

## **TERMS OF REFERENCE FOR DRILLING OF BOREHOLE**

**Location: KajoKeji – Central Equatoria state**

**Project: IRRH**

**Job Title:** Drilling of **02** Bore-hole completed with I MK II/III hand pump.

### **Background**

Kajo Keji County, in Central Equatoria State experienced the brunt of the conflict which upset Central Equatoria State in 2016. The conflict led to majority of the inhabitants in Kajo Keji County to seek refuge in the neighbouring Uganda and others in IDP camps within the Greater Yei region. The conflict negatively impacted on women and vulnerable children facing risks of violence such as sexual abuse, forced displacement, exposure to hunger and life threatening diseases. There has also been food insecurity in the area affecting most of the families. With the formation of the new Government of National Unity in February 2020, Kajo Keji has registered relative calm and peace and the area.

GLI with funding from Islamic Relief Worldwide has secured funding to drill two boreholes in Gimere Village, Mere Payam and Nan Konyenyen Village Nyepo Boma.

### Scope of Work:

The drilling work is expected to be implemented in KajoKeji County , the specific sites are

S/no	Location/village	Boma	Payam
01	Nan Konyenyen	Kansuk	Nyepo
02	Gimere	Mere	Lire

The work will involve:

### Geophysical Survey/Profile Taking

The selected company is expected to carry out geophysical survey before drilling commences , the study is expected to use both secondary and primary data in the exercise; Secondary data will involve desk study of available information/data on existing boreholes



in the area, drill logs, reports and maps. The outcome of the study and recommendations is to be shared with GLI before commencement of drilling work.

The geophysical investigations will be carried out in a multi-step approach:

- a) Desk study: Review of existing data, topographical maps, satellite images, existing studies and borehole site investigations in the area, geological reports and maps (if available), borehole and surface water records, etc.
- b) Findings.
- c) Compilation, analysis, and evaluation of the gathered data and information.
- d) Site selection and reporting.

#### Borehole Siting:

The field investigations **MUST** be undertaken by a senior and experienced Hydrogeologist. The senior hydro-geologist will be responsible for planning, execution and interpretation of all geophysical data, reporting and selection of the most suitable site for the drilling. The most promising site selected for drilling shall be marked with a concrete marker and indicated on a sketch map. The recommended site identified has to be well communicated to the community and the community should be consulted on the site before drilling operation starts. Any geological difficulty arising making proposed sites by the community not suitable for hydrogeological reasons such that the promising sites falls outside the preferred one by the community , all reasons for such changes shall be clearly communicated to the community and ensure they understand and agree on that .

#### Bore Well Drilling Requirements

The drilling of the borehole should be carried out according to the characteristics of the soil formation of the site, as per result of the hydro geophysical survey while using proper drilling tools, drill pipes, casing pipes with centralizers to ensure that casing string is central within the hole.

- The expected bore well diameter is 7.5 inches
- The expected depth of the bore well is between 70.00m to 90.00m
- The expected yield of the bore well is a minimum 3,500 liters/hour.

Screen casing – factory made UPVC slotted 5 inches nominal internal diameter screens will be used throughout the aquifer zone. The slot size and screen length will depend on the aquifer materials and aquifer thickness placed at appropriate positions and depth. Screens



should be of an ISO standard and having the specification UPVC class 9/10 drinking water standard non- toxic.

Plain casing – 5. Inches nominal internal diameter casing should be of ISO standard UPVC class 10 drinking water standard , 3 meters long with threaded joints , well screwed , appropriately placed in the correct positions in non water bearing zone of the well .

Permanent casing – plain casing of 8 inches diameter Permanent casing must go up to 6 m or up to hard formation to ensure that it seals off all materials from surface runoff entering the well and sanitary grout is inserted to a depth of not less than 1.50m from ground level .

Development – on completion of drilling , an appropriate development method will be applied this can include continuous flushing for a period not less than 4 hours , meanwhile estimating the discharge rate . This is necessary to obtain the maximum yield of the well.

Gravel packing – Gravel packing material shall be supplied and install all along the filter (aquifer) section of the well. The material shall be 2mm – 4 mm diameter, clean, well rounded siliceous gravel with not more than 5% of non- siliceous materials. Sanitary seal should be installed at an appropriate depth using recommended grout materials.

Pumping test - Pumping test will be for a period not less than 6 hours in which the first 4 hours is for step draw down while the 2 hours for continuous test . The discharge at this point will correlate to the discharge during flushing.

Recovery test – recovery test should be done for at least 2 hours or such time when there is at least 80% of the static water level noted. The result for the pumping test should guide in determining the capacity of the pump appropriate for the well.

Water Quality Analysis – water quality test to be conducted at the d end of the drilling to determine the status of the water , considering all the parameters recommended for south Sudan, and ensure borehole is chlorinated before opening to users.

#### Bore-hole Installation:

Successful borehole will be installed with either Indian MK II or Indian MK III hand pump will be installed as follows : < 50 m pump depth will be Indian MK II and > 51 m pump depth will be Indian MK III

All platforms (aprons) should conform to south Sudan standards from Ministry of water resources and UNICEF.



All drainage channels should be 6m long. Ensure boreholes are chlorinated and closed for 8 hours before use .

#### Objectives :

To ensure that, two boreholes successfully drilled, completed with approved hand pump and aprons and drainage channels are of good standard. Ensure the production of the borehole is within the stated range.

#### Tasks and expected days of work

The contractor is expected to carry out the job accordingly, while assigning specific and clear task of works to specific team group e.g the hydrogeologist for geophysical survey, well logging and aquifer behavior, water engineer / technicians for test pumping and installation of hand pumps, drillers for good drilling operations .The whole work is expected to take 14 days including mobilization.

#### Reporting

Contractor to report on each phase of work successfully completed, this includes: Phase (1) Preliminary report of geophysical surveys work conducted on the two proposed sites, findings and recommendation of the hydrogeologist (2) drilling completed and test pumping done (3) Hand pump installation , apron construction and fixing of sign posts .

#### Handing over

Final inspection will be jointly conducted with the directorate of rural water supply and sanitation and community representatives whereby various components of the borehole will be inspected and verified, according to the check list In case of any defaults in any component, has to be rectified before final handing over is done.

After the facility is handed over, GLI will carry out post construction monitoring for a period of three months before the liability (retention) money is settled.

#### Visibility

A 0.80m wide x 1.20m long metallic sign post on 1.80m height stand ( legs) shall be properly and appropriately installed for each borehole successfully completed based on art work provided.

#### Rates and Prices

The contractor is deemed to have allowed in the rates and prices inserted in the bill of quantities for all charges for providing all the required materials, labour cost, transportation and handling costs, site supervision, plant, overhead costs and profits in carrying out the job to final completion.

#### Protection of staff and public

The contractor is required to erect guard rail barriers or buffer barriers , covers and warning signs all as necessary to protect the people around and the public especially children , such as protecting against access to the drilling equipment during drilling and construction process .Ensure the barriers are removed after work completion

#### Confine operation



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The contractor shall confine his workmen, plants, materials, equipment and operations within the boundaries As marked on the site plan and shall not enter upon nearby lands without the consent of the concerned persons and or owners of the nearby land. The contractor shall take all necessary precautions during the work progress to prevent damages to the nearby lands or properties for example dumping unwanted materials and other related drilling wastes to nearby lands without consent of the owners .

### **Bill of quantities for drilling of a complete borehole equipped with Indian MK II/II hand pump**

S/no	Item Description	Unit	Quantity	Unit cost	Amount-USD
Item number	<b>Boreholes drilling</b>				
01	Preliminaries: Conduct desk top study of the proposed site to establish information that can guide in decision making regarding the proposed location. Conduct geophysical survey using (resistivity meters Terramater SAS 1,000) or any related instrument to identify the most promising site for the drilling.	<u>Unit</u>	<u>1</u>		
02	mobilization of resources and transportation of drilling equipment to the project sites.	Unit	1		
03	Drilling boreholes of 7.5 inches diameter through all types of soil formation including disposal of excavated materials.	Meter	90.00		
04	Supply and Install 5 inch nominal internal diameter Plain UPVC Casings Well screwed to each other	Meter	81.00		
05	Supply and Install 5 inch nominal internal diameter Slotted (screen) UPVC casings.	Meter	9.00		
06	Provision and Installation UPVC Bore hole end caps	Unit	01		



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07	Supply and Install Permanent casing 8 inch nominal internal diameter plain UPVC casing	Meter	06		
08	Allow for taking samples of drill cuttings at five (5) meters intervals.	Job	1		
09	Supply and insert filter gravel packing 2mm to 4mm size	M <sup>3</sup>	2.50		
10	Sanitary seal - Provide and allow for inserting of grout (1:1 cement to sand) in top annulus space not less than 1.5 metter deep.	M	1.5		
<b>(B)</b>	<b>Borehole development</b>				
11	Borehole development work including inserting and removal of test pumping/development equipment  Test pumping 3 hours for step draw down and 3 hours constant discharge test including installation, removal of test pumping equipment , water level observations and draw down measurements	hours	6		
12	Undertake Water Level observation and record on Recovery	hour	3		
13	Carry out bacteriological, physical and chemical analysis of the borehole water.  Borehole disinfection as specified	Job	1		



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14	Data analysis, drilling, bore hole completion reports, pump test report, hand pump installation report compilation in three hard copies and 1 electronic copy for each well.	Job	1		
<b>(C)</b>	<b>Hand pump installation</b>				
<u>15</u>	<p>Provision and placing of RC in pump Apron and drainage channel Slab 150mm thick mix 1:2:4</p> <p>- general Excavation of top soil &amp; cart away depth need 200mm (assume 3x2m channel inclusive)</p> <p>Blinding on top fill approved material well compacted thick n.e 50mm.</p> <p>Provision and placement of BRC Mesh as apron reinforcement</p>	3.20	M <sup>3</sup>		
16	Provision and installation of hand pump pedestal, head assembly, water tank , 1 1/4" G.I. pipes & connecting rods and cylinder assembly, cylinder depth will be determined by the static water level of the borehole.	1	Set		
17	Soakage pit- allow to excavate 1.00 m diameterx1.50m deep in soakage pit, allow for filling with recommended filling materials and well covered with plastic sheet and soil on top.	1	Unit		
18	Provide and allow to fix 1.20m x0.80m metallic sign post on 1.80 m long stands. Writings on the sign post will be provided	1	Piece		
19	General cleaning and Landscaping all around Borehole 10m radius	1	Job		
<b>Total USD</b>					



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