BAGUIO WATER DISTRICT

"Serving mankind is serving God"

BIDDING DOCUMENTS

PROPOSED SITE DEVELOPMENT AND DRILLING OF PRODUCTION WELL AT RICHWOOD SUBDIVISION, BAGUIO CITY

VOLUME 2 OF 2

TECHNICAL SPECIFICATIONS

April 2023

TECHNICAL SPECIFICATIONS

I. INTRODUCTION

Part of the Baguio Water District's strategic direction is to continuously improve its current water supply geared towards addressing Baguio's current and future water requirements. In line with this objective, the Baguio Water District has embarked on the massive drilling project to increase its present production capability. The project will be implemented by way of tapping the services of private contractors and private well drilling contractors for the drilling of the Proposed Site Development and Drilling of Production Well at Richwood Subdivision.

II. BRIEF DESCRIPTION OF THE PROJECT AND WORK ORDER

The drilling site development, and drilling and construction of the well shall be undertaken at Richwood Subdivision, Baguio City.

The drilling site development shall be completed as per the approved plans and specifications. Final diameter of the boreholes that will be drilled shall be at least 375-400mm diameter. The target depth for the wells shall be one hundred fifty (150) meters. The wells shall be completed with 200mm (8") diameter steel casing and torch slotted steel pipes with slot opening of 3mm and stainless screen (The size of casing will depend on the result of logging). However, a change order maybe issued to drill deeper aquifers in cases where initial yield evaluation indicated minimal output at the target depth of 150 meters.

III. MANNER OF IMPLEMENTATION

The drilling site development and drilling project shall be undertaken by straight contract. The contractor to provide all supplies, materials, labor and equipment to complete the site development and well drilling in accordance with technical specifications and conditions as provided in the Terms of Reference.

IV. QUALIFICATION REQUIREMENTS OF CONTRACTORS

Interested bidders must have the following minimum requirements:

1. PCAB license with at least small B project size range under water supply.
2. Mayor's/Business Permit with drilling services as part of line of business.
3. The drilling rig to be utilized must have the following minimum specifications:

    a. Capable of down the hole hammer drilling method.

    b. Capable of borehole drilling using down the hole hammer with diameter of 16-1/2" at a depth of 150 meters.

    c. Air compressor must have a minimum capacity of 900 CFM x 350 psi.

    d. With official receipt and Certificate of Registration for the drilling rig of owned by the contractor or Lease of Contract if the rig is rented.

V. SCOPE OF WORKS

The scope of work to be undertaken for each works shall include the following:

WORK ITEMS	QTY.
SITE DEVELOPMENT	
1. Mobilization of equipment, personnel, materials to project site and erection of temporary facilities and construction of temporary fence	1 Lot
2. Project Billboard	1 Lot
3. Breaking of concrete and excavation (Transfer of fire hydrant)	1 Lot
4. Transfer of fire hydrant stand pipe and installation of 150 mm sanitary drain pipe and restoration of sidewalk	1 Lot
PHASE 1	
1. Preparation of site and setting up of all equipment (Preparatory works for collar hole and foundation)	1 Lot
2. Drilling 16 ½ "Ø collar hole and installation of 400mmØ permanent conductor casing	6 Meters
3. Drilling of 8" Ø (200mmØ) pilot hole using down the hole hammer method from 6m to 150m (incl. reaming to the desired 350mmØ), 144 meters	144 Meters
PHASE II	
1. Geophysical borehole logging (Electric resistivity and spontaneous potential).	1 Lot
2. Furnishing of 200mm nominal diameter BI/Spiral welded steel casing with a min. thickness of 6mm including one (1) meter stick up pipe (size will depend on the result of logging).	115.00 Meters
3. Furnishing of 200mm nominal diameter stainless steel well casing continuous slot wedge wire wound screen, slot size 1.5mm (size will depend on the result of logging)	36.00 Meters
4. Perforation of 200mm spiral welded casing (torch), 48 meters	48.00 Meters
5. Installation of casings and screens, 151 meters	151.00 Meters
6. Furnishing and installation of 50mm x 18m G.I. gravel fill pipe and gravel packing at annulus around casing, 135 meters	135.00 Meters
7. Well development by air lifting, 12 hours.	1 Lot
8. Step Draw down Pumping Test with four steps at one-hour duration each step carried out in succession with discharge rate increasing in equal fraction of expected maximum discharge.	1 Lot
9. Continuous constant discharge rate pumping test, 72 hours.	1 Lot
10. Cement grouting of annulus around 200mm casing, 15 meters	15 Meters
11. Furnishing and installation of well head cap and 37.5 mm sounding tube with screw cap	1 Lot
12. Demobilization and cleanup of well site	1 Lot

VI. PROJECT DURATION

The project shall be completed within seventy-two (72) calendar days except when there are approved requests of time extensions due to unforeseen circumstances.

VII. TECHNICAL SPECIFICATIONS

7.1. MOBILIZATION OF EQUIPMENT, PERSONNEL, MATERIALS TO PROJECT SITE AND ERECTION OF TEMPORARY FACILITIES AND CONSTRUCTION OF TEMPORARY FENCE

All needed materials, tools and equipment shall be furnished and brought to the site by the Contractor necessary to complete the project.

7.2. PROJECT BILLBOARD

7.2.1. GENERAL

A. The Contractor shall furnish materials necessary to complete the project billboard as specified in the approved drawing. The billboard shall be installed on or before the start of work and shall be visibly located at the start and end of project construction.

7.2.2. METHOD OF MEASUREMENT AND PAYMENT

A. Billboards shall be measured by piece.

B. The accepted quantity shall be paid for at contract price and payment shall be full compensation for the furnishing of materials and labor necessary to complete item.

7.3 DRILLING RIG

The drilling rig to be utilized for the project must be capable of the following minimum requirements appropriate for different subsurface conditions:

1. *Capable of air/mud rotary and down-the-hole hammer method.*
2. *Top-head drive with automated non-drilling functions such as power indexed carousel and fast break out capabilities.*
3. *With pull down (propulsion force) capacity of 2.1 tons.*
4. *With pull back (lifting force) capacity of 4.0 tons.*
5. *With a 900 CFM x 350 psi air compressor on deck or in a separate support truck.*

7.4 WELL DESIGN PREPARATION

The well design shall be carried out by the contractor in two (2) stages at his own expenses.

- Preliminary Well Design – To be submitted to BWD before commencing the drilling activity.
- Final Well Design – To be submitted after completion of the well logging.

7.5 DRILLING METHODS

The drilling method to be used shall be down-the hole-hammer method.

7.6 DRILLING WATER SUPPLY AND POWER REQUIREMENTS

All drilling water, lightning and motive power, including necessary water pumps, connections and installations, required for the proper execution of this contract shall be provided by the contractor.

7.7 BOUNDARIES OF WORK

BWD shall provide land or rights of way for the work specified in this contract. The contractor shall not enter nor occupy with men, tools, equipment or materials, any ground outside the specified drilling area without the written consent of the owner of such property. Other contractors and employees or agents of BWD may for all necessary purposes enter the work premises used by the contractors, and the contractor shall conduct his work so as not to impeded unnecessarily any work being done by others or adjacent to the site.

7.8 SITE DEVELOPMENT/ACCESS ROADWAY

The cost for site development works is included in this contract.

7.9 SAMPLING OF FORMATIONS

The sampling procedure must provide that the fractions of penetrated strata are present in the sample.

The drilling rate expressed in meters penetrated per actual drilling time shall be recorded throughout the drilling operation. Actual drilling time with active drilling operation, i.e., excluding time for replacement of drilling rods and bits, breakdown of drilling equipment and similar non-active drilling operations.

Formations samples or cutting shall be taken at one-meter intervals or more frequent if the formation penetrated changes, and samples shall be dried and placed in plastic or wooden boxes in which space is provided for storage of each sample in separate partitions. Sampling depth shall be written on the box.

7.10 WELL LOGGING

The contractor shall perform well logging by using special approved equipment such as the electric resistivity spontaneous potential flow, gamma and gamma logging equipment.

7.11 RECORD OF CASING PIPE

The contractor shall keep an accurate record (as assembled) of the order, number, type size, and length of the individual pieces of pipe, screens and liners installed in the well and submit the same to BWD upon completion of the well.

7.12 DAILY REPORTS

The contractor shall prepare a daily report describing the nature of penetrated strata encountered, the work done during each day, including the items work accomplished, mud weight, mud viscosity, the water level in the well at the beginning and end of each shift, and such other pertinent data as required by the Engineer to record. He shall submit these records once a week or at other time intervals as requested by the Engineer.

7.13 PRECAUTIONS TO BE TAKEN

The contractor shall take such precautions as are necessary or as maybe required permanently to prevent water having undesirable bacteriological, physical and chemical characteristics from entering, through the opening made by the contractor in

the drilling well, into the stratum from which the well is to draw its supply. He shall also take all necessary precautions during the construction period to prevent any contaminated water, gasoline, and other deleterious substance from entering the well either through openings or by seepage from the ground surface.

7.14 CORRECTIVE WORK

In the event that well becomes contaminated or that water having undesirable physical or chemical characteristics did enter to well due to the negligence of the contractor, he shall at his own expense, perform such work or supply casing, seals, sterilizing agents or other materials as maybe necessary to eliminate the contamination or exclude any undesirable water in the well.

7.15 DRILLING FLUID/FOAMING AGENT

When the contractor employs drilling fluid, the following rules apply: Only high-grade drilling fluid or similar with additives, such as Carbon Metal Cellulose or Aqua Polymer and approved by the Engineer shall be used in the make-up of the drilling fluid. These drilling fluids and additives adequate for a drilling of a well shall be stored on the well site prior to start of drilling of the well.

The drilling fluid shall possess such characteristics required to adequately condition the walls of the hole to avoid cave-in as drilling progresses and to remove the drill cutting from the hole. The contractor shall provide on-site facilities for controlling the density, viscosity and sand content of the drilling fluid. These facilities shall be approved by the Engineer prior to the commencement of the drilling operation and shall be of the same standard as Barroids Mud Lab or similar. Mud control shall be made at the end of each work shift and further after each addition of Bentonite or additives and the results shall be recorded.

From the moment, the drill bit has reached the water bearing formation to be exploited, the drilling mud shall be circulated continuously to minimize seepage of drilling mud into the formation.

The contractor shall provide his own mud pump and construct the necessary mud pits and channels, upon completion of the drilling, all drilling mud and cutting shall be removed from the site and disposed off by the contractor. The mud pits shall be backfilled with clean earth and the ground surface shall be restored to its original condition by the contractor.

Drilling Foaming agents to be used shall have the following properties:

APPEARANCE	: Clear, low viscosity liquid, with a mild detergent odor
MELTING POINT	: 100 Degrees centigrade (approximate)
SOLUBILITY IN WATER	: Miscible
Ph	: 7.0 – 7.5
SPECIFIC GRAVITY	: 1.01

7.16 WELL CASING

The contractor will assume responsibility for any casing failure and will correct, as approved by the Engineer, any casing failure at no cost to BWD.
In the event that the contractor cannot correct a casing failure, the Contractor shall replace the casing with material complying with the specifications of this contract, or if necessary, better casing as approved by the Engineer at no extra cost to BWD.

The joining of the well casing shall use a method suitable to withstand earth stresses encountered and casing emplacement methods employed. Any failure of joint connections will be the responsibility of the contractor and will be corrected or replaced at no extra cost for BWD.

All casing materials shall be of new stock.

In case the well is abandoned, the contractor shall salvage the screen and casing and seal the hole in accordance with the direction of the Engineer.

7.17 MATERIALS FOR CASING

Unless otherwise specified or approved by BWD, all casings to be used hereunder as part of the permanent well shall be new BI/Spiral welded steel pipes, having the following minimum thickness and weight.

Nominal Diameter in Inches	6	8	10	12	14
Minimum Wall thickness in Inches	0.280	0.312	0.365	0.375	0.375
Minimum weight in lbs* / foot (plain ends)	18.51	27.7	40.48	49.56	54.57

Manufactured weight tolerance is 10 percent over and 3.5 percent under nominal weight. Casing shall have either standard API screwed joints or beveled ends for welded joints.*

7.18 TEMPORARY CASINGS

The contractor shall furnish and install the temporary casings as maybe required for construction convenience or expediency. Temporary casings should only be installed upon approval by the Engineer. Such temporary casings intended for construction purposes only shall be of such weight as necessary to prevent entrance of sand and silt, to be reasonable tight, and to permit its installation without distortion or rapture to the depth and dimensions. All temporary casings shall be pulled out and shall remain the property of the Contractor.

7.19 DRIVE SHOES

Use of appropriate drive shoes for driven permanent casings is mandatory. They may not be required for shallow settings of temporary casings in unconsolidated formations. The type and weight of the drive shoe is left to the discretion of the Contractor but must receive prior approval by the Engineer.

7.20 TEMPORARY CAPPING

At all times during the progress of the work, the Contractor shall protect the well in such manner as to effectively prevent either tampering or the entrance of foreign matter in the well, and, upon its completion he shall provide and install a renewed or flanged cap satisfactorily to the Engineer.

7.21 GRAVEL PACKING FOR UNCONSOLIDATED SEDIMENTS

If specified, either a single or double pack shall be made. After the casing has been

installed to the full depth of the well, and the screen has been placed in its proper position, a wall of gravel packing shall be such that separation and bridging of gravel is avoided. Gravel packing in drill mud-filled bore-holes shall be done by reverse circulation of drilling fluids.

7.22 GRAVEL PACKING FOR CONSOLIDATED SEDIMENTS

If needed, a gravel stabilizer shall be placed around the screen.

7.23 GRAVEL PACK MATERIALS

Gravel pack materials if used should be clean, free from sand particles, with well rounded, water worn, gravel's that are smooth and graded, consisting mostly of siliceous and as approved by the Engineer. Angular chipping or road stone must not be used as gravel pack material. The contractor shall in the mobilization period submit to the Engineer samples of gravel pack, stating source of material, quantities and sides available, rate of delivery and any other information requested by the Engineer for his approval.

The gravel shall be graded in accordance with the results of the analysis of data collected during drilling and the grading shall be approved by the Engineer before being placed.

Material required filling cave-ins and over excavations shall be Contractor's expense.

7.24 DEVELOPING THE WELL

The Contractor shall furnish all necessary pumps, compressors, plungers, bailers, jetting tools, electric and other equipment which may be needed. The Contractor shall develop the well to its maximum expected yield by methods as requested and approved by the Engineer.

7.25 REMOVAL OF DRILLING FLUID

In case drilling fluid has been used, special care must be taken in order to avoid permanent clogging of the aquifer by the drilling fluid.

Upon completion of drilling the hole to the desired diameter and depth, installation of the string of casing and screens and gravel packing must commence within six (6) hours, and the installation must take place as one continuous working operation.

The installation of gravel pack shall be completed by clear pumping the well for drilling mud and must within six (6) hours be followed by inspection and/or jetting through the slotted and screened portion of the well with a polyphosphate solution to deflocculated to mud cake formed by the drilling fluids on the walls of the drilled hole.

The concentration of the polyphosphate shall be 3.0% by the weight of the quantity of the water in the casing and gravel pack.

The injection of the polyphosphate solution shall immediately be followed by swabbing for at least 6 hours.

The solution shall stay in the well for at least 24 hours before commencement of further development.

The treatment with polyphosphate must be repeated if so required by the Engineer.

In case the contractor fails to comply with the schedule of operations given above (e.g. due to the equipment breakdown), he may at his own discretion either do the following:

1. Reconstruct the well by reaming the hole to a two (2) inch bigger diameter but otherwise to the same specifications as the original well at no extra cost for BWD.
2. Proceed with the well construction.

If the contractor decides to proceed according to option 2 as stated above and in case the Engineer after pump testing the well finds the well loss to be excessive, the contractor is required, if directed by the Engineer to recover all materials and reconstruct the well after reaming the hole to a two (2) inch bigger to the entire depth.

The recovering of materials, reaming of the hole and reconstruction of the well shall be at no extra cost to the BWD.

Should recovery of gravel pack, casing and screens be possible, a new well shall be constructed to the same specification at no extra cost to the BWD.

7.26 PUMPING

If needed, development by pumping shall be performed by a discharge of about 15% of the anticipated production discharge.

7.27 AIR LIFTING

If needed, the compressor used should be capable of developing a maximum pressure of 150 (150 M.W.C.). The proper compressor capacity is about 10 cu.m. of free air for each cu.m. of water at the anticipated pumping rate.

The quantity of water being pumped at the commencement of the development shall be limited and gradually increased as the water clears. From time to time, the air compressor or pump shall be stopped and the water in the pump column allowed to flow back through the perforations into the aquifer. The well may also be back washed up through the annular space (gravel pack) by back washing with air compressor.

7.28 LIMITS TO SAND TURBIDITY

The contractor shall exercise extreme care in the performance of his work in order to prevent the breakdown or caving-in of strata overlying that from which the water is to be drawn. He shall develop, pump or bail the well by such methods as may be approved by the Engineer until the water pumped from the well is substantially free from sand and until the water pumped from the well does not contain an amount of fine materials in excess of 2 millimeters per cu.m. during final test pumping. The equipment to measure the sand content shall be furnished by the Contractor.

7.29 GROUTING MATERIALS

To seal the top of the well, as directed by the Engineer the annular space between the inner protective casings and the outer casing or hole shall be filled with cement grout. The grouting may not be initiated before the well testing is completed. Grout shall be proportioned such that the cement and the maximum quantity of water (not over 20 liters per 40 kg bag of cement) required will give a mixture of such consistency that if it can be forced through the grout pies. The mixtures, methods of such mixing and

consistency of grout shall be as approved by the Engineer.

All cement required for grouting and other related work shall be provided by the Contractor. Portland cement shall conform to the "SPECIFICATIONS FOR PORTLAND CEMENT" (ASTM c150-LATEST REVISION and shall be Type I, or as otherwise approved by the Engineer.

7.30 PLACEMENT OF GROUT

Before proceeding with the placing of grout, The Contractor shall secure the Engineer's approval of the method he proposes to use. No method shall be approved that does not specify the forcing of grout from the bottom of the space to be grouted towards the surface. A suitable cement retaining packer or plug approved by the Engineer shall be provided at the bottom of the inner casing so that grout shall not leak through or into the bottom of the well. The grouting shall be done continuously and, in such manner, as to ensure the complete filling of the annular space in one operation. No drilling operations or other work in the well shall be permitted within 72 hours after the grouting of casings. If quick-setting cement is used, this period may be reduced to 24 hours or as recommended by the cement admixture manufacturer.

7.31 TESTING FOR YIELD AND DRAWDOWN

After the well has been completely constructed and cleaned out and the depth of the well accurately measured, the Contractor shall immediately notify the Engineer to that effect and shall make the necessary arrangements for conducting pumping tests in order to ascertain the yield and the drawdown of the completed well.

Besides these tests the Engineer may require the Contractor to make such additional pumping or bailer tests during and after construction as found necessary.

All tests shall be run with equipment approved by the Engineer and in a like manner to that hereinafter described.

7.32 TEST PUMP

The pump capacity shall be adequate for pumping with the required discharged being a maximum 150% of the expected average or as otherwise agreed by the Engineer. The test pump and prime-mover assembly shall be equipped with satisfactory throttling device, so that the test discharge may reduce to the quantity defined by the Engineer.

The pumping unit shall be completed with either a gas or diesel engine prime mover of continues stable power, control and appurtenances, and shall be capable of being operated without interruption for a period approximately 7 days with all fuel on site prior to starting.

7.33 DISCHARGE MEASUREMENTS

The Contractor shall furnish, install and maintain all auxiliary equipment of approved size and type as required and approved by the Engineer. To measure the depth to the water level in the well, there must be left space between the riser pipe and the casing so that a 1-1/2" water sounding pipe can be installed, if required by the Engineer the Contractor shall install this pipe to the depth of lowest expected pumping water level and ensure that the electrical probe of 20mm diameter glides inside the pipe to the water level without obstruction.

7.34 DURATION OF THE TEST

If not otherwise specified by the Engineer, the preliminary test for the yield and draw down shall be performed for a minimum of 24 hours and the final test for a minimum of 96 hours. A step-draw down pumping test with at least 4 steps each with duration of one hour shall be performed.

Except as otherwise agreed, the Contractor shall furnish all labor, pump, motive, power, lubricating oil and other necessary materials, equipment, labor and supplies as required by the Engineer. The Contractor shall during the test pumping operate the pumping unit in such a manner that the discharges required by the Engineer are obtained. After the pumping tests are completed, the recovery of the water level shall be measured for such periods of time and with such a frequency as directed by the Engineer.

Accidental interruption during the pumping tests shall render the pumping tests obsolete and if so required by the Engineer, the Contractor must perform a new pumping test lasting for the required period of time at no extra cost to the owner.

After completion of the final test, the Contractor shall remove by bailing, sand pumping, or other method any sand, stones or other foreign material that may have been deposited in the well.

The Engineer reserves the right to require the Contractor to extend the duration of the test, or to make additional tests, this to be paid in unit prices as quoted in the Bid Form.

7.35 WELL CLEANING

At the termination of well testing, the test pump shall be removed from the well and the well shall be bailed clean to the depth.

7.36 PEDESTAL

A concrete pedestal if shown on the drawings shall be formed around each well after testing is completed unless otherwise stated.

7.37 WELL CAP

A permanent well cap shall be provided for each well after completion of testing. The well must be provided with a capped 1-1/2” hole on top for water level measurements.

7.38 SITE CLEAN-UP

After completion of all construction and testing activities at the well site, all equipment and residual materials shall be removed from each site. Each site shall then as have directed by and to the satisfaction of the Engineer be restored to a condition as nearly as possible to that which existed before well drilling and testing activities commenced. This work shall include, but not be limited to, restoration of fences and structures, removal of drill cuttings, leveling of the disturbed ground surfaces, and replacement or compensation for destroyed plants and landscaping.

7.39 ABANDONEMENT OF THE WELL CAUSED BY FAULT OF THE CONTRACTOR

Should the well be abandoned because of loss of tools, failure to withdraw temporary casing or for any other cause due to his fault, he shall be if directed by the Engineer removed the screen and casing and fill the abandoned hole with clay or clay and

concrete. The salvaged material furnished by the contractor shall remain his property. No payment shall be made on the abandoned well.

7.40 SUBMITTAL OF REPORTS AND BOREHOLE DATA

After completing the well construction and the required test and before final payment is made, the Contractor shall submit to the Engineer borehole materials and at least three (3) certified copies of the following reports as specified by the Engineer:

7.40.1 GRAPHICAL LOGS OF WELL:

1. The total depth of the well
2. The description of the strata encountered.
3. The water level as encountered during drilling.
4. The sizes and the lengths/ specifications of the casing installed.
5. The dates of the start and completion of the construction of the well.
6. The locations and the description of the casing perforations or the well screen placement and the recommended setting of the pump.
7. The locations of the gravel, the size of gravel, and the grout installed.

7.40.2 RECORDS OF DEVELOPMENT:

1. The records such as discharge and draw down during the development together with the description of the specified development.
2. The well yield (expressed as the discharge and the draw down), the dates and duration of the test (s).
3. The steps draw down pumping test data.
4. Draw down and the recovery pumping test data.
5. The methods of measuring the discharge and the draw down.
6. The specification of the test pump.

7.40.3 RESULTS OF WATER QUALITY TESTS WHICH INCLUDES THE 9 MANDATORY PARAMETERS AS STIPULATED AT ANNEX B, TABLE B-1 OF THE 2017 PHILIPPINE NATIONAL STANDARDS FOR DRINKING WATER (2017 PNSDW) AND SHOULD BE CONDUCTED BY A DOH ACCREDITED TESTING LABORATORY:

1. Bacteriological water quality test.
   -to include Thermotolerant Coliform (E. coli)
2. Chemical water quality test.
   -to include Arsenic (As), Cadmium (Cd), Lead (Pb) and Nitrates (NO_3)
3. Physical water quality test**.**
   -to include Color (Apparent), Turbidity, pH, and Total Dissolved Solids

7.40.4 CERTIFICATE OF REGISTRATION

The Contractor shall submit to BWD an updated Certificate of Registration issued by the National Water Resources Board (NWRB).

7.40.5 BOREHOLE MATERIALS

The Contractor shall submit to BWD the actual samples of the penetrated strata/rocks properly packed and labeled in boxes.

7.41 UNUSED MATERIALS/EQUIPMENT

All drill bits used on drilling of borehole that were included in the materials shall be turned over to the BWD after the completion of the drilling project.

VIII. VARIATION/CHANGE ORDER

1. If there are changes in plans due to actual site conditions or If the actual condition differs substantially from those which were assumed, then as the various portions of the subsurface are penetrated, the contractor shall in writing promptly notify the BWD Chief Engineer. The contractor shall submit a plan or description of modifications including the decrease or increase in prices as well as time duration that the contractor proposes to make in the contract. If such modifications are not included as additive or deductive bid items, the resulting increase or decrease in the contract price and/or time shall be evaluated by the BWD Chief Engineer who shall submit a duly approved changes order indicating the adjustment of price and/or time.

IX. ENVIRONMENTAL MANAGEMENT

The Contractor and his drilling crew should ensure to avoid:

- Discharge of waste to private and public land
- Discharge of drilling mud and foams over private lands
- Leakage of spillage of Diesel fuel into storm water drains
- Damage to neighborhood roads, paths and gardens

X. REQUEST FOR PAYMENT

Payment shall be made based on progress billing of actual accomplishment as certified by the BWD Chief Engineer. Payments shall be subject to Ten (10) % retention fee which shall be released after 1-year warranty period of the project. The retention money may be substituted with a corresponding surety bond acceptable to BWD.

XI. LIQUIDATED DAMAGES

Where the Contractor refuses or fails to satisfactorily complete the work within the specified contract time, plus any time extension duly granted and is in default under the contract, the Contractor shall pay the District liquidated damages, and not by way of penalty, an amount to be determined in accordance with the following formula (Section 68, RA 9184) until the work is completed and accepted or taken over by BWD:

LD = 1/10 x 1% x TDD x CWI
WHERE:
LD = Liquidated Damages, in Pesos
TDD = Total number of days delay
CWI = Cost of the work item as per contract, in Pesos

XII. WARRANTY

The Contractor has the full responsibility that the proper materials are used and the construction of the well is carried out in compliance with the Technical Specifications.

If within one year from the date of completion of the well any malfunctions or failures occurs, which can be traced to failure by the Contractor he shall, without any cost to BWD, make all necessary repairs to make the well construction comply with the technical specifications.

If the malfunctions of the well are due to damages of such a character that the Contractor fails to repair the damages a new well shall be constructed to the same specifications at the Contractor's sole expense.

XIII. AWARD OF CONTRACT

The Contract shall be awarded to the bidder who offers the lowest calculated responsive bid.

XIV. APPLICABLE STANDARDS

All pertinent provisions of R.A. 9184 shall be applicable and shall form as an integral part of this Term of Reference.

XV. RESERVATION CLAUSE

BWD reserves the right to reject any or all bids which are deemed disadvantageous to the Baguio Water District.