

$$= 27 \text{ ft}^3 \text{ per cubic yard (yd}^3\text{)} / 1.14 \text{ ft}^3 \text{ per sack of cement}$$

$$= \mathbf{23.68 \text{ sacks of cement and pozzolan per yd}^3}$$

For 1 yd³ of Pozz. Cement: Material Type Type Wgt x No. Sacks Total Wgt x Factor

Cement	1,113 lb	5.68 ft ³
Pozzolan	876 lb	5.70 ft ³
Water	971 lb	15.54 ft ³
	2,960 lb	26.92 ft³

NEAT CEMENT MIX DESIGN EXAMPLE

One (1) sack of cement = 1 bulk cubic foot (ft³)*
 = 94 pounds (lb)
 = 3.6 absolute gallons (gal)

*A sack of cement has a bulk volume of approximately one (1) cubic foot (ft³), which is composed of 0.52 cubic feet (ft³) of air and 0.48 cubic feet (ft³) of solids (the actual space occupied by the solids of one (1) sack of cement when mixed with water to form a slurry).

Calculations are based on the specific gravity of cement which is assumed to be equal to 3.15 grams per cubic centimeter (gm/cm³).

Specific Gravity Conversion: Specific gravity (gm/cm³) x 62.4 = pound per cubic foot (lb/ft³)

Volume Conversion: 1 ft³ of water = 7.481 gal of water

Material Type	Pounds of Material (lb)	Factor (Absolute ft ³ /lb)	Absolute Volume (ft ³)	Water Requirement (gal)
Cement	94	0.0051	0.48	6.00
Water	44	0.0160	0.70	--
TOTALS	138	--	1.18	6.00

Slurry Weight = Pounds of Material (lb) / Absolute Volume (ft³)

$$= 138 \text{ lb} / 1.18 \text{ ft}^3 = 117 \text{ lb/ft}^3$$

$$= 117 \text{ lb/ft}^3 / 7.481 \text{ gal} = \underline{\underline{15.6 \text{ lb/gal}}}$$

Slurry Yield = Absolute Volume (ft³) / sack of cement = 1.18 ft³

$$= 27 \text{ ft}^3 \text{ per cubic yard (yd}^3) / 1.18 \text{ ft}^3 \text{ per sack of cement}$$

$$= \underline{\underline{22.88 \text{ sacks of cement per yd}^3}}$$

<u>For 1 yd³ of Neat Cement:</u>	<u>Material Type</u>	<u>Type Wgt x No. Sacks</u>	<u>Total Wgt x Factor</u>
	Cement	2,151 lb	10.97 ft ³
	Water	1,007 lb	16.11 ft ³
		3,158 lb	27.08 ft³

APPENDIX D – Bid Schedule Form for GVID Well #3B

RETURN BID SCHEDULE FORM INCLUDED IN IFB 23B08

BID SCHEDULE^(a)
GVID Well #3B
Golden Valley Improvement District
Mohave County Public Works Department

COMPANY NAME: _____

Item No.	Description	Units	Estimated No. of Units ^(b)
LUMP SUM ESTIMATED UNITS FOR BIDDING			
1	Mobilization/Demobilization	Lump Sum	1
2	Conductor Casing Material and Installation	Linear Foot	40
3	Surface Casing		
	A. Surface Casing Borehole Drilling (from 40 to 1020 feet)	Linear Foot	980
	B. Geophysical Logging of Surface Casing Borehole	Linear Foot	1,020
	C. Surface Casing Material (16-inch diameter, 0.375-inch wall thickness, LCS)	Linear Foot	1,020
	D. Surface Casing and Centralizer Installation	Linear Foot	1,020
	E. Surface Casing Cement Grout Seal Material and Installation (from 0 to 40 feet and 900 to 1020 feet)	Cubic Foot	260
	F. Surface Casing Formation Stabilizer Material and Installation (from 40 to 900 feet)	Ton	72
	G. Surface Casing Bentonite Seal Material and Installation (10 x 5-foot bentonite seals within formation stabilizer)	Cubic Foot	80
4	Pilot Borehole Drilling and Testing		
	A. Drill Minimum 9.875-Inch Diameter Borehole (from 1020 to 1460 feet)	Linear Foot	440
	B. Geophysical Logging of Pilot Borehole	Linear Foot	440
	C. Zonal Sampling Interval Construction	Per Each	3
	D. Zonal Purging and Testing (8 hours per zonal interval)	Hourly	24
	E. Standby During Falling Head Testing (2 hours per zonal interval)	Per Each	3
5	Borehole Reaming		
	A. Drill 14.75-inch Diameter Borehole (from 1020 to 1465 feet)	Linear Foot	445
	B. Final Caliper Log	Lump Sum	1
6	Well Casing and Screen Material and Installation		
	A. Blank Well Casing (nominal 10-inch diameter, 0.375-inch wall thickness, LCS)	Linear Foot	360
	B. Louvered Well Screen (nominal-10 diameter, 0.375-inch wall thickness, LCS)	Linear Foot	200
	C. Well Casing and Screen Installation	Linear Foot	560
7	Annular Materials and Installation ^(c)		
	A. Filter Pack Material (from 960 to 1465 feet)	Ton	20
	B. Bentonite Seal (from 950 to 960 feet)	Cubic Foot	8
	C. Well Casing Grout Seal (from 910 to 950 feet)	Cubic Foot	25
8	Well Development and Testing		
	A. Airlift Development	Hourly	25
	B. Furnish, Install and Remove Test Pump and Equipment	Lump Sum	1
	C. Pump and Surge Development	Hourly	12
	D. Step-Rate and Constant-Rate Test Pumping	Hourly	34
9	Final Tasks		
	A. Final Plumbness and Alignment Test	Lump Sum	1
	B. Final Well Video	Lump Sum	1
10	Applicable Tax	Percent	0
TOTAL LUMP SUM AMOUNT			
LUMP SUM GRAND TOTAL WRITTEN WORDS ^(d):			
RIG AVAILABILITY (Month, Year) :			
POTENTIAL LUMP SUM BID ADJUSTMENT ITEMS AND ALLOWANCE ITEMS			
11	Lost Circulation Conditions (Potential Adjustment Item)		
	A. Hourly Rate including costs for all drilling fluid and additives	Hourly	
12	Low Penetration Rate Conditions (Potential Adjustment Item)		
	A. Hourly Rate including costs for any additional drilling bits	Hourly	
13	Rig Hourly Rate (Allowance Item)		
	A. With Crew	Hourly	
	B. Without Crew	Hourly	

NOTES:

- a = The Contractor's Lump Sum Grand Total shall be based on the number of units specified in this Bid Schedule.
- b = The written word amounts shall take precedence over the figure amounts. Bid amounts shall include all costs for the required labor, equipment and materials.
- c = The quantities of materials were calculated with a 30% overage to accommodate for unanticipated borehole conditions.
- d = Any additional hourly time is subject to the approval of the CONSULTANT or OWNER, and is not included in the total estimated cost.

