



*Republic of the Philippines*

**ZAMBOANGA CITY WATER DISTRICT**

*Pilar Street, Zamboanga City*

## TECHNICAL SPECIFICATIONS

FOR THE

PROPOSED DEEP WELL  
EXPLORATION, TESTING, AND  
DEVELOPMENT AT MERCEDES

**TECHNICAL SERVICES GROUP  
ENGINEERING & CONSTRUCTION DEPARTMENT  
DESIGN DIVISION**

VERSION 2  
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## Table of Contents

<b>1 INTRODUCTION</b>	1
<b>1.1 BACKGROUND</b>	1
<b>2 GENERAL BIDDING REQUIREMENTS</b>	2
<b>3 GENERAL SPECIFICATIONS</b>	3
<b>4 TECHNICAL SPECIFICATIONS</b>	6
<b>4.1 GENERAL</b>	6
<b>4.1.1 Technical Definition</b>	6
<b>4.1.2 Technical Standards</b>	7
<b>4.1.3 Water Supply and Illumination</b>	7
<b>4.1.4 Electrical Power Supply</b>	7
<b>4.1.5 Storage of Inflammables</b>	7
<b>4.1.6 Boundaries of Work</b>	7
<b>4.1.7 Access Roads</b>	8
<b>4.1.8 Protection of Site</b>	8
<b>4.1.9 Site to be Kept Tidy</b>	8
<b>4.1.10 Shop Drawings</b>	8
<b>4.1.11 Well Head Protection</b>	9
<b>4.1.12 Water Level Sounding</b>	9
<b>4.1.13 Transport Personnel and Equipment</b>	9
<b>4.1.14 Site Preparation and Reinstatement</b>	9
<b>4.2 WELL DRILLING</b>	10
<b>4.2.1 Scope</b>	10
<b>4.2.2 Equipment</b>	10
<b>4.2.3 Drilling Method</b>	10
<b>4.2.4 Pilot Borehole Drilling</b>	11
<b>4.2.5 Strata Sampling / Material Testing</b>	11
<b>4.2.6 Drilling Mud</b>	12
<b>4.2.7 Working Hours</b>	13
<b>4.3 GEOPHYSICAL LOGGING</b>	13
<b>4.3.1 Scope</b>	13
<b>4.3.2 Equipment</b>	13
<b>4.3.3 Logs</b>	14



4.3.4	Final Well Design .....	14
4.4	<b>WELL CASING</b> .....	14
4.4.1	Scope .....	14
4.4.2	Casing Material .....	14
4.4.3	Temporary Casing .....	15
4.4.4	Lining Installation .....	15
4.4.5	Lining Material Accessories .....	15
4.4.6	Testing for Plumbness and Alignment .....	16
4.5	<b>WELL SCREENS</b> .....	16
4.5.1	Scope .....	16
4.5.2	Type of Screens .....	16
4.5.3	Responsibility for Malfunction .....	17
4.5.4	Screen Strength .....	17
4.5.5	Screen Accessories .....	17
4.6	<b>FORMATION STABILIZER/GRAVEL PACK</b> .....	18
4.6.1	Scope .....	18
4.6.2	Material .....	18
4.6.3	Method of Installation .....	18
4.7	<b>WELL DEVELOPMENT</b> .....	18
4.7.1	Scope .....	18
4.7.2	Expected Yield .....	19
4.7.3	Surging with Plunger .....	19
4.7.4	Deflocculation .....	19
4.7.5	High Velocity Jetting .....	19
4.7.6	Well Cleaning .....	20
4.7.7	Freedom from Sand .....	20
4.7.8	Acceptance and Development .....	21
4.7.9	Water Pump Motor .....	21
4.7.10	Stick up Pipe .....	22
4.8	<b>WELL TESTING</b> .....	22
4.8.1	Scope .....	22
4.8.2	Water Quality Test .....	23
4.8.3	Equipment Capacity .....	24
4.8.4	Equipment Operation .....	24
4.8.5	Control of Discharge Rate .....	25



<b>4.8.6</b>	<b>Water Level Sounding Pipe</b> .....	25
<b>4.8.7</b>	<b>Discharge Rate Monitoring</b> .....	25
<b>4.8.8</b>	<b>Definition of "Pumping Unit"</b> .....	25
<b>4.8.9</b>	<b>Pumping Procedure</b> .....	25
<b>4.8.10</b>	<b>Suspension of Pumping</b> .....	25
<b>4.8.11</b>	<b>Equipment Breakdown during Pumping</b> .....	26
<b>4.8.12</b>	<b>Duration of Tests</b> .....	26
<b>4.8.13</b>	<b>Temporary Pipeline</b> .....	26
<b>4.9</b>	<b>CEMENT GROUTING</b> .....	27
<b>4.9.1</b>	<b>Scope</b> .....	27
<b>4.9.2</b>	<b>Grouting Materials</b> .....	27
<b>4.9.3</b>	<b>Method of Placing Grout Material</b> .....	27
<b>4.9.4</b>	<b>Setting Time</b> .....	27
<b>4.10</b>	<b>WELL COMPLETION</b> .....	28
<b>4.10.1</b>	<b>Scope</b> .....	28
<b>4.10.2</b>	<b>Site Restoration</b> .....	28
<b>4.10.3</b>	<b>Final Well Inspection</b> .....	28
<b>4.10.4</b>	<b>Well Head Capping</b> .....	28
<b>4.11</b>	<b>SUBMITTAL OF REPORTS AND BOREHOLE DATA</b> .....	29
<b>4.12</b>	<b>SPECIAL PROVISIONS</b> .....	30
<b>4.12.1</b>	<b>MOBILIZATION AND DEMOBOLIZATION</b> .....	30
<b>4.12.2</b>	<b>TEMPORARY SITE FACILITY</b> .....	30
<b>4.12.3</b>	<b>LOGBOOK</b> .....	31
<b>4.12.4</b>	<b>CONSTRUCTION CRITICAL PATH METHOD (CPM)</b> .....	31
<b>4.12.5</b>	<b>WORKMEN'S IDENTIFICATION BADGES AND SAFETY GEARS</b> .....	32
<b>4.12.6</b>	<b>WORKING/CALENDAR DAYS</b> .....	32
<b>4.12.7</b>	<b>INSPECTION OF THE WORK SITE</b> .....	32
<b>4.13</b>	<b>MATERIALS AND WORKMANSHIP</b> .....	32
<b>4.13.1</b>	<b>Safeguarding of Equipment, Materials and Work</b> .....	32
<b>4.13.2</b>	<b>New Materials and Equipment</b> .....	32
<b>4.13.3</b>	<b>Title to Materials Found on the Work</b> .....	32
<b>4.13.4</b>	<b>Defective Equipment, Materials or Work</b> .....	33
<b>4.13.5</b>	<b>Rubbish Control</b> .....	33
<b>4.13.6</b>	<b>Dust Control</b> .....	33
<b>4.13.7</b>	<b>Cleaning Up</b> .....	34



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4.13.8	Character of Workmen .....	34
<b>5</b>	<b>PREPARATION OF ESTIMATES / FINANCIAL BID .....</b>	<b>35</b>
<b>5.1</b>	<b>DIRECT COST .....</b>	<b>35</b>
5.1.1	Cost of Materials .....	35
5.1.2	Cost of Labor .....	35
5.1.3	Equipment Expenses.....	35
<b>5.2</b>	<b>INDIRECT COST .....</b>	<b>36</b>
5.2.1	Overhead Expenses.....	36
5.2.2	Contingencies.....	36
5.2.3	Miscellaneous Expenses .....	37
5.2.4	Contractor's Profit Margin .....	37
5.2.5	Value Added Tax (VAT) Component.....	37
5.2.6	OCM and Profit Mark-Up .....	37
<b>6</b>	<b>BILL OF QUANTITIES .....</b>	<b>38</b>
<b>7</b>	<b>SIGNATORIES .....</b>	<b>39</b>



# **1 INTRODUCTION**

## **1.1 BACKGROUND**

As of April 2024, the El Niño has already persisted in Zamboanga City which affects the water supply level and resulted to water rationing throughout the ZCWD service area. Although water conservation and water rationing are one of the actions needed to be taken to mitigate the effects of the El Nino, however, it is still imperative to develop an additional water source as water security that can withstand even during the worst effect of El Niño.

The Technical Services Group through the management conceptualizes the project of development of deep well at ZCWD lot located at Brgy. Mercedes which can serve the barangay Mercedes (should they opt to transfer to ZCWD in the future) and barangay Zambwood. Hence, a board resolution number 45 Series of 2024, was approved on March 27, 2024, a resolution approving a supplemental budget appropriation amounting to Php3,963,742.44 for the well development at barangay Mercedes and Tetuan.

This project to bid is comprising of the exploration, testing and development of one deep well at Barangay Mercedes. Barangay Mercedes is located on the east coast with 13.8 kilometers away from the Zamboanga City Hall. Its population as determined by the 2020 Census was 22,321. This represented 2.28% of the total population of Zamboanga City. It is expected that this barangay will further develop due to the proposed Zamboanga City International Airport thereat. Hence, water demand is expected to increase in the area. With this, the proposed deep well development will serve those water demand in the future and this will also augment the existing water supply at Barangay Zambowood that is presently insufficient in water supply.

The viability of the project was determined with the geo-resistivity survey data that the water-bearing zone or the aquifer development of groundwater source is likely recommended from 77.4 meters up to 90 meters at Barangay. A preliminary well design was prepared with the expectation of tapping the most productive zones in the area.



## **2 GENERAL BIDDING REQUIREMENTS**

- 2.1 All eligibility documents shall conform to the requirements stipulated in the Updated Revised Implementing Rules and Regulation of Republic Act 9184.
- 2.2 Statement of the bidder's Single Largest Completed Contract (SLCC) similar to the contract to be bid shall refer to deep well exploration, testing and development regardless of depth and borehole size as long as the SLCC is not less than 50% of the ABC.
- 2.3 For single contractor, PCAB LICENSE shall be in compliance with the DTI PCAB Categorization Table, Board Resolution No. 201 Series of 2017. For this project, the PCAB License shall be SP-WD (Well-Drilling Work) Classification with Size Range Small B.
- 2.5 The Bidder shall not be allowed to subcontract any portions of the Project.
- 2.6 The contractor cannot proceed with the next work item unless they can present that the materials to be used indeed passed the requirements/specifications, in which case, the project engineer has the right to demand from the contractor, otherwise, the project engineer may order the stoppage of the work portion where the construction materials did not pass the specifications while the period to complete the project shall continue to run.
- 2.7 All Items of Works as enumerated in the Bill of Quantities shall include all the necessary equipment, manpower and materials to complete the said items of works; and this shall be considered and anticipated by the Contractor in their financial bid offer. Hence, any additional equipment, manpower and/or materials which will be needed during the implementation, in order to complete the Items of Works, shall be at the expenses of the contractor.
- 2.8 The Bill of Quantities (BOQ) prevails in all issues relating to pay items of work. The contractor shall supply the needed materials, equipment/tools & manpower to complete the quantity stated in the BOQ with specifications as stated herein. For deficiency in the contractor's detailed estimate, the contractor shall bear the expenses for the deficiency made in the detailed estimates (materials, manpower or equipment) to complete the quantity stated in the BOQ.
- 2.9 The Minimum Manpower and Equipment Requirement for this project shall refer to the Philippine Bidding Documents.



### 3 GENERAL SPECIFICATIONS

- 3.1 The ZCWD Technical Services Group will locate the final location of borehole.
- 3.2 Any equipment breakdown or damaged during the implementation of the project shall subject to immediate replacement at the cost of the contractor as this will not toll the running of the period to complete the works called for under this Technical Specifications. Delays will be subjected to liquidated damages provided in Section 68 and Annex E of the Updated Revised IRR of RA 9184.
- Advance payment, progress billing, imposing of liquidated damages, and suspension of work shall be in accordance with Annex "E" of the IRR of RA 9184. Payment/progress billing shall be based only on the actual work accomplished in the bill of quantities. Unimplemented or unperformed items of work or quantity in the BOQ shall be subject to deductions.
- 3.3 The Procuring Entity has the authority to suspend the work wholly or partly by written order for such period as may be deemed necessary due to the following:
- 3.3.1 Force majeure or any fortuitous event;
- 3.3.2 Failed on the part of the contractor to:
- Correct bad conditions which are unsafe for worker or for the general public;
  - Carry out valid orders given by the Procuring Entity;
  - Perform any provisions of the contract; or
  - Adjustment of plans to suit field conditions as found necessary during construction.
- 3.4 The contractor shall furnish As-Built Plan as part of the requirement for issuance of Completion Certificate and Final Billing payment. Submission of the project as built layout is likewise a requirement for project that has stopped implementation due to arbitration or court litigation or the contract for the project has been terminated.
- 3.5 The contractor's site engineer shall prepare and submit a daily report reflecting the following information with concurrence of this Office Project In-Charge:
- Weather condition
  - Activities for the day reflecting all the detail of the actual works performed. (It shall show the plan vs. actual)
  - Breakdown of utilized equipment
  - Breakdown of manpower
  - Materials utilized and delivered on site
  - Any other details relevant to the executed activities.





- 3.6 In cases where the delay reaches 5% of the planned activities, the contractor shall submit a CATCH-UP PLAN the following day reckoned from the date of the delay incurred. The "catch-up plan" shall cover the left-behind activities of the preceding week and the remaining works.
- 3.7 The procurement and payment of permits and licenses necessary for the project implementation shall be the responsibility of the Contractor. ZCWD shall provide assistance whenever necessary. The expense for the permits and ECC shall be included & chargeable to in the OCM, hence shall not be a separate pay item.
- 3.8 Permit and other documents required in this procurement
  - 3.8.1 Permit to drill from NWRB - The contractor shall process this permit once they have received the Notice to Proceed. Drilling activity shall not commence until the said permit is approved. Also, this shall be a requisite for the advance payment of 15%;
  - 3.8.2 Other documents that may be required by existing laws and the Procuring Entity concerned in the bidding documents.
- 3.9 The Contractor must have a duly registered well driller with updated Well Driller Certificate of Registration issued by National Water Resource Board (NWRB) who will undertake the drilling as it is a requirement in the processing of the necessary permit/s to drill issued by the NWRB. For Well Drilling, all applications involving extraction of groundwater shall include the name of a duly registered well driller who will undertake the drilling.
- 3.10 Deployment of labor and equipment shall only be done upon issuance of the Permit to Drill. Works and activities that do not need permits can commence simultaneously.
- 3.11 The affected barangays and stakeholders must all be well-informed and documented through writing as to the definite date of TAKE-OFF.
- 3.12 Temporary facilities include the construction of site facilities and other necessary components to complete the job. The detail for temporary facilities is reflected in the detailed engineering plan. However, the contractor may construct larger temporary facilities than what is reflected in the plan should deemed necessary without additional cost to the ZCWD.
- 3.13 The contractor shall process and seek the approval from the Department of Labor and Employment (DOLE) for the Construction Safety and Health Program for this project and shall implement the Construction Safety and Health Program in compliance with DOLE D.O. No. 13, Series of 1998. This item shall include the provision of the Safety Officers, the provision of warning devices, safety and warning signage, barricades, first aid kit and personal protective equipment (PPE) for the workers.



- 3.14 Regardless of project suspension and any impediments, the contractor shall maintain the safety measures and cleanliness at any of the working areas of the project.
- 3.15 This item of work includes the construction of one (1) set project signage/ billboard by the contractor, placed on-site in accordance with the guidelines as specified in COA Circular No. 2013-044 dated Jan. 30, 2013. The frame for bill boards may be made from coco lumber or any lumber as long as the same shall stand for the entire duration of project implementation. The exact location for the installation shall be determined by ZCWD engineer project in-charge. For infrastructure projects, a tarpaulin project signboard must be suitably framed for outdoor display at the project location, and shall be posted as soon as the award has been made. The design and format of the project signboard tarpaulin, as shown in Annex "A" of the said COA Circular shall have the following specifications:

Annex "A"

Name of Agency  
Business Address

Project: \_\_\_\_\_ Cost: \_\_\_\_\_  
 Location: \_\_\_\_\_ Fund Source/s: \_\_\_\_\_

Implementing Agency/ies: \_\_\_\_\_  
 Development Partner/s: \_\_\_\_\_  
 Contractor/Supplier: \_\_\_\_\_  
 Brief Description of Project: \_\_\_\_\_

Project Details:

Duration	Project Date		Percentage of Completion	Project Status			Remarks
	Started	Target Date of Completion		As of (Date)	Cost Incurred to Date	Date Completed	

For particulars or complaints about this project, please contact the Regional Office or Cluster which has audit jurisdiction on this project:

COA Regional Office No./Cluster: \_\_\_\_\_  
 Address : \_\_\_\_\_  
 Contact No. : \_\_\_\_\_ or Text COA Citizen's Desk at 0915-5391957

Tarpaulin, white, 8ft x 8ft;  
 Resolution: 70dpi  
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 Font Size: Main Information – 3"  
 Sub-Information- 1"  
 Font Color: Black



## 4 TECHNICAL SPECIFICATIONS

### 4.1 GENERAL

#### 4.1.1 Technical Definition

The following definitions shall apply:

- a. Borehole means any drilled section of boring before completion as defined in well below.
- b. Casing means unslotted or non-perforated lining tubes.
- c. Development Equipment means high velocity jetting tool, surge plunger and all other equipment needed to develop the well.
- d. Diameters mean nominal diameters unless otherwise stated.
- e. Drilling Rig means drilling equipment and the auxiliary equipment for its operation.
- f. Drilling Unit as defined as Equipment.
- g. Final Well Design means the drawing and description prepared by the Contractor's Engineer upon completion of the drilling of the pilot hole and geophysical borehole logging specifying the final well construction.
- h. Lining Materials means any casing, screen, slotted lining or perforated lining tube whether permanently or temporarily installed in the borehole.
- i. Pumping Unit is the equipment used in the operation of the drilling activities, used in control of discharge rate, water level sounding pipe and discharge rate monitoring.
- j. Screens mean continuous wire wound stainless or low carbon steel screens, or slotted or perforated lining tube.
- k. Tentative Well Design means the contract drawing showing the estimated quantities of the work.
- l. Well - means any completed hole in which all lining material has been set, all grouting completed and all temporary lining removed.



## **4.1.2 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 ZCWD.

## **4.1.3 Water Supply and Illumination**

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 and illumination sufficient for drilling operations.

## **4.1.4 Electrical Power Supply**

- a. The Contractor will make arrangements as may be necessary for the connection of or supply of power to site.
- b. Payment for the provision of electrical power supplies shall be deemed to be included in the rates entered in the tendered price for setting up equipment at the site, drilling rates and rates entered for operation of pumping unit.

## **4.1.5 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 on the site, and shall ensure that adequate precautions are taken against fire.

## **4.1.6 Boundaries of Work**

The ZCWD shall provide 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 ZCWD without the written consent of the ZCWD of such property. Other employees of the ZCWD 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.



#### **4.1.7 Access Roads**

The project site at barangay Mercedes has already an access road. Further improvement of the access road to the well, may be done by the Contractor at his own cost. The access road shall be kept in proper condition during the entire construction period.

#### **4.1.8 Protection of Site**

- a. Except as otherwise provided herein, the Contractor shall protect all structures, walks, pipelines, trees, shrubberies, lawns, etc., during the progress of their 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 Zamboanga City Water District.
- b. Water pumped from the well shall be disposed to a place approved by the ZCWD where it will be possible to dispose the water without damage to property or creation of a nuisance.

#### **4.1.9 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.

#### **4.1.10 Shop Drawings**

- a. The Contractor shall, if requested by the ZCWD prior to start of each operation, produce for the ZCWD'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 ZCWD.
- b. Requested shop drawings shall be completed with respect to dimensions, design criteria, materials, methods of construction and the like to enable the ZCWD to review the information as required.



#### **4.1.11 Well Head Protection**

- a. 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 they shall provide and install a well head cap satisfactory to the ZCWD.
- b. 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, the contractor shall at its own expense perform such work or supply casings, seals, sterilizing agents or other materials as may be necessary to eliminate the contamination or to exclude any undesirable water in the well.

#### **4.1.12 Water Level Sounding**

The Contractor shall provide a functioning and accurate water sounding instrument acceptable to the ZCWD 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 PhP1,000.00 per day from the date of the notice issued by the ZCWD until said instrument has been completed and shall be deducted from the monthly billing.

#### **4.1.13 Transport Personnel and Equipment**

- a. The contractor shall supply and operate all transport required for transporting his employees, materials and equipment.
- b. The cost of movement of personnel, materials and equipment shall be included in the rates given for drilling development and pump operation.

#### **4.1.14 Site Preparation and Reinstatement**

- a. 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 ZCWD.
- b. Payment shall be deemed to be included in the items entered in the tendered price for erection and dismantling of drilling rigs.



## **4.2 WELL DRILLING**

### **4.2.1 Scope**

- a. The Contractor shall provide and operate one or more mobile Drilling Units required in completing the works within the contract period.
- b. The Contractor shall provide all auxiliary equipment, lubricants, fuels and spares necessary to keep the drilling rig(s) in continuous operation.

### **4.2.2 Equipment**

- a. The drilling rig(s) together with all auxiliary equipment and personnel shall be defined as the Drilling Unit(s).
- b. 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, at the minimum, 25% higher than indicated in the Contract Drawings.
- c. Payment for drilling shall be in accordance with the Bill of Quantities, where payment for drilling is by linear meter of borehole as measured after removal of drill string. The rates set against drilling items in the tendered price shall be deemed to include all equipment, personnel, fuels, and lubricants and the accessories required for operation of the Drilling Unit.
- d. The Contractor shall provide and operate one (1) mud rotary drilling rig including all auxiliary equipment necessary to complete the work within the contract period.

### **4.2.3 Drilling Method**

- a. All drilling shall, unless otherwise specified in the Special Provisions, be performed with the rotary drilling method.
- b. The Contractor shall drill the hole to such depth and with such 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.
- c. The drilling shall be performed with the mud rotary method.



#### 4.2.4 Pilot Borehole Drilling

Pilot Drilling shall determine whether there is potential water. If a pilot hole does not contain potential water, all other remaining items of work in this project shall not be implemented, and only delivered and performed items of work shall be paid to the contractor.

The Contractor shall first drill the 250mmØ pilot borehole as specified in the preliminary well design to a target depth of 77.40 linear meters. However, during the drilling activity, the ZCWD Engineer shall monitor the potential water source through strata sampling and shall have the right to determine the well's final depth.

The Contractor shall take all measures necessary to protect the borehole from caving. **Drilling of pilot hole directly to 250mmØ is not allowed.** The second drilling step is to ream the pilot hole to its full diameter as specified in the preliminary well design and in the bill of quantities. If the Contractor will introduce a methodology other than specified herein, it shall seek approval from the ZCWD.

#### 4.2.5 Strata Sampling / Material Testing

- a. Strata samples 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.
- b. The sampling procedure must provide that all the fraction of the penetrated strata is present in the sample.
- c. 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.
- d. A record of samples taken with the details described above shall be submitted to the ZCWD every day.
- e. Payment for sampling shall be deemed to be included in the rates entered for drilling in the tendered price.
- f. The failure on the part of the Contractor to obtain, preserve and deliver samples or records, satisfactory to the ZCWD, shall be considered as actual damage to the ZCWD. Such failure shall entitle the Zamboanga City Water District to retain from the Contractor the sum of One Thousand (P1,000.00) as liquidated damages for each sample that the





Contractor shall fail to obtain, preserve or deliver, or for each length 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 ZCWD, 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 ZCWD deems necessary to remedy such failure at no cost to the ZCWD. It is understood that the liquidated damages herein provided are fixed, agreed and not by way of penalty; and that the ZCWD shall not be required to prove that he has incurred actual damages.

#### **4.2.6 Drilling Mud**

- a. Bentonite, if used, shall be of premium quality in accordance with API Standard 13A with 150 kg/cum 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.).
- b. 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.
- c. During drilling with mud, the Contractor shall perform hourly measurements of the following mud characteristics:
  - pH value
  - Mud Viscosity
  - Funnel Viscosity
  - Specific Gravity
  - Sand Content
  - Filtration loss
  - Filter cake thickness

The drilling contractor shall maintain a drilling fluid log showing the date, time, depth, Marsh Funnel viscosity, drilling fluid weight and PH, and shall record any drilling fluid additives used, including time introduction as well as other pertinent information.

The recorded mud characteristics shall not exceed the following values, without prior approval of the ZCWD:

Specific Gravity	: 9.5 lb/gal
Sand Content	: 4%
Filtration Loss	: 10 ml
Filter Cake	: 1.5 mm



- d. It is the contractor's responsibility to assure that equipment for measuring fluid properties shall be at the drilling site.
- e. An Alternative to Bentonite: Polymer or other substitute may only be allowed, when it will be proven as more efficient, less cost, effective and not hazardous to the quality of water and no plugging effects to the aquifer, and as approved by the ZCWD.

#### **4.2.7 Working Hours**

All work from start of drilling of the borehole until completion of well development shall be on the round the clock basis (24 hours per day).

### **4.3 GEOPHYSICAL LOGGING**

#### **4.3.1 Scope**

The Contractor shall perform geophysical logging as specified in this Technical Specifications

The work includes geophysical logging. Geophysical logging shall be done from ground surface down to 77.40 meters depth. The brief interpretation of the data obtained from the geophysical logging results and the recommended final well design should be signed and sealed by a Hydrogeologist (Photocopy of the License and Professional Tax Receipt of the signing professional should also be submitted).

In addition, the electronic file of the geophysical well logging results (Resistivity Log, Spontaneous Potential Log/Self-Potential Log (SP), Mud Viscosity Log and Penetration Rate) including the raw data shall be submitted to the Zamboanga City Water District together with the recommended final well design.

#### **4.3.2 Equipment**

- a. 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. 0.33 m of borehole length.
- b. The recorded logs shall be submitted to the ZCWD immediately upon completion of logging as plots of recorded characteristics versus depth



for his approval. In case of disapproval by the ZCWD, the logs shall be repeated immediately.

### **4.3.3 Logs**

**Geophysical logging shall comprise the following logs:**

- Resistivity log (16" and 64")
- Self-potential log (SP)
- Mud Viscosity Log
- Penetration Rate

### **4.3.4 Final Well Design**

The Contractor shall prepare the Final Well Design plan based on the result of the Borehole Logging of Pilot Hole conducted. The final well design plan shall be prepared by the Contractor's Engineer & to be approved by ZCWD. The Final Well Design shall be approved before furnishing the 250mm Blank Casings & 250mm Screens.

## **4.4 WELL CASING**

### **4.4.1 Scope**

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

### **4.4.2 Casing Material**

a. The Contractor shall, before commencement of the work, submit for the approval to the ZCWD the following details of all casing:

- Type of material
- Internal and external diameters
- Wall thickness
- Method of jointing

b. All permanent casing material shall be uPVC Pipe Materials and of new stock unless otherwise specified in these documents.

c. All permanent casings to be installed shall be:

250mmØ UPVC casing with minimum thickness of 9.60mm and a maximum of 11mm as shown in the preliminary well design and should be of new stock.



- d. The Contractor shall assume responsibility for any casing failure and shall correct, as approved by the ZCWD, any casing failure at no cost to the ZCWD. 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 ZCWD at no extra cost.
- e. The Contractor shall not be allowed to order casing materials prior the approval of the Final Well Design by the ZCWD. All casing materials shall be delivered based from the Approved Final Well Design, no payment shall be made for excess length of casing material that is not in accordance with the final well design.

### **4.4.3 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.

### **4.4.4 Lining Installation**

- a. 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 ZCWD.
- b. 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 their own expense.

### **4.4.5 Lining Material Accessories**

- a. The Contractor shall provide as necessary the following accessories to set the lining materials to the required depth:
  - 1. Centralizers to be affixed to the lining material at intervals of 20 meters to locate the lining material in the center of the drill hole;
  - 2. Supporting clamps, equipment and tools;
  - 3. Reducing cones and connecting pieces;



4. Casing hangers;
  5. All other necessary equipment.
- b. Except where expressly provided, all accessories shall be deemed to be included in the Bid Form for the provision and insertion of lining material.

#### **4.4.6 Testing for Plumbness and Alignment**

- a. All boreholes shall be constructed, plumb and true to line as defined herein. To demonstrate the compliance of contractor's work with this 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 ZCWD.
- b. 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.
- c. Should the results of the test for plumbness and alignment show that the 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 or plumbness, the ZCWD may refuse to accept the well and the Contractor shall drill a new well without charge to the ZCWD.

### **4.5 WELL SCREENS**

#### **4.5.1 Scope**

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

#### **4.5.2 Type of Screens**

- a. The type of screens shall be as specified in the tentative well design.



- b. 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.
- c. The screens shall be UPVC screen in accordance with ISO 9002 standard or equivalent, 3 meters length per piece and of new stock. The screen specifications shall be subject to evaluation as to the quality, efficiency and must be cost effective. Photocopies of receipts of purchase duly certified shall be submitted to ZCWD as proof of purchase.

### **4.5.3 Responsibility for Malfunction**

- a. 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 ZCWD at no extra cost to ZCWD.
- b. The screen must have no change of alignment at any of its joints after installation. If requested by the ZCWD, the Contractor shall submit for approval by the ZCWD the design and method of construction and installation of the screen.
- c. In the event that the Contractor cannot correct a screen failure, the Contractor shall replace the screen with material complying with the specifications of this Contract at no extra cost to the ZCWD.

### **4.5.4 Screen Strength**

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

### **4.5.5 Screen Accessories**

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



## **4.6 FORMATION STABILIZER/GRAVEL PACK**

### **4.6.1 Scope**

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

### **4.6.2 Material**

- a. The formation stabilizer/gravel pack material shall be #5 & #10 and 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.
- b. The Contractor during the mobilization period shall submit to the ZCWD for his approval, samples of the formation stabilizer it proposes to use, stating the source of the formation stabilizer, quantities available, rate of delivery and any other information requested by the ZCWD.

### **4.6.3 Method of Installation**

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

## **4.7 WELL DEVELOPMENT**

### **4.7.1 Scope**

- a. The Contractor shall furnish compressors, surge plungers, jetting tools, electric generators, chemicals and any other equipment required for satisfactory well development and shall undertake the development as directed by the ZCWD.
- b. Development shall comprise deflocculation, high velocity jetting in continuous slot screens, surging with plunger in slotted screens, unless otherwise, specified in this Technical Specifications.
- c. Well development for each production well shall consist of deflocculation, surging with plunger and bailing, water jetting and airlifting.



#### **4.7.2 Expected Yield**

- a. The Contractor shall develop the well to its maximum expected yield, which is to be determined during Well Testing and Step Drawdown Testing. All communications between the contractor and the ZCWD shall be in writing.

#### **4.7.3 Surging with Plunger**

- a. 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 ZCWD.
- b. Before start of surging and with one-hour intervals during the surging operation, the depth to the well bottom and to the top of gravel pack shall be recorded.
- c. Surging shall be continued until accumulation of sediments in the sump pipe, during a one-hour period surging operation, is negligible.

#### **4.7.4 Deflocculation**

- a. 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
- b. Mud displacement shall immediately be followed by injection and/or jetting through the screened sections with polyphosphate solution to deflocculate 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.

#### **4.7.5 High Velocity Jetting**

- a. 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.





- b. 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 ZCWD for approval before the start of drilling operation.
- c. The jetting tool shall also be equipped with a circular brush or any approved equivalent to facilitate cleaning. The jetting tool with equipped brush shall be presented to the ZCWD for approval before the start of drilling operation.
- d. The jetting tool shall be supplied with water through a high-pressure pump capable of producing a nozzle velocity appropriate to develop a well in order to maximize well yield. The pump shall be equipped with suitable pressure gauge on the discharge side to facilitate monitoring of nozzle velocity.
- e. 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.
- f. 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.
- g. 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.

#### **4.7.6 Well Cleaning**

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

#### **4.7.7 Freedom from Sand**

- a. 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).



- b. 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.

#### **4.7.8 Acceptance and Development**

- a. The development by the specified methods shall be repeated and continued until the well is thoroughly developed in accordance with the criteria specified.
- b. 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 ZCWD may instruct the Contractor to perform further development.

#### **4.7.9 Water Pump Motor**

The contractor shall supply, install and commission a 20 Horsepower Single Stage submersible deep well borehole pump/motor with complete accessories but not limited to the B.I. Pipe for the Rising Main Pipe and the power cable. The installation, testing & commissioning shall be subject to the well test & drawdown pump test result. If the well testing result requires a lesser pump/motor rating, a variation order shall be executed pursuant to the updated revised IRR of RA 9184. Hence, the Submersible pump shall be supplied only after the well test & drawdown pump test. Submersible pump shall only be installed after well development if the yield permitted as to be determined by the ZCWD engineer & it shall not be used in well testing.

Specifications for a 20HP Submersible Pump:

- 3" NPT Riser Pipe Connection
- Head 80m. - 89.9m.
- Q (flow) = 35 - 37 cu.m./hr.
- Bowl, Impellers & Shafting all in stainless;
- Complete with cable guard,
- Suction strainer, Built-in check valve;
- 8 Stages w/ complete Stainless Steel Bolt w/ lock washer;
- 3,400-3500 rpm
- 3-Phase, 230VAC, 60Hz
- With Motor Controls



#### **4.7.10 Stick up Pipe**

The Contractor shall furnish and install 300mmØ Spiral Welded Steel Encasement Pipe with cap with a length of not less than 1 meter and with a minimum wall thickness of 4.7mm as shown in the detailed engineering plan.

### **4.8 WELL TESTING**

#### **4.8.1 Scope**

- A. The Contractor shall provide all personnel and labor, instrumentation and water level indicators and operate a Pumping Unit for the following purposes:
1. Well Flushing for a duration of two (2) hours prior to the Step-drawdown pumping tests (SDT). After the flushing, the well shall be allowed to recover prior to performing SDT, wherein the well's water level shall reach the static water level measured prior to flushing or as directed by the ZCWD.
  2. Step-drawdown pumping tests on the completed well in accordance with the standard methods or as directed by the ZCWD.
  3. Constant discharge pumping test on the completed well in accordance with the standard methods or as directed by the ZCWD.
- B. During the Exploration & Testing Phase of this project, the contractor shall have the water quality tests that passed the Physical, Chemical & Bacteriological Quality of the PNSDW 2017 to proceed with the Well Development Phase; otherwise, the Procuring Entity reserves the right to terminate the Well Development Phase depending on the magnitude of the adverse water quality results and cost to address the same to conform with the PNSDW 2017, subject further to deductive and only performed works shall be paid to the contractor.



## 4.8.2 Water Quality Test

The Contractor shall get a water sample, every eight (8) hours and have it tested at a DOH-accredited laboratory for water quality results at their expense. The result of the analysis shall be forwarded to the ZCWD. After the well development and prior commissioning and acceptance by ZCWD, the Contractor shall conduct Physical, Chemical, Bacteriological, and Radiological parameters tests per PNSDW 2017 standards at their expense. Further, the ZCWD's Procuring Entity reserves the right to stop the work based on the exploration and testing results, deduct the undelivered/unimplemented items of work, terminate the contract, and pay only the performed and delivered items of work.

Below are the phases based on the Bill of Quantities:

### **Well Exploration & Testing Phase:**

- SPL-1 Mobilization/Demobilization;
- SPL-2 Construction Safety & Health Program;
- SPL-3 Construction of Project Billboards/Signages;
- SPL-4a Site Preparation, Construction of Temporary Facility & Setting up of Equipment
- SPL-4b Drilling of Pilot Hole;
- SPL-4c Borehole Logging of Pilot Hole
- SPL-4d Reaming to 400mm Borehole
- SPL-4e Furnishing of 250mm Blank Casing
- SPL-4f Furnishing of 250mm Screen
- SPL-4g Furnishing/Fabrication of 250mm End Cap
- SPL-4h Installation of Blank Casing, Screen & End Cap
- SPL-4i Furnishing & installation of Casing Centralizers
- SPL-4j Furnishing & Installation of Gravel Packing at Annulus around casing & screens;
- SPL-4k De-flocculation of Drilling Mud with Polyphosphate Solution

### **Well Development Phase:**

- SPL-4l Development by Water Jetting
- SPL-4m Development by Surging & Bailing
- SPL-4n Development by Airlifting
- SPL-4o Step Drawdown Pump Testing
- SPL-4p Well Testing (72 Hours Constant Rate Discharge Test)
- SPL-4q Cement Grouting of Annulus
- SPL-4r Well Disinfection and Cleaning
- SPL-4s Furnishing & Installation of 300mm Steel Pipe as Stick Up Pipe
- SPL-4t Supply, Installation, Testing & Commissioning of One (1) Unit 20HP Submersible Motor & Pump



SPL-4u Well Completion, Furnishing & Installation of Gravel Fill Pipe 50mm  
w/ Screw Cap & Furnishing & Installation of Water Level 38mm  
Sounding Tube

### **4.8.3 Equipment Capacity**

- a. 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.
- b. Suitable pumping machinery will be deemed and shall be provided by the contractor to conduct the well testing:
  1. 5Hp motor/pump rating with a generator set/power supply.
  2. Lineshaft pump and internal combustion prime mover together with all accessories.

### **4.8.4 Equipment Operation**

- a. The Contractor shall supply and operate all equipment and accessories necessary for installation and removal of pumps.
- b. The Contractor shall provide a generator set which **operates at a noise level not louder than 85 decibels (dB)**. In the instance that the existing equipment of the Contractor emits noise more than 85 dB, the Contractor shall provide positive noise abatement devices to tone down the noise level of the generator set to the acceptable limit.
- c. 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 ZCWD.
- d. The Contractor shall provide sufficient competent personnel including a qualified fitter and electrician, as may be necessary to install and operate the Pumping Unit.



#### **4.8.5 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.

#### **4.8.6 Water Level Sounding Pipe**

- a. The Contractor shall provide and install a temporary tube of at least one (1) inch 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.
- b. Payment for providing, installing and removing the tube shall be deemed to be included in the rates given for pumping tests.

#### **4.8.7 Discharge Rate Monitoring**

Discharge rates shall be measured and recorded with a water meter. All items are subject to the ZCWD's approval before start of drilling.

#### **4.8.8 Definition of "Pumping Unit"**

- a. Pumping Unit refers to equipment used in the operation of the drilling activities, used in control of discharge rate, water level sounding pipe and discharge rate monitoring.

#### **4.8.9 Pumping Procedure**

The ZCWD through the Technical Specifications will determine the pumping procedure necessary to obtain the objectives of this Contract.

#### **4.8.10 Suspension of Pumping**

If the ZCWD 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.



#### **4.8.11 Equipment Breakdown during Pumping**

- a. The pumping must be continuous and at a constant rate during the pumping tests. The ZCWD will instruct the Contractor as to the expected maximum duration of each pumping test before start of each test.
- b. 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 ZCWD.
- c. If any pumping test is interrupted because of equipment breakdown or inadequate supervision or discharge control without any reasonable cause and at the failure of the contractor, no payment shall be made for any pumping period less than the minimum of **72 hours**. The Contractor has to recommence the pumping test at a minimum of 24 hours provided that the maximum discharge rate will be reached, otherwise, the pumping test shall continue until the required maximum discharge will be attained.
- d. In such case that the pumping test is interrupted due to dry pumping or at any valid and justifiable cause, whichever claims are subject for evaluation. Payment shall be made based on the actual period of the pump test prior the interruption.

#### **4.8.12 Duration of Tests**

- a. The step drawdown pumping tests shall be performed on 5 steps with duration of 1 hour each.
- b. The constant discharge pumping tests shall be performed for a period of three (3) days, unless otherwise specified in the Special Provisions or unless otherwise instructed by the ZCWD.

#### **4.8.13 Temporary Pipeline**

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



## **4.9 CEMENT GROUTING**

### **4.9.1 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 Preliminary Well Design and shall place the cement grout as **specified**.

### **4.9.2 Grouting Materials**

- a. Cement grout shall consist of a mixture of 95% Portland Cement, 5% Bentonite, sand and clean water, mixed in the proportion of 52.5 kg. of Portland Cement/Bentonite to maximum of 30 liters of water.
- b. All cement shall, unless otherwise specified in the Contract Documents, conform to the "Specifications for Portland Cement" (ASTM C150 latest revision).

### **4.9.3 Method of Placing Grout Material**

- a. The method and equipment 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 ZCWD. 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.
- b. 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.

### **4.9.4 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 ZCWD's prior approval.





## **4.10 WELL COMPLETION**

### **4.10.1 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.

### **4.10.2 Site Restoration**

The site shall be restored to a condition as nearly 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. The site shall also be cleared from all debris, excavated materials, temporary facilities and other related obstructions, or as directed by the ZCWD.

In such a case when the drilling is completed and concluded that no water could be extracted from the site, the Contractor shall restore the area to its original condition at no additional cost to the ZCWD.

### **4.10.3 Final Well Inspection**

After each material has been installed in place, an inspection shall be conducted by the ZCWD. A well camcorder will be performed in the well to ensure the integrity of the installed blank casing and well screens. Any discrepancy found during the inspection that entails cost will be subject to imposition of corresponding payment reduction.

### **4.10.4 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.



## **4.11 SUBMITTAL OF REPORTS AND BOREHOLE DATA**

- a. The Contractor shall submit to the ZCWD daily records in duplicate containing the following information:
  1. Site
  2. Date
  3. Description of each stratum encountered
  4. Depth below ground of each change of stratum
  5. Depths and details of all disturbed samples
  
- b. The Contractor will be required to keep a record of penetration rate, mud losses and mud conditions.
  
- c. At the end of the well construction and before final payment is made, the Contractor shall submit to the ZCWD a report containing the following information:
  1. Total depth of the well
  2. Description of the strata encountered
  3. The sizes and the lengths/specifications of the casing installed
  4. The date of the start and the completion of the well construction
  5. The locations and the description of the casing perforations or the well screen placement
  6. The locations of the gravel, the size of gravel, if applicable, and the amount of cement grout installed
  7. Records of discharge rates and drawdown during well development together with description of the methods of development
  8. The well yield (expressed as discharge rate and drawdown), the dates and the duration of the test(s)
  9. The methods of measuring the discharge rate and the drawdown
  
- d. The cost of records shall be deemed to be included in the contract rates.



## **4.12 SPECIAL PROVISIONS**

### **4.12.1 MOBILIZATION AND DEMOBOLIZATION**

- a. The Contractor shall mobilize, and bring out into work, all personnel plant and equipment, in accordance with its approved Construction Program, Equipment Utilization Schedule and Manpower Schedule, from its regular place of business or another project to the site to undertake the Contract.
- b. Mobilization shall include the obtaining and transporting to jobsite of pipes, materials, equipment, personnel, constructional plant and all necessary items for the execution and completion of the work and shall also include the setting up and the verification of all equipment, instrument and all other plant until it is rendered operable. It shall include sufficient supply of spare parts for the pipe laying works. Breakdowns are to be repaired on site by the most expeditious method possible at no cost to ZCWD. In the event repairs being beyond the personnel or tools at the site to effect repairs in a reasonable time, such that it has to be removed from the site, then a replacement of machine or equipment of a similar capacity shall be provided by the Contractor at no additional mobilization costs to ZCWD nor extension of completion of works.
- c. Demobilization shall include dismantlement and removal from the site of the Contractor's plant, materials and equipment and all temporary facilities. Demobilization shall include clean-up of the site after completion of the Contract Work as approved by the ZCWD and transportation from the site of Contractor's employees.

### **4.12.2 TEMPORARY SITE FACILITY**

The Contractor shall provide and maintain at least one temporary field office only at the project site dedicated to the Contractor's personnel and the ZCWD Field Engineer. The size of the temporary facility shall be at least as reflected in the detailed plan; however, the Contractor may opt to construct a larger facility without additional cost to the ZCWD.



#### **a. TEMPORARY CONNECTIONS DURING CONTRACT PERIOD (Water and Power)**

1. Water Supply – For all operations required in the execution of the Contract, the Contractor shall be responsible for providing ample water supply under a pressure sufficient for all construction purposes. The ZCWD may furnish reasonable quantities of water when available subject to corresponding fees' schedule of the ZCWD. All cost for water consumed in the implementation of the project shall be paid by the Contractor and shall be priced accordingly, this cost shall be included in its tender bid price. The ZCWD reserves the right to limit, suspend, or terminate this supply of water should it consider such action to be detrimental to the operation of the system. In this event, the Contractor shall obtain water from some other approved source at his own expense.
2. Power and Lighting – The Contractor shall make all necessary applications and arrangements and pay all fees and charges for all temporary wirings, switches, connections, meters and monthly bills for power and light necessary for the proper completion of this Contract. There shall be sufficient electric lighting so that all works may be done in a workmanlike manner when there is no sufficient daylight or during night work.

#### **4.12.3 LOGBOOK**

A logbook shall be maintained by the Field Engineer at all times reflecting time extensions, work suspensions, change/extra work orders and circumstances, affecting the progress of work, to be signed by both the Field Engineer and the Contractor.

#### **4.12.4 CONSTRUCTION CRITICAL PATH METHOD (CPM)**

The CPM network shall be the basis of the contractor in completing the project in the prescribed period of time.

The CPM shall be updated by the Contractor when required by the ZCWD but not more than once per month.



#### **4.12.5 WORKMEN'S IDENTIFICATION BADGES AND SAFETY GEARS**

The Contractor shall provide all his men working in the project with proper identification badges and safety gears.

#### **4.12.6 WORKING/CALENDAR DAYS**

The term "Working Day" refers to working days in the government service. The term "Calendar Day" refers to the days in a week, including Saturdays, Sundays and holidays. Whenever the word "day" is used, it shall refer to calendar day. The required duration/timeline to complete the project is within **60 Calendar Days**.

#### **4.12.7 INSPECTION OF THE WORK SITE**

Contractor may inspect the site of the work by personal examination of the location of the proposed work and the actual visualization of the work to be done. They should be aware of the conditions which might affect the execution of this contract and has made provisions in his bid.

### **4.13 MATERIALS AND WORKMANSHIP**

#### **4.13.1 Safeguarding of Equipment, Materials and Work**

The Contractor shall properly safeguard all equipment, materials and work against loss, damages, malicious mischief, or tampering by unauthorized persons until acceptance of the work by the ZCWD.

Locked and covered storage or continuous surveillance by a watchman shall be provided if required to accomplish this purpose.

#### **4.13.2 New Materials and Equipment**

Unless otherwise specifically shown, or permitted by the ZCWD, all materials and equipment incorporated in the work shall be new and of current manufacture. The ZCWD may request the Contractor to furnish manufacturer's certificate to this effect.

#### **4.13.3 Title to Materials Found on the Work**

The ZCWD reserves the right to retain title to all materials developed and obtained from the operations connected with the work.



Unless otherwise specified in the Special Provisions, neither the Contractor shall have any right, title, or interest in or to any such materials. The Contractor will be permitted to use in his work, without charge, any such materials that meet the requirements of the Specifications and Drawings.

#### **4.13.4 Defective Equipment, Materials or Work**

Inspection of the work shall not relieve the Contractor of any of his obligations under the Contract. Even though the equipment, materials, or work required to be provided under the Contract have been inspected, accepted, and estimated for payment, the Contractor shall, at his own expense, replace or repair any such equipment, materials, or work found to be defective or otherwise not to comply with the requirements of the Contract up to the end of the maintenance and guarantee period.

- a. Any equipment or materials brought upon the job site by the Contractor and subsequently rejected by the ZCWD as not complying with the requirements of the Contract shall be removed immediately by the Contractor to a satisfactory distance from the job site.
- b. If the Contractor shall fail to repair or replace unsatisfactory equipment or materials from the job site within seven (7) calendar days after being ordered to do so by the ZCWD, the ZCWD, acting on behalf of the ZCWD, may make the ordered repairs or remove the condemned equipment or materials; and the ZCWD shall deduct the cost thereof from any moneys due or to become due the Contractor.

#### **4.13.5 Rubbish Control**

During the progress of the work, the Contractor shall keep the site of the work and other areas used by him in a neat and clean condition, and free from any accumulation of rubbish.

#### **4.13.6 Dust Control**

The Contractor shall at all times conduct his work so as to avoid unnecessary dust. He shall provide adequate equipment and water as determined by the ZCWD to be necessary for accomplishment of this objective.



#### **4.13.7 Cleaning Up**

The Contractor shall promptly remove from the vicinity of the completed work all rubbish, unused materials, concrete forms, equipment, and temporary structures used during construction.

#### **4.13.8 Character of Workmen**

Only qualified personnel and skilled workmen shall be employed on the site except in positions normally occupied by unskilled labor. When required in writing by the ZCWD, the Contractor shall discharge any person who is, in the opinion of the ZCWD, incompetent, disorderly, or otherwise unsatisfactory and shall not again employ such discharged person on the work except with the written consent of the ZCWD. Such discharged person shall not be the basis of any claim for damages against ZCWD or any of its agents. If the Contractor permits such a person on the work site without the consent of the ZCWD, this alone shall be sufficient to immediately suspend the Contract until the ZCWD's instructions have been fulfilled.



## 5 PREPARATION OF ESTIMATES / FINANCIAL BID

In the preparation of the detailed estimates or financial bid, the DPWH Department Order No. 197, Series of 2016 shall be followed:

### 5.1 DIRECT COST

The **Estimated DIRECT COST** shall consist of the following:

#### 5.1.1 Cost of Materials

Cost of materials to be used in doing the work item called for, which shall include, inter alia, the following:

- Cost at source, including processing, crushing, stockpiling, loading, royalties, local taxes, construction and/or maintenance of haul roads, etc.
- Expenses for hauling to project site.
- Handling expenses.
- Storage expenses.
- Allowance for waste and/or losses, not to exceed 5% of materials requirement.

#### 5.1.2 Cost of Labor

Cost of Labor this shall include the following:

- Salaries and wages, as authorized by the Department of Labor and Employment.
- Fringe benefits, such as vacation and sick leaves, benefits under the Workmen's Compensation Act, GSIS and/or SSS contributions, allowances, 13th month pay, bonuses, etc.

#### 5.1.3 Equipment Expenses





Rental rates of equipment shall be based on the prevailing "Association of Carriers and Equipment Lessors, (ACEL) Inc." approved for use by the DPWH (Presently it is the 2014 ACEL Rates). Rental rates of equipment not indicated in the ACEL booklet shall be taken from the rental rates prepared by the Bureau of Equipment. For simplicity in computation, the operated rental rates are preferred over the bare rental rates as the former includes operator's wages, fringe benefits, fuel, oil, lubricants and equipment maintenance. The make, model and capacity of the equipment should be indicated in the detailed unit cost analysis.

Mobilization and Demobilization shall be treated as a separate pay item. It shall be computed based on the equipment requirements of the project stipulated in the proposal and contract booklet. Mobilization and demobilization shall not exceed 1% of the Estimated Direct Cost (ECD) of the civil works items.

## **5.2 INDIRECT COST**

The Indirect Cost shall consist of the following:

### **5.2.1 Overhead Expenses**

Overhead Expenses which include the following:

- Engineering and Administrative Supervision.
- Transportation allowances.
- Office Expenses, e.g., for office equipment and supplies, power and water consumption, communication and maintenance.
- Premium on Contractor's All Risk Insurance (CARI).
- Financing Cost such as Premium on Bid Security, Premium on Performance Security, Premium on Surety for Advance Payment, Premium on Warranty Bond (one year).
- Fees, Permits and clearances.
- Provision of service vehicle.

### **5.2.2 Contingencies**

Contingencies includes the following:

- Expenses for meetings, coordination with other stakeholders, billboards (excluding Project Billboard which is a pay item under



the General Requirements), stages during ground breaking & inauguration ceremonies, and other unforeseen events.

**5.2.3 Miscellaneous Expenses**

These include laboratory tests for quality control and plan preparation.

**5.2.4 Contractor’s Profit Margin**

The margin of contractor’s profit shall be in accordance with the table below. The profit is computed as the profit mark-up multiply by the Estimated Direct Cost.

**5.2.5 Value Added Tax (VAT) Component**

Which shall be the five (5) percent of the summation of Estimated Direct Cost, Overhead, Contingencies & Miscellaneous (OCM) and Contractor’s Profit.

**5.2.6 OCM and Profit Mark-Up**

1. The following items shall not be subjected to OCM and Profit mark-up:
  - Mobilization and Demobilization
2. The following non-civil works items shall not be subjected to OCM mark-up:
  - Field/Laboratory Office & Living Quarters (Rental Basis)
  - Furnishing of Furniture, Laboratory Equipment, Survey Equipment and Consumables
  - Assistance to the Engineers
  - Photographs
  - Health and Safety
  - Environmental Certificate
  - Traffic Management
  - Communication Equipment, etc.
3. The detailed estimates for this project shall not exceed with the following mark-ups:

Estimated Direct Cost	OCM	PROFIT	VALUE ADDED TAX (VAT)
Up to 5 Million	15%	10%	5%



## 6 BILL OF QUANTITIES



Republic of the Philippines  
**ZAMBOANGA CITY WATER DISTRICT**  
Pilar Street, Zamboanga City

### BILL OF QUANTITIES

#### PROPOSED WELL EXPLORATION, TESTING AND DEVELOPMENT AT MERCEDES

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST (W/ OCM, PROFIT & VAT)	TOTAL
SPL - 1	MOBILIZATION/DEMobilIZATION (UP TO 1% OF ESTIMATED DIRECT COST)	1.00	LOT		
SPL - 2	CONSTRUCTION SAFETY & HEALTH PROGRAM	1.00	LOT		
SPL - 3	CONSTRUCTION OF PROJECT BILLBOARDS/ SIGNAGES	1.00	LOT		
<b>Well Exploration, Testing and Development at Mercedes</b>					
SPL - 4a	SITE PREPARATION, CONSTRUCTION OF TEMPORARY FACILITY AND SETTING-UP OF EQUIPMENT	1.00	LOT		
SPL - 4b	DRILLING OF PILOT HOLE	77.40	METERS		
SPL - 4c	BOREHOLE LOGGING OF PILOT HOLE	1.00	LOT		
SPL - 4d	REAMING TO 400mmØ BOREHOLE	77.40	METERS		
SPL - 4e	FURNISHING OF 250mmØ BLANK CASING	55.18	METERS		
SPL - 4f	FURNISHING OF 250mmØ SCREEN	23.22	METERS		
SPL - 4g	FURNISHING/FABRICATION OF 250MMØ END CAP	1.00	PC.		
SPL - 4h	INSTALLATION OF BLANK CASING, SCREEN AND END CAP	78.40	METERS		
SPL - 4i	FURNISHING AND INSTALLATION OF CASING CENTRALIZERS	6.45	PCS.		
SPL - 4j	FURNISHING AND INSTALLATION OF GRAVEL PACKING AT ANNULUS AROUND CASINGS AND SCREENS	62.40	METERS		
SPL - 4k	DE-FLOCCULATION OF DRILLING MUD WITH POLYPHOSPHATE SOLUTION	1.00	LOT		
SPL - 4l	DEVELOPMENT BY WATER JETTING	12.00	HOUR		
SPL - 4m	DEVELOPMENT BY SURGING AND BAILING	12.00	HOUR		
SPL - 4n	DEVELOPMENT BY AIRLIFTING	12.00	HOUR		
SPL - 4o	STEP DRAWDOWN PUMPING TEST	1.00	LOT		
SPL - 4p	WELL TESTING (72 hours Constant Rate Discharge Test)	72.00	HOUR		
SPL - 4q	CEMENT GROUTING OF ANNULUS	15.00	METERS		
SPL - 4r	WELL DISINFECTION AND CLEANING	1.00	LOT		
SPL - 4s	FURNISHING AND INSTALLATION OF 300 MM STEEL PIPE AS STICK UP PIPE	1.00	LOT		
SPL - 4t	SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF ONE (1) UNIT 20 HP SUBMERSIBLE MOTOR & PUMP, 3" INLET AND OUTLET SUCTION W/ COMPLETE ACCESSORIES <b>INCLUDING MOTOR CONTROLS</b>	1.00	ASSY.		
SPL - 4u	WELL COMPLETION, FURNISHING & INSTALLATION OF GRAVEL FILL PIPE 50MMØ WITH SCREW CAP AND FURNISHING AND INSTALLATION OF WATER LEVEL 38MMØ SOUNDING TUBE	1.00	LOT		
<b>TOTAL BID AMOUNT</b>					

Prepared & Submitted by:

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Bidder's Authorized Representative



## 7 SIGNATORIES

Prepared by:

  
**VERLIN ANN L. LORIA**  
Senior Engineer A (M.E.)  
*Design Division*

Checked by:

  
**REX D. SALE JR.**  
Supervising Engineer A  
*Design Division*

Submitted by:

  
**EDITO M. BAUTISTA JR.**  
Officer-In-Charge  
*Engineering and Construction Department*

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Recommending Approval for Implementation:

  
**MICHAEL ANGELO M. CARBON**  
*AGM, Technical Services Group*

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Approved for Implementation:

**REYNALDO R. CABILIN**  
*General Manager A*