Republic of the Philippines
GENERAL SANTOS CITY WATER DISTRICT
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PROJECT TITLE:

EXPLORATORY/ DRILLINGOF PRODUCTION WELL

LOCATION:

LANDERO LOT PUROK 1, BRGY. MABUHAY GENERAL SANTOS CITY

OWNER:

GENERAL SANTOS CITY WATER DISTRICT

S P E C I F I C A T I O N S

1.0 SCOPE OF WORK

The work includes **the Exploratory / Drilling of Production Well at Reservoir Site, Brgy. Sinawal, General Santos City.**

2.0 BIDDER'S QUALIFICATION

a.) Similar contract should be projects with civil, piping and structural steel works in any Government or Private Institutions duly supported by a satisfactory CPES rating and or /an owner's certificate of acceptance in Two (2) years from the date of submission and receipts of bids.

b.) Bidders under Small A and Small B category who do not have completed contracts are allowed to participate if the cost is not more than the ARCC under their PCAB registration.

c.) Contractor's PCAB shall be unexpired upon submission and related projects shall be Water supply and PCAB classification of SP-WD (Well-Drilling Work) and GE-4 (Water Supply).

3.0 SAFETY & HEALTH PROGRAM

As part of GSCWD's advocacy on zero accident and healthy workplace, the winning bidder is required to supply personal protective equipment in proportion to the assigned actual workers. Hard hat, rubber boots, ear muffs and hand gloves are some of the required PPE's which a

must to be worn during their work in the area with strict observance on safety and health program.

4.0 GENERAL

4.1 Technical Definition

4.1.1 *Borehole* means any drilled section of boring before completion as defined in well below.

4.1.2 *Casing* means non-slotted or non-perforated lining tubes.

4.1.3 *Development Equipment* means high velocity jetting tool, surge plunger and all other equipment needed to develop the well.

4.1.4 *Diameters* mean nominal diameters unless otherwise stated.

4.1.5 *Drilling Rig* means drilling equipment and the auxiliary equipment for its operation.

4.1.6 *Drilling Unit* as defined in Clause 2.2 under this section *(Equipment)*

4.1.7 *Final Well Design* means the drawing and description prepared by the Engineer upon completion of the drilling of the pilot hole and geophysical borehole logging specifying the final well construction.

4.1.8 *Lining materials* means any casing, screen, slotted lining or perforated lining tube whether permanently of temporarily installed in the borehole.

4.1.9 *Pumping Unit* as defined in Clause 8.7 under this Section *(Definition of "Pumping Unit").*

4.1.10 *Screen* mean continuous wire wound stainless.

4.1.11 *Tentative Well Design* means the contract drawing showing the estimated quantities of the work.

4.1.12 *Well* means any completed hole in which all lining material has been set, all grouting completed and all temporary lining removed.

4.2 Technical Standards

All materials or workmanship shall comply with the specifications. Other standards equal or superior to those enumerated in this specification, shall be acceptable, subject to the approval of the Resident Engineer.

4.3 Water and Power Supply

In the absence of adequate quantities of water or illumination required for drilling at the drilling site, the contractor shall make such arrangements including the provision for mobile tanks or fixed as may be necessary to ensure a supply of water sufficient for drilling operations.The Contractor will make arrangements as may be necessary for the connection of or supply of power at site.Payments for the provision of electrical power supplies as specified in sub-clause 1.4 (1) shall be deemed to be included in the rates entered in the Bid Form for setting up equipment at the site, drilling rates and rates entered for the operation of pumping unit.

4.4 **Storage of Inflammables**

The Contractor shall comply with all local authority regulations applicable to the use and storage of diesel oils, petrol, paraffin and other inflammable fuels used by him on the site, and shall ensure that adequate precautions are taken against fire.

4.5 **Boundaries of Work**

The Owner shall provide land or rights-of-way for the work specified in this Contract and make suitable provisions for ingress and egress, and the Contractor shall not enter or occupy with men, tools, equipment or material, any ground outside the property of the Owner without the written consent of the Owner of such property. Other Contractors and employees or agents of the Owner may, for all necessary purposes, enter upon the work premises used by the Contractor, and the Contractor shall conduct his work so as not to impede unnecessarily any work being done by others on or adjacent to the site.

4.6 **Access Roads**

Construction or improvements of access roads to the wells shall, unless otherwise agreed, be done by the Contractor at his own cost, which is deemed to be included in the contract sum. The access road shall be kept in proper condition during the entire construction period.

4.7 **Protection of Site**

Except as otherwise provided herein, the Contractor shall protect all structures, walks, pipelines, trees, shrubberies, lawns, etc., during the progress of his work, shall remove from the site all drill cuttings, debris, and unused materials, and shall upon the completion of the work restore the site as nearly as possible to its original condition, including removal of access tracks and the replacement, at the Contractor's sole expense of any facility or landscaping which has been damaged beyond restoration to its original condition all to the satisfaction of the Engineer. Water pumped from the well shall be to a place approved by the Engineer where it will be possible to dispose the water without damage to property or creation of a nuisance.

4.8 **Site to be Kept Tidy**

The Contractor shall at all-time keep the site and all working areas in a tidy and workmanship condition and free from rubbish and waste materials.

4.9 **Temporary Buildings for Use by Contractor/Inspectors**

The Contractor shall provide at the site of the works such temporary buildings, tanks, workshop, etc., as may be necessary and proper for his general use in connection with the works, and for the use of persons employed by him. The nature of the buildings, tanks, etc. and the positioning of them shall be subject to the prior approval of the Engineer and the

relevant authorities. The Contractor shall also provide the Owner's Resident Engineer with a temporary office at the project work site. The said office shall be weatherproof building field office or "Payag".

4.10 **Shop Drawings**

4.10.1 The Contractor shall if requested by the Engineer prior to start of each operation, produce for the Engineer's approval shop drawings showing details of technical operations such as test of plumbness and alignment, the method of the slotted casing production, if so required, the methods of placement of formation stabilizer and/ or cement grout, the arrangement for well testing, the method for well development and all other drawings pertinent to the well drilling, well construction operations and well development as requested by the Engineer.

4.10.2 Shop drawing shall be completed with respect to the dimensions, design criteria, materials, method of construction and the like to enable the Engineer to review the information as required.

4.11 **Well Head Protection**

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

4.11.2 In the event that the well becomes contaminated or that water having undesirable physical or chemical characteristics has entered the well due to the negligence of the Contractor, he shall at its own expense perform such work or supply casings, seals, sterilizing agents or other materials as may be necessary to eliminate the contaminations or to exclude any undesirable water in the well.

4.12 **Transport of Personnel and Equipment**

4.12.1 The Contractor shall supply and operate all transport required for transporting his employees, materials and equipment.

4.12.2 The cost of movement of personnel, materials and equipment shall be included in the rates given for drilling development and pump operation.

4.13 **Site Preparation and Reinstatement**

4.13.1 The Contractor shall prepare the site, provide all necessary tanks and pits and make all necessary arrangements for erecting and dismantling the drilling unit and shall reinstate the site on completion of such phase of work to the satisfaction of the Engineer.

4.13.2 Payment shall be deemed to be included in the items entered in the Bid Form for erection and dismantling of drilling rigs.

5.0 WELL DRILLING

5.1 Preliminary Well Design Details

DESCRIPTION	DETAILS
DEPTH	**200meters**
BLANK CASING	**400mmØ&300mmØ, 9mm thick Spiral Welded Steel Pipe.**
BOREHOLE	**600mmØ**
WELL SCREEN	**Stainless Steel Continuous Slot Wedge Wire wound,SLOT 60/ SIZE 1.5mm/300mmØ**
CASING CENTRALIZERS	**PLACED EVERY 12m**
GRAVEL PACK DIAMETER	**4-5mm**
CEMENT GROUT	**25meters**

5.2 Scope

5.2.1 The Contractor shall provide and operate one or more mobile drilling Units required completing the works within the contract period.

5.2.2 The Contractor shall provide all auxiliary equipment, lubricants, fuels and spares necessary to keep the drilling rig(s) in continuous operation.

5.3 Equipment

5.3.1 The drilling rig(s) together with all auxiliary equipment and personnel shall be defined as the drilling Unit(s).

5.3.2 All rigs shall have sufficient capacity to drill the specified borehole(s) in the diameters specified in the tentative well design(s) to a depth which is min. 25% higher than indicated in the Contract Drawings.

5.3.3 Payments of drilling will be by the linear meter of borehole as measured after removal of drill string. The rates set against drilling items in the Bid Form shall be deemed to include all equipment, personnel, fuels and lubricants and the accessories required for operation of the drilling Unit.

5.3.4 When the Drilling unit is being used for a purpose other than drilling, then the rates for that purpose entered in the Bid Form shall be deemed to include the running costs of the Drilling Unit.

5.3.5 Drilling rig equipment shall be either driven by an electric motor or a diesel engine.

5.3.6 The Contractor shall provide the following minimum equipment intended for the project. During Post-Qualification, GSCWD shall conduct inspection to verify the

availability of the listed equipment. Absence of any one of the required equipment is ground for disqualification.

Quantity	Description of Equipment
1	Drilling Machine
2	Welding machine
1	Welding Genset
1	Generator Set
1	Boom Truck / Truck
1	Mud Pump
1	E-Log Equipment
1	Set of Jetting Tools
1	Set of Surging / Bailing tools
1	Air Compressor
1	Submersible pump and motor with motor controller suitable for the project.
1	Submersible Cable
1	Camera/Logging Equipment

The contractor shall be required to include the list of their equipment in the technical documents and specify whether the same is leased or owned. If leased, the Contractor shall provide a Memorandum of Agreement or lease contract. ***The bidder shall attached official receipts or sales invoice for owned equipment. Affidavits or any other form of certification executed under oath shall not be accepted and is ground for disqualification.***

5.4 Drilling Method

5.4.1 All drilling shall, unless otherwise specified in the special provisions, be performed with the rotary drilling method.

5.4.2 The Contractor shall drill the hole to such depth and with such a diameter, which shall enable an easy installation of casing and screen and placement of gravel envelope with a uniform thickness as specified, if required. During drilling of the hole, the Contractor shall ensure that the natural permeability of the yielding strata near the well bore is not irreversibly reduced due to the drilling method employed.

5.5 Strata Sampling / Material Testing

5.5.1 Strata samples (washed and unwashed) shall be taken at one-meter intervals or more frequent if the formation penetrated changes. Samples shall be placed in plastic or other appropriate bags on which or in which the sampling depth and the date of sampling is written in such a manner that it is permanently readable.

5.5.2 The sampling procedure must provide that all the fraction of the penetrated strata is present in the sample.

5.5.3 Each sample shall be placed in a wooden box with space for storage of one sample and the sampling depth shall be written on the box.

5.5.4 A record of samples taken with the details described above shall be submitted to the Engineer every day.

5.5.5 Payment for sampling shall be deemed to be included in the rates entered for drilling in the Bid Form.

5.5.6 The failure on the part of the Contractor to obtain, preserve and deliver samples or records, satisfactory to the Engineer, shall be considered as actual damage to the Owner. Such a failure authorize the Engineer to retain from money due or to become due to the Contractor the sum of **TWO THOUSAND PESOS(P 2,000.00)** as liquidated damages for each sample that the contractor shall fail to obtain, preserve or deliver, or for each of pipe not properly measured and recorded in the order in which it was placed in the well. In the event that, in the opinion of the Engineer, the failure of the Contractor to take and preserve the samples may affect the proper design of the well, the Contractor may be required to perform such work as the Engineer deems necessary to remedy such failure at no cost to the Owner. It is understood that the liquidated damages herein provided are fixed, agreed and not by way of penalty; and that the Owner shall not be required to prove that he has incurred actual damages.

5.5.7 All samples taken shall be field or laboratory tested in accordance to ASTM standard on the following:

a. Grain-size distribution analysis at least 8 standard sieves.

b. Determination of uniformity coefficient.

5.6 Drilling Mud

5.6.1 Bentonites, if used, shall be of premium quality in accordance with API Standard 13A with 150 kg/cu.m of make-up water yielding a mud with a viscosity of between 35 and 40 seconds using a Marsh funnel and a mud weight of less than 1.10 kg/l *(9.2 lbs/US gal.).*

5.6.2 Make-up water shall be treated with caustic soda (soda ash) to maintain the pH between 8.0 and 9.0 prior to mixing mud.

5.6.3 During drilling with mud, the Contractor shall perform hourly measurements of the following mud characteristics:

a. pH value

b. Funnel viscosity

c. Specific gravity

d. Sand content

e. Filtration loss

f. Filter cake thickness

g. Mud viscosity

h. Conductivity Measurement

5.6.4 The drilling Contractor shall maintain a drilling fluid Log showing the date, time depth, Marsh Funnel viscosity, drilling fluid weight and PH, and all shall record any drilling fluid additives used, including time introduction as well as other pertinent comments. The recorded mud characteristics shall not exceed the following values, without prior approval of the Engineer:

Specific gravity	9.5 lb/gal
Sand content	4%
Filtration loss	10 ml
Filter cake	1.5 Mm

5.6.5 It is the Contractor's responsibility to assure that equipment for measuring fluid properties shall be available at the drilling site.

6.0 WORKING HOURS

All work from start of drilling of the borehole until completion of well development shall be within reasonable hours of the day except during test pumping, installation of well casing and screen, and subject to existing local ordinances.

The contractor shall provide the following minimum number of man power intended for the project.

Quantity	List of Man Power
1	Project Engineer
1	Safety Officer
2	Drilling Operator/ Operator
1	Truck driver
1	Boom Truck driver
3	Helper
1	Well Camera Operator
2	Welder
1	Mason

1	Carpenter

The bidder shall submit its organizational structure for the project including unexpired licenses of professionals to be assigned and stipulate specific functions wherein One (1) professional can hold only up to two (2) key positions. Welders shall also submit unexpired corresponding National Competency (NC) certificate from TESDA. Original document must be available and presented during the conduct of post-qualification. Absence of any original document is subject for disqualification.

7.0 GEOPHYSICAL LOGGING

7.1 Scope

The Contractor shall perform geophysical logging as specified in the Special Provisions.

7.2 Equipment

7.2.1 The geophysical logs may be recorded either by automatic recording on a chart strip or by manual reading of recorded values. In case the logs are recorded by the manual method, readings shall be taken per min. 1.0 m of borehole length.

7.2.2 The recorded logs shall be submitted to the Engineer immediately upon completion of logging as plots of recorded characteristics versus depth for his approval. In case of disapproval by the Engineer, the logs shall be repeated immediately.

7.3 Logs

Geophysical logging shall comprise the following logs:

a. Resistivity log (16" and 64")
b. Self-potential log (SP)

8.0 WELL CASING

8.1 Scope

The Contractor shall provide and install the well casing specified in the Contract Drawings and any temporary casing required during the work.

8.2 Casing Material

8.2.1 The Contractor shall, before commencement of the work, submit for the approval to the Engineer the following details of all casing:

a. Type of materials
b. Internal and external diameters
c. Wall thickness

d. Method of jointing

8.2.2 All permanent casing material shall be spiral welded pipe and of new stock unless otherwise specified in these documents.

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

8.3 **Temporary Casing**

The Contractor shall provide such temporary casing as may be necessary to prevent the collapse of any formation during the drilling operation to allow the well to be sunk to the specified depth and to allow the insertion of permanent lining material as required. The Contractor shall remove the temporary casing before completing the well, unless otherwise specified in these documents.

8.4 **Lining Installation**

8.4.1 Lining materials shall be assembled and located in the well at the required depth in a continuous operation. The lining material shall be set concentric within the borehole by centralizing bars unless otherwise agreed with the Engineer.

8.4.2 If the lining jams or is lost before it is set to the specified depth, the Contractor shall endeavor to remove the lining material from the well or, if unable to effect removal, shall re-drill the well and replace the lining material at his own expense.

8.5 **Lining Materials Accessories**

8.5.1 The Contractor shall provide as necessary the following accessories to set the lining materials to the required depth:

a. Centralizers to be affixed to the lining material at intervals of 12 meters to locate the lining material in the center of the drill hole;
b. Supporting clamps, equipment and tools;
c. Reducing cones and connecting piece;
d. Casing hangers;
e. All other necessary equipment.

8.5.2 Except where expressly provided, all accessories shall be deemed to be included in the Bid Form for the provision and insertion of lining material.

8.6 **Testing for Plumbness and Alignment**

8.6.1 All boreholes shall be constructed, plumb and true to line as defined herein. To demonstrate the compliance of his work with the requirement, the Contractor shall

furnish all labor, tools and equipment and shall provide the detailed drawings and the description of the tests to the satisfaction of the Engineer.

8.6.2 Tests for plumbness and alignment must be made after the complete construction of the well and before its acceptance. The Contractor, however, may make additional tests, during the performance of the work. No specific payments shall be made for making these tests.Should the results of the test for plumbness and alignment show that plumb bob of dummy fails to move freely throughout the length of the lining or borehole to a depth of the lowest anticipated pump setting and should the well vary from the vertical in excess of two thirds of the smallest inside diameter of that part of the well being tested or beyond the limitations of this test, the plumbness and alignment of the well shall be corrected by the Contractor at his own expense. Should the Contractor fail to correct such faulty alignment of plumbness, the Engineer may refuse to accept the well and the Contractor shall drill a new well without charge to the Owner.

9.0 WELL SCREENS

9.1 Scope

The Contractor shall provide and install the well screens specified in the Contract Drawings, unless otherwise specified in the Special Provisions.

9.2 Types of Screens

9.2.1 The type of screens shall be as specified in the tentative well design and the Special Provisions.

9.2.2 Slotted screens, if specified for installation, shall be so fabricated as to ensure the maximum yield of the well and to prevent clogging and encrustation and shall be free from jagged edges and irregularities that may accelerate clogging or corrosion.

9.3 Responsibility for Malfunction

9.3.1 The Contractor shall assume full responsibility for any malfunction of the screen caused by inadequate installation procedure and shall undertake any correction as approved by the Engineer at no extra cost for the Owner.

9.3.2 The screen must have no change of alignment at any of its joints after installation. If requested by the Engineer, the Contractor shall submit for approval by the Engineer the design and method of construction and installation of the screen.

9.3.3 In the event that the Contractor cannot correct a screen failure, the Contractor shall replace the screen with material complying with the specification of this Contract at no extra cost for the Owner.

9.4 Screen Strength

The screens shall have adequate strength to resist the external forces that may be applied during and after installation.

9.5 Screen Accessories

All fittings, packers, couplings, joints, plug and seals used during installation of well screen together with the installation procedure, shall be to the approval of the Engineer.

10.0 FORMATION STABILIZER/GRAVEL PACK

10.1 Scope

The Contractor shall provide and install formation stabilizer, or gravel pack if specified in the Contract Drawings and the Special Provisions.

10.2 Materials

10.2.1 The formation stabilizer/gravel pack material shall consist of well-rounded, water worn siliceous grains. Angular chippings or road stone must under no circumstances be used as formation stabilizer/gravel pack material.

10.2.2 The Contractor shall, during the mobilization period, submit it to the Engineer for his approval, samples of the formation stabilizer he proposes to use, stating the source of the formation stabilizer, quantities available, rate of delivery and any other information requested by the Engineer.

10.2.3 The physical characteristics of the filter pack shall conform to AWWA A-100-84 Section 6.3.1 to 6.3.6 or latest edition. The grading of the filter shall be determined from sieve analysis of the aquifer materials. The 85-90 percent retained size of aquifer sample having the finest grain size distribution as approved by the Engineer. The uniformity coefficient of the filter packed shall not exceed 2.50.

10.3 Method of Installation

10.3.1 The method of placing the formation stabilizer/gravel pack in the annulus shall be such that separation of the gravel and bridging is avoided.

10.3.2 The formation/stabilizer/gravel pack shall immediately upon completion of lining installation, be placed in the annulus between the borehole and the lining, in the screened section(s) of the lining, as specified in the final well design.

10.3.3 Since the borehole shall be drilled by the rotary method, installation of formation stabilizer/gravel pack shall be done by circulation of the drilling mud.

11.0 WELL DEVELOPMENT

11.1 Scope

11.1.1 The scope shall consist of deflocculation, surging with plunger and bailing, water jetting and airlifting.

11.1.2 The Contractor shall furnish compressors, surge plungers, jetting tools, electric generators, chemical and any other equipment required for satisfactory well development as directed by the Engineer.

11.1.3 Development shall, since the rotary drilling method is applied, comprise deflocculation, high velocity jetting in continuous slot screens, surging with plunger in slotted screens, unless otherwise, specified in the Special Provisions.

11.2 **Expected Yield**

The Contractor shall develop the well to its maximum expected yield, as specified in the Special Provisions.

11.3 **Surging with Plunger**

11.3.1 Upon completion of installation of lining or formation stabilizer/gravel pack, the Contractor shall develop the well by mechanical surging with a valve-type surge plunger approved by the Engineer.

11.3.2 Before start of surging and with one-hour intervals during the surging operation, the depth to the well bottom and to top of gravel pack shall be recorded.

11.3.3 Surging shall be continued until accumulation of sediments in the sump pipe, during a one hour period surging operation, is negligible.

11.4 **Deflocculation**

11.4.1 Upon completion of installation of lining or formation stabilizer/gravel pack, the drilling mud shall immediately be displaced from the well by pumping clean water into the sump pipe.

11.4.2 Mud displacement shall immediately be followed by injection and/or jetting through the screened section with polyphosphate solution to deflocculates the mud cake on the borehole wall. The concentration of the polyphosphate solution shall be 3.0 percent by weight of the quantity of water in the borehole. The well shall then be left for 12-24 hours before developing is continued, to allow the polyphosphate to react; however, if the drilling mud viscosity during drilling had been or had exceeded 40, the percentage of the polyphosphate solution shall be increased proportionately with the increase of viscosity.

11.5 **High Velocity Jetting**

11.5.1 After the deflocculation material has been allowed to work for 12-24 hours, all sections screened with continuous slot screens shall be developed by high velocity jetting.

11.5.2 The jetting tool shall be equipped with two or four nozzles. The nozzle design shall be such that it produces a concentrated jetting action. The tool shall be presented to the Engineer for approval before start of drilling operation.

11.5.3 The jetting tool shall be supplied with water through a high-pressure pump capable of producing a nozzle velocity of 40 meter per second. The pump shall be equipped with suitable pressure gauge on the discharge side to facilitate monitoring of nozzle velocity.

11.5.4 The development shall be carried out by slowly rotating the jetting tool and gradually lowering it in order to cover the entire surface of the screen.

11.5.5 At the same time as the high velocity jetting is performed, the well shall be discharged with a discharge rate slightly higher than the discharge rate from the jetting tool.

11.5.6 Each section of the screen shall be jetted until the return water is free from drilling mud, but no section shall be jetted less than 15 minutes per meter of screen.

11.6 **Airlifting**

11.6.1 The contractor shall use the "open casing or Back-blow" method.

11.6.2 The following tools and devices are needed for well development by compressed air:

a. Air compressor and tank required of size.
b. Educator pipe and airline, with means for raising and lowering each line independently of each other.
c. Flexible high pressure air hose to permit rising and lowering of the airline.
d. Quick opening valve at the outlet.
e. Pressure gauges and relief valves to safeguard against accidental overloading.

11.6.3 The air compressor shall be capable of producing 120 cfm at a pressure of 100 psi to 150 psi.

11.6.4 Minimum size of airline shall be at 4 inches diameter.

11.7 **Well Cleaning**

Upon completion of the development operations, the Contractor shall demonstrate to the satisfaction of the Engineer that the bottom of the well is clear of all sand, mud and other foreign materials.

11.8 **Freedom from Sand**

11.8.1 The Contractor shall develop the well by the methods specified until the water pumped from the well is substantially free from sand and until the turbidity is less than 5 on the Silica Scale described in the Standard Methods of Water Analysis (latest edition as published by AWWA, APHA and WPCT).

11.8.2 The water pumped from the well shall not contain an amount of fine material in excess of 1.0 mg per liter when the well is pumped at its maximum expected yield. The Contractor shall furnish the equipment for measurement of the sand content.

12.0 **DOWN THE HOLE CAMERA LOGGING**

After the well development, the contractor shall perform down-the-hole camera to ensure that the well is clear of any mud, bentonite and other materials for the satisfaction of the owner.

Any problem that may occur, the contractor shall repeat the well rehabilitation at contractor's expense.

13.0 ACCEPTANCE OF DEVELOPMENT

13.1 The development by the specified methods shall be repeated and continued until the well is thoroughly developed in accordance with the criteria specified.

13.2 If the well yield after the well has been confirmed sand-free is still below the yield, which is considered acceptable for the penetrated aquifer, then the Engineer may instruct the Contractor to perform further development.

14.0 WELL TESTING

14.1 Scope

The Contractor shall provide all personnel and labor, instrumentation and water level indicators and operate a pumping Unit for the following purposes:

a. Step-drawdown pumping tests on the completed well in accordance with the standard methods or as directed by the Engineer.
b. Constant discharge pumping test on the completed well in accordance with the standard methods or as directed by the Engineer.

14.2 Equipment Capacity

14.2.1 The Contractor shall provide and operate pumping machinery capable of carrying out the specified pumping and shall provide adequate controls to allow discharge rates to be kept constant at varying pumping water levels and to permit pumping with a variation of not more than 5% of the designated discharge rate during any period of yield or aquifer testing.

14.2.2 The pumping Unit set shall be able to deliver a minimum discharge rate of **70lpsat maximum pump setting of 80 meters** or as directed by the Engineer.

14.3 Equipment Operation

14.3.1 The Contractor shall supply and operate all equipment and accessories necessary for installation and removal of pumps.

14.3.2 The Contractor shall maintain on site sufficient fuels, lubricants, spares and other accessories needed to run the pumping unit for whatever period may be specified by the Engineer.

14.3.3 The Contractor shall provide sufficient competent personnel including a qualified fitter and electrician, as may be necessary to install and operate the Pumping Unit.

14.4 Control of Discharge Rate

The Contractor shall, during the pumping tests, provide a suitable gate valve on the discharge pipeline to facilitate easy control of the discharge rate.

14.5 Water Level Sounding Pipe

14.5.1 The Contractor shall provide and install a temporary tube of at least one (1) inches diameter from the top of the well to 2 m above the pump bowl assembly to facilitate easy measurements of water level. The tube shall be open only at the bottom and top.

14.5.2 Payments for providing, installing and removing the tube shall be deemed to be included in the rates given for pumping tests.

14.6 **Discharge Rate Monitoring**

Discharge rates shall be measured usingPiezometer and manually recorded.

14.7 **Definition of "Pumping Unit"**

The equipment specified in Clause 8.2-8.6 is referred to as the Pumping Unit.

14.8 **Pumping Procedure**

The Resident Engineer will determine the pumping procedure necessary to obtain the objectives of this Contract.

14.9 **Suspension of Pumping**

If the ResidentEngineer considers that the absence or condition of any equipment, personnel, fuel, lubricants or accessories will prejudice the quality of data obtained from any pumping test, he may suspend the work in accordance with the provisions of the conditions of Contract.

14.10 **Equipment Breakdown during Pumping**

14.10.1 The pumping must be continuous and at a constant rate during the pumping tests. The Engineer will instruct the Contractor as to the expected maximum duration of each pumping test before start to each test.

14.10.2 If pumping is interrupted or the discharge rate fluctuates by more than 5% of the designated discharge rate, the test may be repeated after a period of recovery determined by the Engineer.

14.10.3 In any pumping test is interrupted because of equipment breakdown or inadequate supervision or discharge control, no payments will be made for any pumping period before recommencing the test.

14.11 **Duration of Tests**

14.11.1 The step drawdown pumping tests shall be performed on 5 steps with duration of 1 hour each.

14.11.2 The constant discharge pumping tests shall be performed for a period of Three (3) days or 72 hours, unless otherwise specified in the special provisions or unless otherwise instructed by the Engineer.

14.12 **Temporary Pipeline**

The Contractor shall provide a temporary pipeline as directed by the Engineer for the discharge from pumping tests and for clearance to a suitable watercourse or drain.Under certain circumstances when re-infiltration cannot be avoided or it is costly to provide for this condition, the Engineer shall decide to what distance from the well water may be discharge on the ground.

15.0 CEMENT GROUTING

15.1 Scope

The Contractor shall, unless otherwise specified in the special provisions, provide the cement and mixing equipment required for the mixing of the grouting indicated in the Tentative Well Design and shall place the cement grout as specified.

15.2 Grouting Material

Cement grout shall consist of a mixture of 95 % Portland Cement, 5% Bentonite, Sand and clean water, mixed in the proportion of 52.50 kilogram of Portland Cement/Bentonite to maximum 30 liters of water. All cement shall, unless otherwise specified in the Contract Documents, conform to the "Specifications for Portland Cement" *(ASTM C150 latest revision).*

15.3 Method of Placing Grout Material

The method for placing the grout from the bottom of the casing/hole/annulus to be grouted, to the surface shall be to the approval of the Engineer. Flushing of the annular space with fluid to assure the space is open and to remove loose material will be required by the contractor before grouting is commenced. Any grouting operation shall be continuous and before starting, sufficient grout shall be mixed to complete the whole operation. During the grouting operation, the mixed grout shall be continuously stirred. The Contractor shall provide such tanks, hoppers and other equipment as may be necessary to meet these requirements.

15.4 Setting Time

No work will be allowed on the well within a period after completion of grouting unless quick setting cement is used. In such case, the idle period may be reduced subject to the Engineer's prior approval.

16.0 WELL COMPLETION

16.1 Scope

The Contractor shall provide and operate all equipment necessary to restore the site as near as possible to its condition before commencement of drilling and shall furnish and install a well head cap as specified in the Contract Drawings.

16.2 Site Restoration

The site shall be restored to a condition as neatly possible to that, which existed before the well drilling and testing activities commenced. This work shall include, but not limited to restoration of fences and structures, removal of drill cuttings, leveling of the disturbed ground surfaces and replacement or compensation for the destroyed plants and landscaping.

16.3 Well Head Capping

The well head shall be completed with a well head assembly fully welded to the upper casing as well as a water level sounding tube with screw cap in order to prevent any unauthorized tampering of the well.

17.0 SUBMITTAL OF REPORTS AND BOREHOLE DATA

17.1 The Contractor shall submit to the Engineer daily records in duplicate containing the following information:

a. Site
b. Date
c. Description of each stratum encountered
d. Depth below ground of each change of stratum
e. Depths and details of all disturbed samples.

17.2 The Contractor will be required to keep a record of penetration rate, mud losses and mud conditions.

17.3 At the end of the well construction and before final payments is made, the Contractor shall submit to the Engineer a report containing the following information:

a. Total depth of the well
b. Description of the strata encountered
c. The sizes and the lengths/specifications of the casing installed
d. The date of the start and the completion of the well construction
e. The locations and the description of the casing perforations or the well screen placement.
f. The locations of the gravel, the size of gravel, if applicable, and the amount of cement grout installed.
g. Records of discharge rates and drawdown during well development together with description of the methods of development.
h. The well yield (expressed as discharge rate and drawdown), the dates and the duration of the test(s)
i. The methods of measuring the discharge rate and the drawdown.

17.4 The cost of records shall be deemed to be included in the contract rates.

18.0 DRAWINGS

18.1 INTENT OF SPECIFICATIONS AND DRAWINGS

18.1.1 The intent of the Specifications and Drawings is that the Contractor shall furnish all the required plant, labor, materials, equipment and services, unless otherwise specifically provided.

18.1.2 The Specifications and Drawings are complementary and what is called for in one shall be as binding as if called for in both.

18.1.3 Any discrepancies, errors or omissions found in the Specifications of Drawings shall be reported in writing within ten (10) days from discovery to the Engineer who will issue the correction in writing within the same period. The Contractor shall not take advantage of any such discrepancies, errors or omissions, but shall comply with any corrective measures regarding the same prescribed by the Engineer.

18.1.4 In case of conflict between the Specifications and the Drawings, the Specifications shall govern over the Drawings. In case of conflict between the General Conditions and the special Provisions and the Technical Specifications of the Specifications, the Special Provisions and the Technical Specifications shall govern over the General Conditions. In case of conflict between the Special Provisions and Technical Specifications of the Specifications, the Special Provisions shall govern over the technical Specifications. In case conflict between the contract agreement and the General Conditions, the **Contract Agreement** shall govern over the General Conditions.

18.2 SHOP DRAWINGS

18.2.1 Whenever called for in these Specifications or in the drawings, or where required by the Engineer, the Contractor shall furnish the Owner for review three (3) prints of each shop drawing. The term "shop drawing" as used herein shall be understood to include detail design calculations, fabrications and installation drawings, lists, graphs, operating instructions, etc. Shop drawings shall be submitted to the Owner for review/approval within fifteen (15) days from receipt of the Notice of Award, unless otherwise extended in writing by the Owner.

18.2.2 All shop drawing submittals shall be accompanied by a transmittal form using the format bound with the Contract Documents, if one is included. Any shop drawing submittal not accompanied by such a form, or where all applicable items on the form are not completed, will be returned for re-submittal. The Contractor may authorize a materials or equipment supplier to deal directly with the Owner with regard to shop drawings, however, ultimate responsibility for the accuracy and completeness of the information contained in the submittal shall remain with the Contractor.

18.2.3 `A separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of shop drawings on various items using a single "package" or are so functionally related that expediency indicates review of the group or package as a whole. At his option, the Contractor or Supplier may obtain from the Owner quantities of the shop drawing transmittal form at reproduction cost.

18.2.4 Within five (5) calendar days after receipt of said prints, the Owner will return prints of each drawing to the contractor with his comments noted thereon. Whenever a re-submittal is required, the Contractor shall make a complete and acceptable submittal to the Owner within ten (10) days from receipt of the returned shop drawings. Non-compliance hereof will give rise to the Owner's right to either (a) cancel the award; or (b) withhold the money due the Contractor to cover additional costs of the Engineer's review beyond the second submission. Such failure may be considered a factor against the contractor's competence in future biddings to be conducted by the Owner.

18.2.5 If three (3) prints of the drawings are returned to the contractor marked "NO EXCEPTIONS TAKEN", formal revision of said drawings will not be required.

18.2.6 If three (3) prints of the drawings are returned to the Contractor marked "MAKE CORRECTIONS NOTED", formal revision of said drawings will not be required.

18.2.7 If one (1) print of the drawings is returned to the Contractor marked "AMEND-RESUBMIT", the Contractor shall revise the said drawing and shall resubmit eight (8) copies of said revised drawing to the Owner.

18.2.8 If one (1) print of the drawings is returned to the Contractor marked "REJECTED-RESUBMIT", the Contractor shall revised the said drawings and shall resubmit eight (8) copies of said revised drawing to the Owner.

18.2.9 Fabrication of an item shall not be commenced before the Owner has reviewed/examined the pertinent shop drawings and returned copies to the Supplier marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED". Revisions indicated on shop drawings shall be considered as changes necessary to meet the requirements of the Contract Drawings and Specifications and shall not be taken as the basis of claims for extra work.

18.2.10 The Contractor shall have no claim for damages or extension of time due to any delay resulting from the Contractor having to make required revisions to shop drawings (unless reviewed by the Owner of said drawings is delayed beyond a reasonable period of time and unless the Contractor can establish that the Owner's delay in review actually resulted in a delay in the Contractor's Construction Schedule). The review of said drawings by the Owner will be limited to checking for general agreement with the specifications and drawings, and shall in no way relieve the Contractor of the responsibility for errors or omissions contained therein nor shall review operate to waive or modify any provision contained in Specifications or Contract Drawings. Fabricating Dimensions, quantities of material, applicable code requirements shall be the Contractor's responsibility.

19.0 REFERENCE TO STANDARDS OR PUBLICATIONS

Any reference in the Specifications or Drawings to any specification, standard or publication of any organization shall, in the absence of a specific designation to the contrary, be understood to refer to the latest edition of the specification, standard or publication in effect as of the date of advertising the work. Internationally accepted standards equal to or better than specified standards or specifications are acceptable.

20.0 REFERENCE TO PROPRIETARY PRODUCTS

Where references to proprietary products appear in the specifications or drawings, it is for the purpose of establishing an acceptable standard of quality or design but no guarantee is given that said referenced manufacturer's products will meet all contract requirements without modifications. Unless a substitute is expressly prohibited, the Contractor may request approval of a substitute for any such proprietary product. Such request must be in writing and must include descriptive literature, specifications, test reports of samples, as appropriate, to enable the Owner to determine the acceptability of the product proposed for substitution. No substitute product shall be used in the work until written approval has been received from the Owner. All costs involved in making laboratory tests of the samples submitted as substitute for the specified materials shall be borne by the Contractor.

21.0 SPECIFICATIONS AND DRAWINGS FURNISHED TO CONTRACTOR

The Owner will furnish the Contractor with two (2) sets of specifications together with reduced drawings (if any) and two (2) sets full-scale Drawings. Additional quantities of Specifications and Drawings will be furnished at reproduction cost.

22.0 AS BUILT DRAWINGS

The Contractor shall maintain at least one (1) set of blueprints/plansof all works at the job site. These prints shall be marked and updated to indicate current job progress and shall show deviations from the construction drawings. After final inspection, the Contractor shall transfer all as-built information to a set of reproducible tracings that shall be delivered to the Engineer prior to acceptance of the project.

23.0 GENERAL PROVISIONS

23.1 Water Level Sounding

The Contractor shall provide a functioning and accurate water sounding instrument acceptable to the Engineer to measure the water level during the drilling, development and testing of the well. Failure to provide such will subject the Contractor to a penalty of **P1000.00** per day from the date of the notice issued by the Engineer until said instrument has been completed and shall be deducted from the monthly billing.

23.2 Well Drilling Equipment

The Contractor shall provide and operate either one (1) mud or air rotary drilling rig and includes all auxiliary equipment necessary to complete the work within the contract period.

All equipment required for the completion of the project is subject for inspection/evaluation during post qualification.

List of equipment must be included in the submitted bidding documents.

23.3 Drilling Method

The drilling shall be performed with either mud or air rotary method.

23.4 Geophysical Logging

The work includes geophysical logging. Geophysical logging shall be done from ground surface down to 180 meters depth.

23.5 Well Casing Materials

All permanent casings to be installed shall be 400mmØ(16")spiral welded steel casing with minimum thickness of 9mm as shown in the preliminary well design and should be of new stock.

23.6 Type of Screen

The screens shall bestainless steel continuous slot wedge wirewound with slot size 1.5mm (slot 60), 3 meters length per piece and of new stock. Photocopies of receipts of purchase duly certified shall be submitted to the Engineer as proof of purchase.

23.7 Well Casing Installation

The well casing shall be installed at a depth of 180 meters. In the event that the well casing is not properly installed in the desired depth, the owner shall not accept the installation and shall require the Contractor to perform necessary correction.

23.8 **Expected Yield**

The production well is expected to yield 70 liters per second.

23.9 **Well Design**

Well Depth and final well design will depend on the actual results of the Geophysical Logging. Payment will be based on the actual works performed particularly on the length of casings and screens installed.

23.10 **Test Pumping**

Prior to the pumping test, the contractor shall excavate the necessary drainage canal in preparation for 72 Hours testing. Excavated materials resulting from canal construction should be placed and restored properly to the satisfaction of the engineer.

23.11 **Cement Grouting**

No Special Provisions.

23.12 **Project Signboard**

The Contractor shall furnish, erect and maintain One (1) project tarpaulin signboard 4ft x 8ft in size. The location for the erection of this sign by the Contractor shall be as directed by the Engineer.

23.13 **Water Quality Testing**

Water quality testing such as Bacteriological Testing, Physical and Chemical analysis, Pesticide and Heavy Metal Testing shall be conducted by accredited laboratory. All expenses shall be covered by the contractor.

23.14 **CONTRACTOR'S PERFORMANCE**

Liquidated Damage shall apply if the Contractor fails to meet the project completion date as per RA 9184. However; if the Contractor incurred more than 15% negative slippage upon the expiration of contract, a suspension will be imposed to the Contractor together with the Liquidated Damages.

23.15 **Contractor's Superintendence**

A qualified superintendent shall be present in the work and shall provide competent supervision of the work, until its completion. The superintendent shall have full authority to act in behalf of the contractor, and all directions given by the Owner to the superintendent shall be considered given to the contractor.

23.16 **Inspection and Testing**

All Materials furnished and all work performed under the Contract shall be subject to inspection by the Owner. The Contractor shall be held strictly to the true intent of the Specifications and Drawing in regard to quality of materials, workmanship and diligent execution of the Contract. Work done in the absence of prescribed inspection may be required to be removed and replaced under the proper inspection; and the entire cost of

removal and replacement, including the cost of all materials which may be used in the work shall be borne by the Contractor. The cost of carrying out the normal inspection and testing for materials should be at the Contractor's expense.

23.17 **Plans and Specifications**

All works that may be called for, in the specifications and not shown on the plans or vice versa shall be executed and finished as if described in both. Also, should any work required which is not denoted on either plans and specifications either directly or indirectly out of the intent thereof, it is understood that same shall be implied and required and shall be performed and furnished such materials and layout as if it has been so described. The plans and specifications shall be considered complementary and any details mentioned in one but not in the other, or vice versa, shall be interpreted to be applicable in both. If no numerical label of the dimension(s) of any part of details appeared on plan, the drawings shall be carefully followed in accordance to the scale thus indicated, otherwise all numerical data of dimensions of details when so provided must be followed and not the scale of the drawing.

24.0 **Preliminary Site Inspection**

The Contractor shall conduct an ocular inspection of the site in order to be familiar of the location and shall provide certificate of visit duly signed by the representative.

The Contractor must submit **Certificate of Site Inspection** upon submission of bid proposal.

25.0**Contract Duration**

The Contractor shall perform all scope of works within the period of One Hundred Twenty (120) Calendar days. Liquidated Damages (LD) shall be imposed for each day of delay as provided by the IRR of RA 9184.

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