ANNEX: 1 C

A) GENERAL NOTES

A1) UNDERSTANDING THIS SPECIFICATION

The following technical specifications apply to all NCA South Sudan borehole drilling activities and will be applicable in any contract awarded under this RFP. The terms and conditions applicable to the successful Applicant's work will be contained in the Contract to be signed by both parties but will include these technical specifications. If the Applicant does not understand anything written in this specification, they should consult the NCA South Sudan WASH Programme Coordinator for clarification, whether during the bidding period or during project implementation for successful contractors. Questions may be addressed in email form to Taban.Charles@nca.no

All bidders are asked to familiarize themselves with the content of South Sudan WASH Technical Guidelines and Manuals for Water Yards construction. The above documents may be requested from the Ministry of Water Resources and Irrigation in Juba or downloaded directly from http://db.wes-sudan.org/databasepublish.aspx.

A2) MATERIALS AND WORKMANSHIP

All the work noted in this specification must be carried out to the highest standard, using only the best tools, machinery, materials and skilled workforce. Samples of all materials to the quality specifications given hereunder must be shown to a representative of NCA South Sudan WASH Programme staff assigned supervisory roles on the project or for written approval from the WASH Coordinator before installation or use on the project component.

A3) STORAGE OF MATERIALS

All materials for use in the water yard construction must be stored in a safe place. If any material can be damaged by water, then the place must also be dry. If any materials are damaged before use, they must be replaced. All HDPE pipes and ancillaries should be stored in shaded places away from direct sunlight and with the threaded end caped. Ordinary Portland cement should be stored in dry place.

A4) SITE IN CHARGE

The Contractor must employ an experienced and knowledgeable site-in-charge who must always be on site to supervise the borehole construction work when work is being done. Such an individual must be conversant with the hydrogeology of South Sudan.

A5) CLEANING OF THE CONSTRUCTION SITE

When all construction and pump testing work is complete the Contractor must remove any rubbish, remove or flatten (as instructed by a WASH Programme staff of NCA South Sudan) any piles of loose earth, back fill metal scraps, concrete pieces and generally leave the whole area of the site clean and ready for use of the facility.

B) BOREHOLE CONSTRUCTION REQUIREMENTS

B1) PLATFORM, SPILT WATER CHANNEL AND LIVESTOCK WATERING TROUGH

All the tap stands shall have platforms. The apron of the platform is the standard design used in South Sudan. Sufficient quantity of cement (minimum 7 bags per platform and drainage channel), sand and aggregate with a mix ratio of 1:2:4 should be used to produce the concrete mix. A welded mesh should be used to reinforce the

structure and the drainage channel must be a minimum of 6 meters long and reinforced with rebar to avoid settlement cracks. At the end of the drainage, animal trough measuring 1.5m x 1.5m x 0.6m shall be constructed (see drawing for details). No brickworks are allowed for the construction of platform, spilt water channel and the livestock watering trough, thus the work is entirely concrete.

C) BOREHOLE FLUSHING BY AIRLIFTING AND TEST PUMPING

C1) BOREHOLE FLUSHING BY AIRLIFTING

The proposed borehole will be airlifted by hydraulic surging (by means of compressed air using a suitable compressor) for at least four (4) hours until satisfactory clarity is reached, stabilized and turbidity is less than 5 NTU. During flushing/airlifting, the contractor will proceed with static water level measurement. The Contractor is required to have a compressor of minimum capacity 10bars or 145 PSI and adequate supply fuel and lubricants for the use of the same. The airlifting/flushing date must be communicated to NCA to enable authorized NCA representative to be present during the process otherwise it will be considered that no flushing or airlifting occurred, and equivalent cost will be deducted from the final invoice.

C2) PUMPING TESTS

The Contractor must have a pumping unit capable of discharging 3,000 litres per hour of water, at the pump intake level. Immediately after flushing, all the flushing unit must be retrieved from the borehole, and the pumping unit introduced into the borehole. The Contractor will communicate (three days in advance) the date the pumping test is to be carried out.

The pumping test will consist of continuously pumping the borehole at the maximum yield 3,000 litres per hour for 4 hours followed by a 1-hour recovery test. The measuring of the dynamic water levels will be performed according to the logarithmic timescale schedule normally used for test pumping water boreholes. The Contractor will convey the pumped water at least 200 m away from the borehole such that no pumped water will be left standing within a radius of 200 m of the borehole. The Contractor will provide all the necessary equipment for this to be achieved. The Contractor will provide all the necessary equipment (weirs [V-notch], pipes, gauges, etc.) for the proper measurement of discharge rates and water levels. Draw-down and recovery data should be reported on the standard borehole logs supplied. This result will inform the size and depth of submersible pump installation.

C3) BOREHOLE YIELD

After the pumping tests have been carried out, the NCA South Sudan WASH Programme staff will compare the yield for such borehole with the one recorded on the earlier log available on record. The yield obtained by the contractor shall inform the type and depth of installation of the submersible pump.

D) BOREHOLE PROTECTION AND DISINFECTION

D1) BOREHOLE POLLUTION

The Contractor will take maximum care to avoid the physical, chemical or bacteriological contamination of the borehole water during insertion of tools for flushing or pump testing. If water is polluted due to the Contractor's neglect during construction, the Contractor will be obliged to carry out all the necessary operations, at the Contractor's cost, to redeem the borehole from such pollutants.

D2) BOREHOLE DISINFECTION

Once the borehole has been completed and tested, the Contractor shall sterilize the borehole with a chlorine solution yielding at least 50 mg/litre of active chlorine in all parts of the borehole. The chlorine solution may be prepared from calcium hypochlorite, sodium hypochlorite or gaseous chlorine. The chlorine solution should stay in the borehole for at least four hours at the specified concentration.

D3) WATER SAMPLES

The Contractor will take two water samples for laboratory analysis after completion of the long pumping test. One sample will be used for physical and chemical analysis in the following two groups:

- (Group1: Electrical conductivity, pH, Turbidity, Faecal Coliform and Residual Chlorine).
- (Group2: Arsenic, Chloride, Fluoride, Nitrate/Nitrite, Sulphate and Total Coliform)

Samples should be put in a clean and properly sealed and labelled (GPS coordinates, date and time, State, County, Payam and Boma) plastic or glass container. Another sample for bacteriological analysis should be collected in three sterilized and properly sealed containers. The volume of each container should not be less than 100 ml. All samples should be handed to a certified laboratory as soon as they are taken, in any case within a period of 12 hours.

D4) SAND PARTICLE CONTENT

The water drawn out of the borehole will be deemed unacceptable if it has a sand particle content of more than 5 g/m^3. As this sand content is deemed ruinous to the submersible pump.

E) BOREHOLE COMPLETION REPORT

E1) BOREHOLE LOGS, SITE PHOTOGRAPHS, LOCAL AUTHORITY AKNOWLEDGEMENT

The contractor has the responsibility to submit accurately completed borehole logs with the available information including GPS, well flushing results, test pumping results, photographs, submersible pump installation data, static water level, total well depth, dynamic water level and the date of starting and completion of the well, type of submersible pump installed, etc. Two copies of complete borehole logs will be provided by the contractor to NCA South Sudan. One copy will be handed over to the MWRI data base by NCA. Borehole logs must be entered to the correct understanding of the Site In-charge. The Site In-charge must sign in their full names clearly. Any slovenly completed well log will be rejected by NCA and payments for such works shall be withheld until the contractor corrects the log at their own cost. Contractors must avoid whitewashing and crossings on the final well logs submitted to NCA as such logs will lose their authenticity.

_____ Applicant's Signature Date