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# **Technical Specifications**

#### 1.0 Scope of works

The scope of the work requires that contractors furnish only <u>satisfactorily rehabilitated</u> <u>boreholes</u> to the client. A <u>satisfactorily rehabilitated borehole</u> is defined as one rehabilitated as per the requirements clearly reflected in the working documents i.e. the (Bill of Quantities) BOQs, technical Specifications and Drawings.

All wells will be installed with U2 hand pumps with either stainless steel (G304 steel) pipes and rods or Upvc pipes with stainless steel coupling, on instruction from the GOAL Supervisor. The choice of material is dependent on the PH of the water on Laboratory analysis. All stainless-steel pipes and rods as described shall be in Grade 304 stainless steel. **All depths of installation will be approved by GOAL** but shall not exceed the total installation depth reflected in the BOQs.

Works include general overhaul and replacement of the water columns, disinfection and flushing of wells, reconstruction of new or hacking and re-plastering of the existing aprons and drainage channels and reconstruction of the borehole (s) surrounding soils as specified hereinafter and as directed by the Client.

# a. Location of the works

The works are in communities and institutions in Butaleja (Busaba, Naweyo, Nawanjofu, Himutu and Mazimasa sub-counties) and Kaabong (Kaabong West, Sidok, Kaabong East, Lolelia South, Kalapata ,Kathile South, Lobongia, Lotime and Kathile sub counties).

# b. Borehole Overhaul:

The contractor/s is/are to overhaul all the 95 boreholes; removing all the water columns (rising mains) and all worn parts and hand them to the supervisor / respective District Water Office. Records of all pump parts retrieved should be kept and will form part of the completion report submitted for the

whole works. Evidence of receipt of these materials by the respective DWOs clearly reflecting numbers should also form part of the final report.

The Client representative should inspect all the tools before works commence to ensure that the contractor uses the right tools for the works.

The contractor should ensure that the personnel on site are suitably qualified and experienced person(s). The nominated person(s) shall be available for the specified contract period. Proposed changes to the personnel should be agreed with the supervising engineer/GOAL.

During the rehabilitation works, the contractor should ensure that representatives of the local community/institution shall be involved. GOAL will assist with community liaison activities.

#### 2.0 Borehole Disinfection (see detailed specifications for borehole disinfection in Annex 1)

All boreholes shall be disinfected of both fecal and metal corroding bacteria using High- Strength Calcium Hypochlorite (refer to the Terms of Reference for borehole disinfection).

# 22. Water Quality Testing

Water quality testing of the borehole water will be a precursor to the Borehole rehabilitation works. Sampling for physiochemical analysis shall be the responsibility of the contractor; Water samples shall be delivered to an approved water quality analysis Laboratory. The contractor shall meet the cost of water quality analysis and original test certificates shall be handed to the contractor. The original test certificates shall form part of the final borehole completion report submitted by the contractor to the client.

# Sampling:

**For non - functional Boreholes,** the contractor will temporarily install the source to be able to draw the water. In this case therefore, he will be required to pump it until the discharge is visibly clear before taking the sample, filling the sample bottle/container to the brim, seal and label it ready for delivery to the approved water quality laboratory. Afterwards, the water sources shall be uninstalled while awaits the water quality analysis results.

For functional Boreholes, the contractor will directly take the sample from the borehole while being pumped (refer to the preceding paragraph) and thereafter leave it in its functional state until such a time when the water quality analysis results have been reviewed and declared to be satisfying the national standards for safe drinking water. Sampling for Water Quality analysis shall be carried out in the presence of the supervising Engineer or the approved clients' representative on site. The contractor should include any extra cost for the delivery of the samples to the laboratory within this timeline in the respective BoQ item.

The samples should reach the laboratory within 6 hours of the time of collection. Specific parameters to be analyzed include:

- Physical Parameters Colour apparent (PtCo), Turbidity (NTU), Electrical Conductivity (µS/cm), TSS (mg/L), PH
- Chemical Parameters Nitrate(mg/L N), Total Hardness (mg/L), Fluoride (mg/L F), Chloride (mg/L Cl<sup>-</sup>), Sulphate (mg/LSO<sub>4</sub><sup>2</sup>-), Total Iron (mg/L Fe) Manganese (mg/L Mn), TDS (mg/L), Calcium (mg/L Ca<sup>2+</sup>), Magnesium (Mg/L Mg<sup>2+</sup>), Bicarbonate (mg/L CaCO<sub>3</sub>), Alkalinity (total mg/L CaCO<sub>3</sub>)

# 3.0 Environmental protection of the site

Care must be taken in the handling and storage of the disinfection chemicals and fuel to avoid introducing environmental contaminants and pollutants to the environment. The contractor shall safely dispose of any toxic materials including construction debris, discharged waters in a manner approved by the client and so as not to contaminate/pollute public and private property. The contractor shall adhere to relevant national regulations and guidelines on environmental protection that apply to drilling. The contractor shall ensure that all their personnel are aware of environmental protection requirements and MUST ensure that the community is not within reach, while the borehole disinfection exercise is being conducted to avoid chemical contamination by inhaling.

# 4.0 Materials for the works and Workmanship

Materials that will form part of the complete works must be supplied new and never used. Materials must comply with the minimum specifications in the relevant codes. Materials not specified here must comply with the minimum specifications in the relevant codes of practice. Where a national standard does not exist for the material, the relevant British Standard shall apply.

The contractor is expected to carry out all works as specified and in a professional manner. The contractor shall carry out operations in accordance with the terms of the contract and to the satisfaction of the client. The contractor shall use suitable equipment and supply efficient and experienced staff.

**a)** The contractor will provide an experienced project coordinator to oversee the whole rehabilitation works to be carried out under this contract.

**b)** The contractor will maintain a full crew on each rehabilitation unit. If a member of crew quits for personal reasons or must leave because of illness or injury, the contractor will replace him as soon as possible with a worker of similar experience.

**c)** If the client is dissatisfied with the performance of members of the crew, such members shall be informed of their shortcomings and warned by the contractor. If no change results within a reasonable period, the contractor will be notified and requested to take necessary measures on the unsatisfactory crewmember.

e) In the case of absence of one or more members of the rehabilitation crew the decision of whether to proceed with operations will be at the discretion of the client however, works shall be halted if the appointed contractor's site supervisor is not onsite.

# 5.0 Contractor to provide all equipment for the works

All necessary machinery, equipment and materials to carry out the boreholes overhaul and reinstallation, disinfection, flushing, apron and drainage channel construction works shall be provided by the contractor. Prior to mobilization, the Client shall verify the specifications and state of repair of all major items of plant and transport and shall have the right to order the removal and/or replacement of any items which in his opinion are insufficient or in unsatisfactory condition. Acceptance by the client of the contractor's proposed plant and transport does not relieve the contractor of his obligations under this contract, in cases where such plant and transport accepted by the client fails to successfully complete the required works.

# 6.0 Borehole depth and diameter

The Contractor shall consult with the respective District Offices and line Ministry for the Borehole construction data if need be. This will be additional data to the data provided by GOAL. This data will be useful for calculating the chlorine dosing rate while disinfecting the wells. *Refer to clause 2, Borehole disinfection*.

# 7. Verticality and Alignment

The contractor's works shall whatsoever not change the Verticality and alignment of the well casings and if this occurs, the contractor shall be asked to replace the well by drilling another, at his own cost. The abandoned well shall be backfilled and or, capped. No payment shall be made for re-drilling, the sealing/backfilling of the abandoned well, or for moving to a new site. Any materials (i.e. casing, screens, gravel pack, cement, etc.) lost in the abandoned well shall be at the contractor's cost.

# 8. Loss of equipment

Any equipment lost down a well must be removed by the contractor or the well shall be considered a lost bore. A replacement well shall have to be constructed at the contractor's expense. The contractor shall not be entitled to further payments for such a well.

# 9. Lost bore

If completion of the well is prevented by any of incident to the plant, behavior of the ground, jamming of the tools, or casing or any other cause, the well shall be deemed to be lost and no payment shall be made for that bore or for any materials not recovered there from, nor for any time spent during drilling or while attempting to overcome problems.

In the event of a lost bore, the contractor shall construct a new well. The option of declaring any bore lost shall rest with the contractor, subject to the approval of the client.

# A lost bore shall be treated as follows:

- a) Any material supplied by the employer and salvaged damaged shall become the property of the contractor, and the contractor shall compensate the employer accordingly.
- b) The lost bore shall be sealed by concrete or cement grout, which shall be placed from the bok6ttom upward by methods approved by the client.
- c) The upper 2 meters of the lost bore shall be backfilled with native topsoil. Sealing of such abandoned wells shall be done in such a manner as to avoid accidents or subsidence, and to prevent it from acting as a vertical conduit for transmitting contaminated surface or subsurface waters into the water bearing formations.

# 10. Water supply for the works

The contractor shall make his own arrangement for obtaining, transporting and pumping of water required for the works and for use by his crew at their camp site.

# 11. Development and cleaning of wells

Well development must be undertaken by the contractor at every borehole rehabilitation site. Development and cleaning of the wells in this case will be done to circulate the disinfectant all-round the well linings, remove the rust deposits of corroded Galvanized iron pipes, remove native silts and clay accumulated overtime and flush out the chlorinated water from the well.

For circulating the chlorinated water all-round the well lining, the method adopted for development should be able to create adequate turbulence in the water without flushing any out: *this should be* done for one hour. (*Refer to clause 2; Borehole disinfection*).

The borehole should thereafter be flushed until the chlorine smell is insignificant, the water is free of fines and turbidity. This should be done continuously for a period of about 60 minutes.

Whenever possible, natural well development must be used. During development. Cleaning may be carried out by airlift pumping, surging, backwashing or jetting, to the approval of the client. Clay desegregation by means of Sodium Hexametaphosphate ("Calgon") treatment may, in some cases, also be called for by the Client.

The method proposed by the contractor for development of wells should be submitted to the client in writing for his approval. Development of wells shall be effective from the depth at which water is encountered to the bottom of each well. Development shall continue for such time as directed by the client and until the client is satisfied that the water is as free from fine particles as possible. Upon completion of development, any accumulation of material shall be removed from the bottom of the well by airlifting.

The contractor shall include a description of the well-developed data to form part of his completion report. A brief report on the colour, smell and content of the water during development and the time taken for the water to clear if it had become turbid or cloudy at any one time shall be well captured by the contractor.

# 12. Capping of well

During rehabilitation works, the contractor shall assume the responsibility of the Well and must therefore also use all reasonable measures to prevent entrance of foreign matter into the well. The Contractor shall be responsible for any objectionable materials that may fall into the well and any effect it may have on water quality or quantity until completion of the Works and acceptance by the Client.

# 13. Acceptance of well

# The Client shall accept the well upon satisfactory completion of all works executed with stringent adherence to the attached Technical specifications, BOQs and Technical drawings.

# 14. Standby time

In the event of delays because of the action or inaction of the client, for which the contractor would be entitled to claim standby time, the contractor shall notify the client immediately in writing. A claim for standby time is only effective if all the contractor's plant, equipment and personnel are on site, available for work and in a serviceable condition. Standby time shall not exceed the standard working day as defined in the contract data, and any claim shall only be deemed to start at the date and time of a notice in writing to the client.

# 15. Concrete apron/platform casting and hand pump installation

For platforms requiring complete replacement of the aprons and drainage channels, the contractor shall construct concrete platform for such boreholes carrying out the following activities in order: Excavate square pit 760x760x400mm deep around casing pipe and remove all the topsoil all-round the square pit to a depth not exceeding 200mm and to a radius of 1m from the pedestal and level the ground to receive platform concrete. Remove also the topsoil to a depth not exceeding 200mm for all the area on which the well drainage channel will be constructed.

- 1. Place stand assembly (pedestal) over casing pipe, ensuring that the third leg (corresponding to the water tank spout pipe position) faces the proposed direction of the drain.
- 2. To make sure the pedestal is vertical, construct concrete in layers of 100mm up to the top of legs.
- 3. Cover stand assembly with a cover plate and, level the ground around the pump pedestal.
- 4. Lay the mild steel shuttering (molds), place 10mm ribbed r/f bar to the channel thickness and wire mesh fabric to the apron (refer to the drawings) and cast platform in mass concrete (mix 1:2:4/20mm aggregates.) conforming to the dimensions and other specifications shown in drawings.
- 5. Cure concrete for 5 days and protect it from excessive sunshine (using gunny bags and thorny bushes, etc.).

Plaster platform and drain in cement screed to a smooth finish, then engrave the borehole details provided by the client on the platform. The contractor should maintain and engrave the:

- Name of the original funder of the borehole construction works
- Initial borehole construction date
- The statement "Rehabilitated by C: W / GOAL"
- Date of Rehabilitation.

For aprons and drainage channels that will not be replaced, hack all-round the concrete structure and re-plaster with mortar of mix ratio 1:3; re-plaster and neatly finish the surfaces.

# 16. Hand pump equipment and installation

The Contractor shall supply pipes and pump parts, to cast and install India Mark II; U2 Deep well Hand pump as per Bureau of Indian Standard Specifications IS-13056: 1991, Bureau of Indian Standard Specifications IS-13056: 1991 – Amendment 6, with 50mm dia. cast iron brass sleeved open top cylinder assembly with extractable plunger and foot valves assemblies or a similar specification according to Uganda standards.

# 17. Pump cylinders

All wells with depths beyond 39m are to be installed with heavy duty extra deep well cylinders with three washer cups or valves. **The client must confirm the cylinder before installation.** 

# 18. Clearing the site

Upon completion of works on a well site, the site must be left free from debris, hydrocarbons and waste, and all pits must be filled up. A site not delivered clean may render the well unacceptable.

# **19. Records and Reporting**

The contractor shall keep daily activity records for each borehole. The records shall contain the information as specified below. The notes collected per site shall compose the rehabilitation completion report.

# i) Daily Record

- \_ Site name
- \_ Reference number of borehole if any
- \_ Date of reporting
- \_ Names of foreman and borehole installation technician
- \_Records of the pump parts removed, replaced and refurbished (Pedestal and water tank)
- \_Static Water Level (SWL) and borehole depth in metres
- \_ Problems encountered during the works if any.
- \_ Installation depth
- \_ Duration of borehole flushing and disinfection

A copy of the daily record shall be made available daily to the supervisor and should include any other pertinent data as may be requested by the Supervisor.

# ii) Reporting

The completion report that the contractor shall submit will capture the details from both daily record and borehole disinfection.