PROCUREMENT OF WORKS FOR TEST PUMPING OF FOUR (4) BOREHOLES IN THE MOLOPO SUB-BASIN IN BOTSWANA

TERMS OF REFERENCE

OCTOBER 2021

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1 BACKGROUND

1.1 The Orange Senqu River Commission (ORASECOM)

The Orange-Senqu River originates in the Lesotho Highlands, from where it flows westwards to its mouth at Alexander Bay/Oranjemund on the Atlantic West Coast. The river basin is the third largest in Southern Africa, after the Zambezi and the Congo, covering a total area of 1,000,000 km^2 of which almost 600,000 km^2 is inside the Republic of South Africa. Four countries - Botswana, Lesotho, Namibia and South Africa - share the Basin, and the river forms the border between South Africa and Namibia at its lower reaches.

Lesotho, the upstream country falls entirely within the basin and contributes over 40% of the stream flow from only 3.4% of the total basin area but is one of the smallest users of water from the basin. South Africa is by far the biggest user of water from the Orange-Senqu River Basin, and this use drives the economic heartland of South Africa. The Botswana part of the Basin is entirely covered by the Kalahari Desert with very little surface runoff, but groundwater contributes to the water demands in this portion of the basin.

The water requirements in the lower reaches of the river are driven primarily by irrigation demands from both Namibia and South Africa, and the need to maintain environmental flows to the estuary. As the most downstream portion of a heavily used basin, water resources quality in this stretch is a concern. Similarly, the middle and lower reaches of the river are subject to periodic and often devastating floods. The Orange River estuary is ranked as one of the most important wetland systems in Southern Africa but has experienced environmental degradation. This wetland system was re-designated as a Ramsar Site, but because of its threatened status it was placed on Montreux Record in 1995.

The effective management of the Orange-Senqu River Basin is, therefore, particularly complex, but is also vital to the economy of the region. As a result, the riparian States prioritised this basin for the establishment of a Shared Watercourse Institution under the revised Southern African Development Community (SADC) Revised Protocol on Shared Watercourses. ORASECOM was one of the first of the Shared Watercourses Institutions to be established in SADC.

ORASECOM is an advisory body, issuing recommendations to its Member States (The Parties) aimed at optimizing the development and management of the water resources of the Orange-Senqu River Basin for the benefit of all the people in the Parties.

1.2 The ORASECOM Agreement

The Agreement establishes Council as a technical advisor to the Parties on matters relating to the development, utilization, and conservation of the water resources in the River System. The Parties may also assign other functions pertaining to the development and utilisation of water resources to the Commission. Article 5 of the Agreement empowers Council to take all measures to make recommendations on *inter alia;* water availability in the basin, equitable and reasonable sharing of water, studies on the development of the River System, the extent to which stakeholders should be involved in management of the system, the prevention of pollution and the control of aquatic weeds, and plans for emergency situations.

All recommendations provided by Council to Parties must be contained in a report, signed by the leader of each Delegation. These reports must also include estimates of the cost of implementing the recommendation and may suggest how these costs may be apportioned between the Parties. Recommendations to Parties must therefore not only indicate what must be done, but also how it must be done.

1.3 The ORASECOM UNDP-GEF Project to support the Strategic Action Programme Implementation

ORASECOM, with support from UNDP, managed to secure further financial support from GEF to implement selected priority activities of SAP. The UNDP-GEF project titled, Support to the Orange-Senqu River Strategic Action Programme Implementation, will be implemented by UNDP and executed by ORASECOM in the next 5 years to support ORASECOM and its member states to implement SAP. The client (ORASECOM) has received funds from UNDP GEF towards the cost of the services and shall be allocated among member states for chosen projects. The project has been built on the Transboundary Diagnostic Analysis (TDA) which has carried out the necessary causal chain analyses in order to identify the transboundary threats to the sustainable development and management of the water resources of the Orange-Senqu Basin. Having identified and understood the threats and their causes, it was possible to identify the barriers which are preventing the removal of these threats, so that sustainable development/management of the basins water and related resources can proceed.

The overall objective of the SAP Implementation project is the strengthening of joint management capacity for implementation of the basin-wide IWRM Plan and demonstrating environmental and socioeconomic benefits of ecosystem-based

approach to water resources management through the implementation of SAP priority actions in the Orange-Senqu River basin.

The ORASECOM UNDP SAP Implementation project is supporting the Government of Botswana to develop and implement a comprehensive groundwater monitoring system in the Orange - Senqu basin part of the country. The monitoring system is important in that it will be used to pilot a common approach to the management of the available groundwater resources and a common protocol for data gathering, which can then be replicated in other parts of the basin. Thus, a comprehensive groundwater assessment is being undertaken to improve understanding of the quantity and quality of groundwater resources as well enhance good planning for utilisation. The monitoring of the quality of groundwater has lagged which is a serious issue considering how many people depend on it for their potable water. If all these are addressed, they will lead to development of an effective groundwater monitoring system which will be critical for the monitoring and evaluation of the impacts of the various interventions in the basin (such as desalination plants) and ultimately at the basin wide level as part of scaling up.

1.4 Projective Objectives

The main objective of the project is to undertake a comprehensive groundwater assessment of the Molopo Sub-basin Catchment which stretches from Tsabong to Bokspits in Kgalagadi South. In addressing gaps, this will help in mitigating the challenges faced by the shortage of potable water and decreasing water quality in the project area.

As a precursor to the wider assessment, four (4) existing boreholes are to be test pumped in order to understand the aquifer parameters. These four (4) boreholes were selected in different geological environments (Kalahari, Karoo, and Olifantshoek Formations).

The contractor will be expected to undertake Test Pumping of Four (4) existing boreholes between Tsabong and Bokspits in Molopo Sub-Basin in Botswana.

1.5 Project Location and Access

Access to the project area is by tarred road from Gaborone to Tsabong (520km) and to Bokspits (780km). From Bokspits to Two Rivers is gravel road along the Nossob River. Off road needs four wheel drive vehicle due to heavy sand and sand dunes. The location map of the project area along with locations of four (4) existing boreholes for test pumping works is presented in Figures 1-1.

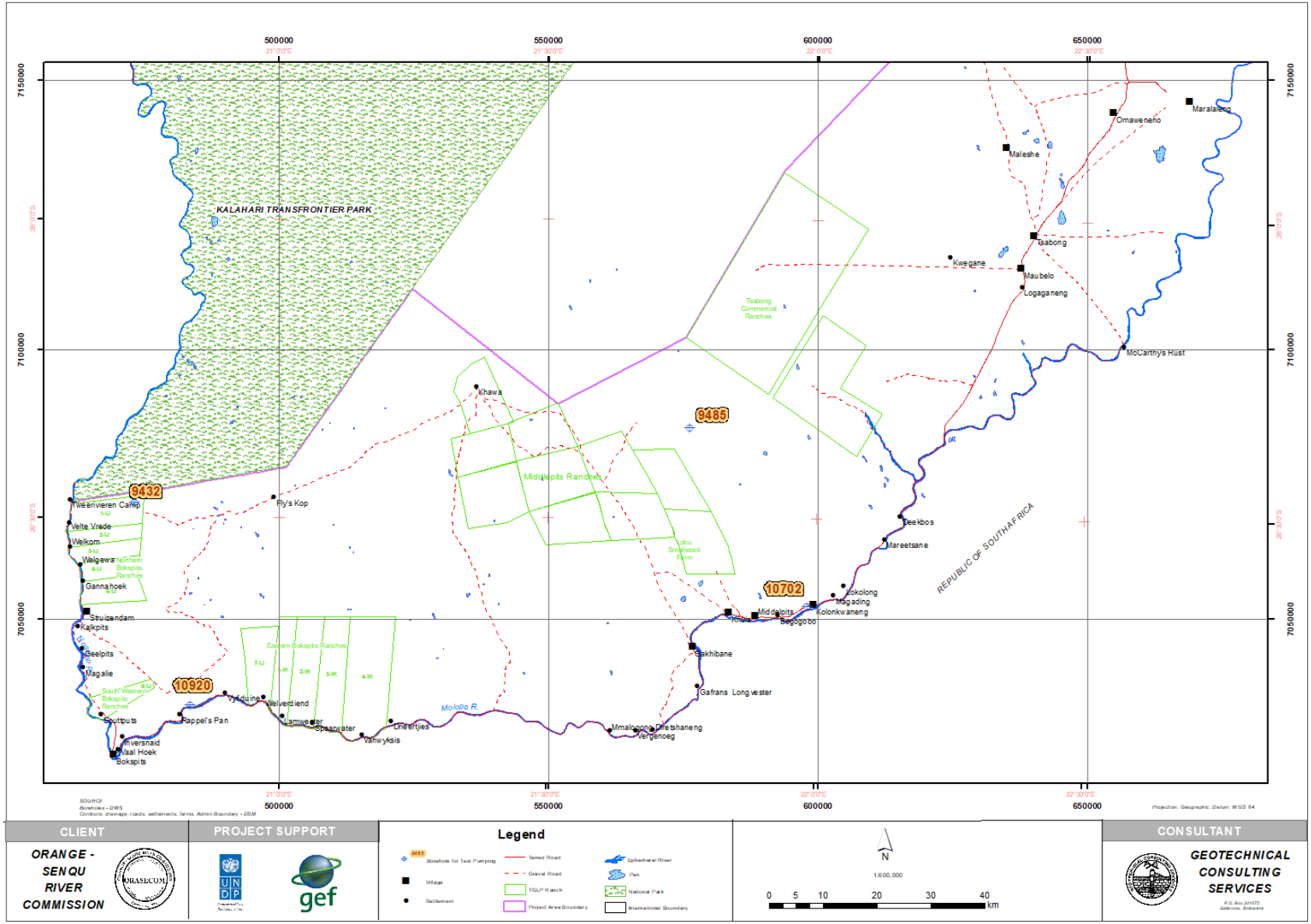

Figure 1-1 **Location Map of the Project Area and Boreholes for Test Pumping Works**

2 TECHNICAL SPECIFICATIONS

2.1 Description of Works

The contracting works comprise test pumping of Four (4) existing boreholes for water supply purposes between Tsabong and Bokspits in Molopo Sub-Basin in Botswana. The four existing boreholes not in operation were identified in different hydrogeological environments. Two boreholes (BH 9432 and BH 9485) were identified in Karoo aquifer and one each Borehole 10920 in Kalahari and borehole 10702 in Olifantshoek Formation. The summary details of these boreholes are given in Table 2-1 and are shown in Figure 1-1.

The Test Pumping Works will be undertaken in accordance with the General Technical Specifications of the DWA March 2000 Drilling and Test Pumping Document. If there is disparity between the Specifications contained herein, the General Technical Specifications of the DWA March 2000 Drilling and Test Pumping Document will prevail.

The purpose of the test pumping works is to determine the hydraulic characteristics of the aquifer in the project areas and the hydraulic performance of the boreholes. The tests to be conducted are as under:

- Calibration Test
- Step Drawdown Test
- Constant Rate Test
- Recovery Test

The contractor is expected to conform to the following:

- Yield during Constant Rate Tests remains constant
- Water level measurements are accurately taken at the specified times
- Actual time of measurement in observation wells is recorded
- Co-operate with the consultant in taking water samples and any other observations/samples required by the consultant
- Proper lighting arrangement during the night

Table 2-1 Summary of Borehole Data for Test Pumping Works

Borehole Number	Location	Date Drilled	Depth (mbgl)	Drilled Diameter (mm)	Casing Interval (m)	Casing Diameter (mm)	Type of Casing	Water Strike (mbgl)	Estimated yield(m^3/h)	SWL (mbgl)	Lithology	Formation/group
9432	about 12 km E of Two Rivers Camp	03/05/2001	215	0 - 34 m; 305 mm	0 - 10.66	305	Plain	97	Seepage	60.91	6 - 21 m; Sand, yellowish, fine grained	Kalahari
				34 - 97 m; 254 mm	0 - 34.16	254	Plain	187	9.0		21 - 34 m; Silcrete and sandstone, brown to greenish, fine grained	Kalahari
				97 - 215 m; 203 mm	0 - 97.375	203	Plain				34 - 67 m; Mudstone, green to reddish	Otshe
					0 - 179.93	165	Plain				67 - 96 m; Sandstone, reddish and white, medium to fine grained	Otshe
					179.93 - 198.295	165	Screen				96 - 103 m; Sandstone, light brown to greyish, medium to coarse grained	Otshe
					198.295 - 212.525	165	Plain				103 - 116 m; Sandstone, redish and greyish, fine to medium grained	Otshe
											116 - 138 m; Sandstone, varigated reddish, yellowish, and greenish, fine to medium grained	Otshe
											138 - 154 m; Sandstone, grey, fine grained	Otshe
											154 - 156 m; Sandstone, light brown, medium grained	Otshe
											156 - 158 m; Dolerite	
											158 - 167 m; Sandstone, light brown to grey, fine to medium grained	Otshe
											167 - 187 m; Sandstone, grey, fine grained interbedded with shal	Otshe
											187 - 207 m; Sandstone, grey, fine to medium grained	Otshe
											207 - 215 m; Shale, dark greyish black, carbonaceous	Kobe
9485	about 8 km SE of Stokoma Cattle Post	03/08/2001	79	0 - 23 m; 305 mm	0 - 6.10	305	Plain	55	1.9	46.30	0 - 17 m; Sand, reddish, orange, pink	Kalahari
				23 - 53 m; 254 mm	0 - 23.06	254	Plain	65	4.9		5 - 9 m; Sand, light brown, fine grained	Kalahari
				53 - 79 m; 203 mm	0 - 53.64	203	Plain				9 - 15 m; Sand, reddish, fine grained	Kalahari
					0 - 53.68	165	Plain				15 - 18 m; Calcrete and silcrete	Kalahari
					53.68 - 59.43	165	Screen				18 - 46 m; Mudstone, pink	Otshe
					59.43 - 63.57	165	Plain				46 - 53 m; Mudstone, brown	Otshe
					63.57 - 75.66	165	Screen				53 - 55 m; Sandstone, brown, medium grained	Otshe
					75.66 - 77.66	165	Plain				55 - 62 m; Mudstone, dark grey	Otshe
											62 - 65 m; Sandstone, yellow, medium grained	Otshe
											65 - 79 m; Sandstone, light grey, medium to coarse grained interbedded with shale, dark greyish black, carbonaceous	Otshe
10702	Bogogobo	11/26/2010	136	0 - 6.0 m; 305 mm	0.0 - 6.5	254	Plain	nil	na	48.10	0-1m: Sand, brown	Kalahari
				6.0 - 52.0 m ; 254 mm	0.0 - 52.50	203	Plain				1-10: Silcrete, cream, hard	Kalahari
				52.0 - 136.0 m; 165 mm ?	0.0 - 87.50	165	Plain				10-12m: Quartzite, grey, massive	Kalahari
											12-20m: Mudstone, greyish brown	Kalahari
											20-24m: Quartzite, dark grey	Olifantshoek
											24-40m: Mudstone, reddish brown	Olifantshoek
											40-86m: Quartzite, light grey, fine grained	Olifantshoek
											86-136m: Quatrzite, grey, fractured, fine grained	Olifantshoek
10920	Rapple's Pan	15-12-2012	100	0 - 20.00 m; 381 mm	0.0 - 1.0	381	Plain	57	8.0	40.60	0-1m: Sand, brown, fine grained	Kalahari
				20.00 - 100.00 m; 254 mm	+1.0 - 20.0	254	Plain				1-15m: Calcrete	Kalahari
					+1.0 - 55.0	165	Epoxy Plain				15-18m: Sandstone, clayey	Kalahari
					55.0 - 70.0	165	Epoxy Screen				18-30m: Sandstone, brown, fine grained	Kalahari
					70.0 - 75.0	165	Epoxy Plain				30-44m: Mudstone, yellow	Kalahari
					75.0 - 90.0	165	Epoxy Screen				44-58m: Sandstone, reddish brown, fine grained	Kalahari
					90.0 - 100.0	165	Epoxy Plain				58-85m: Sandstone, brown, medium grained	Kalahari
											85-98m: Sandstone, brownish red, medium grained	Kalahari
											98-100m: Sandstone, reddish, fine grained	Kalahari

Note:	
m	Meters
mbgl	Meters below ground level
mm	Millimeter
m^3/h	Cubic meter per hour

2.2 Test Pumping Programme

Calibration Test

A calibration test comprising up to eight (8) steps, each step being of 15 minutes duration will be under taken to determine engine RPM, maximum borehole yields and drawdowns.

Step Drawdown Test

Continuous step drawdown tests comprising of four (4) to six (6) steps, each step of 120 minutes will be carried out to determine borehole hydraulic parameters and a suitable yield for the constant rate tests.

Constant Rate Test (CRT)

Constant rate tests are to be carried out for duration of 72 hours (3 days), however, a longer duration test can be carried out depending on aquifer response and on site decision by the consultant.

Recovery Test

Recovery measurements will be taken for twenty-four (24) hours or 95% recovery or for a period to be specified by the consultant.

2.3 Equipment

Pumps

The depth of boreholes ranges from 79m to 215m. The estimated borehole yields are ranging from seepage to $10m^3/hr$. The Rest water levels are in the range of 40.10m to 60.90m. The pump intake will be in the range of 75m to 200m. The contractor should mobilise pumps and rising main columns accordingly to accommodate yield and pump intake range.

Discharge Measurement

Discharge (yield) measurements are to be taken using a combination of flow meter, piezometer/orifice plate method and calibrated bucket. Methods will be approved at the pre- mobilisation meeting. Discharge measurements will be taken at the wellhead (within 50m) with a suitable method of removing discharge water when

measurements are not being taken. Discharge lines will be 250m in length and if required booster pumps and reservoir ponds are to be provided.

Observation Boreholes

The contractor will be responsible for taking water level measurements during CRT and recovery tests at nominated boreholes within 1km radius of the pumping well. The contractor will ensure that the delay time between pumping water level reading and observation well water level reading is recorded.

Water Level Measurements

Water level measurements will be taken using electrical dippers at the times specified on the prescribed DWS forms or as advised by consultant.

Water Sampling

Water samples will be collected by the consultant with the assistance of the Contractor(s). Samples are to be collected in one (1) plastic bottles in pairs, one acidified and one non-acidified and labeled. The consultant will supply the bottles. Well head chemistry (pH & EC/TDS) will be taken by both the Contractor(s) and consultant at hourly intervals. Other well head chemical parameters and samples will be collected by the consultant.

Reporting

The contractor will email/fax a daily report to the Consultant (Geotechnical Consulting Services). Completed test data forms are to be handed over to the consultant at the end of each test.

Mobilisation and Mobilisation

The test pumping activities at the site will commence fourteen (14) days after the premobilization meeting or as discussed and agreed during the premobilization meeting.

3 Contractor Composition and Qualification Requirements

3.1 Contractor's Experience General

The Contractor should possess the required experience to undertake a project of such magnitude. The contractor domiciled in Botswana and has been registered with the Public Procurement and Asset Disposal Board (PPADB) in the following categories:

- Code: 09 Grade OC (Drilling Services); Sub code(s): 02 (Test Pumping)
- Tax Clearance Certificate

3.2 Personnel Requirements

The Contractor should provide all the below required staff to carry out all the stated tasks and other duties in the project and all key staff must demonstrate experience. The Contractor shall include a detailed time schedule showing each specific task that will be used as a tracking sheet to meet the project deliverables. Personnel scheduling chart, identifying everyone by name and his discipline, and showing on a Gantt chart the estimated number of man-months of each individual, shall be used on the project. The Contractor shall be required to make appropriate use of available local expertise to ensure that local conditions and capacities are best considered. In the selection of local individuals, any conflicts of interest must be avoided. The Consultant shall also note that civil servants and other staff of the public administration cannot be recruited as experts.

3.2.1 Key Personnel for Tasks

- **Test Pumping Supervisor:** Minimum of 10 years' experience as Test pumping Supervisor
- **Operator:** Minimum of 5-years experience as a Test Pumping operator

In addition to completing the following, full curricula vitae of the Test Pumping Supervisor (s) and Supporting Staff shall be inserted. Any changes of personnel within the execution of the Programme will be subject to approval by the Client.

Test Pumping Supervisor (to be filled and signed)

Name Age Nationality

Years of Experience Total

With Company

Details of Experience: (Other than stock, domestic and shot hole drilling)

Client	**Position**	**Technique**	**Completed Depth**	**Yield m^3/hr**

Signed by Test Pumping Supervisor as true and accurate account of his test pumping experience

----------Date:

Test Pumping Operators

Name Age Nationality

Years of Experience- Total

With Company

Details of Experience: (Other than stock, domestic and shot hole drilling)

Client	**Position**	**Technique**	**Completed Depth**	**Yield m^3/hr**

Signed by Operator as true and accurate account of his experience

.....……. ……Date:

Invoicing

Separate invoices and completed data sheets are to be given to the consultant for checking and approval. There should be no gaps on completed data sheets and no overwriting of numbers on submitted data sheets would be accepted. Where no yield

data is collected, especially at the start of tests, a comment on the data sheet is to be made. The contractor will also provide the consultant with the original field data sheets.

Timing of Activities

The contractor will have 7 days to mobilise to the site, following the pre-mobilisation meeting. The estimated time for the testing pumping of a borehole is 10 days including moving to and rigging at the site, calibration test, step draw-down test, constant rate test and a 24 hour or 95% recovery time. Thus estimated time of completion of the test pumping is 40 days. The high yielding boreholes (yield exceeding $10m^3/hr$) could be considered for a longer duration of pumping (5 days) depending upon the aquifer response and the decision taken by the consultant. Therefore the estimated time of completion could be as much as over 50 days. The number of boreholes for long duration test will be specified during Pre-mobilisation meeting.

Camp Site and Safety

The contractor is to abide by the Environmental Code of Conduct (Appendix A). The contractor's personnel should have safety equipment (hard hats, safety boots etc.). The contractor must sign and submit the Environmental Declaration as part of this tender submission.

Co-ordination of Works

Name of Client and DWS Supervisor: Orange-Senqu River Commission (ORASECOM) Mr. Michael Ramaano (mike.ramaano@orasecom.org Tel: +27843051002) and Mr. Thato Seth Setloboko (tssetloboko@gov.bw, Tel: 00267 360 7321)

Name of Consultant: Geotechnical Consulting Services (Pty) Ltd (Mr Comfort Molosiwa, Tel: 00267 313 2967)

4 Submission of the Tender

Electronic Technical and Financial proposals should be submitted with a subject line clearly titled: **"Procurement of Works for Test Pumping of Four (4) Boreholes in the Molopo Sub-Basin in Botswana"** through email to Mr Michael Ramaano (mike.ramaano@orasecom.org) with a copy to communication.orasecom@gmail.com and mike.ramaano@gmail.com no later than **1600hrs on 05 November 2021**.

Request for clarifications should be emailed (preferred mode of communication) to the above contacts, mobile +27 843051002, no later than **1600hrs on 01 November 2021**.

5 BILL OF QUANTITIES

Test Pumping Mobilisation and Demobilisation					
Once off Charge for the entire Project					
Item No.	**Description**	**Unit**	**Qty**	**Rate (Pula)**	**Amount (Pula)**
1	Mobilisation and Demobilisation	Once off	1		
SUB TOTAL					

Test Pumping of Four (4) Existing Boreholes					
Item	**Description**	**Unit**	**Quantity**	**Unit Rate**	**Amount**
2	**RIGGING UP**				
2.1	2" Columns	No.	Rate only		
2.2	3" Columns	No.	4		
2.3	4" Columns	No.	Rate only		
3	**INSTALLATION AND REMOVAL**				
3.1	Steel Pipe	M	493		
4	**Rate**				
4.1	Up to 15m³/hr	Hr	426		
4.2	15 to 30m³/hr	Hr	14		
4.3	30 to 60m³/hr	Hr	Rate only		
4.4	> 60m³/hr	Hr	Rate only		
5	**Recovery**				
5.1	Measurements	Hr	96		
6	**Monitoring**				
6.1	Observation Boreholes (pumping)	Hr	240		
6.3	Observation Boreholes (recovery)	Hr	48		
6	**Other Operations**				
6.1	Uncapping and Capping	No.	4		
6.2	Discharge to 250m	No.	4		
6.3	Discharge > 250m	M	Rate only		
6.4	Work Time	Hr	8		
SUB TOTAL					

Note: *Measurements of Observation boreholes are subjected to availability within 1km radius.*

SUMMARY OF TEST PUMPING COSTS		
Summary Items	**TEST PUMPING ACTIVITIES**	**In Pula**
1	Mobilisation	
2	Test Pumping Rate	
3	Recovery	
4	Monitoring of Observation Boreholes	
5	Other Operations	
TOTAL 1 - 5		
Total Test Pumping		
VAT 14%		
GRAND TOTAL		

APPENDIX A

ENVIRONMENTAL GUIDELINES AND CODE OF CONDUCT

General

All test pumping works shall be conducted in an environmentally and socially sensitive and responsible manner.

The following guidelines are intended to ensure that all parties involved are aware of the potential impacts of their activities and carry out the work in a manner that is environmentally sensitive as well as sensitive to the interests and rights of local communities.

The guidelines and code of conduct are designed as a written statement of intent for Contractors to adhere to, and to which recourse can be made in the event of perceived undesirable impact. They should therefore be read and construed as part of the contract for test pumping. The Contractor shall be required to familiarise all employees with the contents and spirit of these guidelines.

The Contractor shall be required to strictly adhere to these guidelines and code of conduct, failing which the Contractor shall be required to repair any damages resulting from such failure at his/her own cost. There shall be no time limit on when a Contractor can be called back to a site to clean it up.

Access

Tracks leading to people's lands/fields or cattle posts if used by the Contractor during test pumping must be cared for especially during wet season. The contractor at his own cost will repair any adverse damage to the tracks used by people.

If fences need to be cut to gain access to a field or area the Contractor will obtain permission for access and repair at his own cost any damage caused to fences in obtaining such access. Access across environmentally sensitivity areas (pans, reverie vegetation) is to be avoided. Where such areas occur access roads will go around them as directed by the site supervisor.

Clearing of Vegetation

(a) Clearing of vegetation should be undertaken using hand tools, save in circumstances when it is necessary to use mechanical clearing equipment. Approval will be given by the Engineer. No unnecessary clearing of the vegetation shall take place

(b) The clearing of the vegetation using vehicles or heavy equipment such as bulldozers and tractors, shall not be allowed

(c) Large trees, with a stem diameter of 200 millimetres (mm) or more, shall not be cut, cutlines and access routes (vehicle tracks) should be routed around them

(d) Where this may not be possible, these trees can only be removed with the express permission of the Consultant

Camps

If and where new field camps are needed, their construction and removal should be carried out along the following lines:

(a) permission for camp areas must be obtained from the Land Board authorities,

(b) access roads and the camp areas should be sited to cause minimum disturbance. No large trees should be cut down and the use of fire wood must be restricted to dead wood only and should not conflict with the needs of residents in the area,

(c) no permanent structure should be built,

(d) the camp is to be removed, site cleared and all scrap removed at the end of each project and work at a site,

(e) all rubbish (except for oils and other mechanical or chemical waste) is removed,

(f) waste oils, chemical and mechanical waste to be stored and removed to Government /Municipality designated dumping sites or recycling plants,

(g) human waste must be buried at least 30cm below the ground and where a permanent or base camp is established, proper sanitary facilities should be put in place,

(h) should fuel, oil or any other chemical substances need to be stored at the field camps, these must be stored in appropriate spill proof containers with adequate spill containment, to prevent these substances entering in to the environment. Hazardous substances should be stored in a safe pace.

Human Relations

(a) Peoples water, lands and livestock must be respected.

(b) Where test pumping is to take place within private property, the Contractor is to ensure that he has a copy of the approval letter from the owner of the property or Land Board Authorities authorising the work to continue,

failing which the Contractor might be stopped at any time without any claims for standby time.

(c) All conflicts/disagreements and agreements (use of boreholes etc.) no matter how trivial, must be logged and dated, with details of persons involved and subject matter, in a book for this purpose at base camp.

Test Pumping Operations

(a) During test pumping it is preferable if the water is pumped into the existing extraction/production pipes. Failing that, test pumping water should be directed into pans or river courses, where possible. Long duration pumping will affect livestock distribution if surface water (pumpage waste) is available in the dry season.

(b) Outlets should be designed to minimise erosion and soil disturbance. A splash surface and rip-rap should be used to disperse outlet flows. These should be removed when testing is finished.

(c) Drawdown effects on surrounding stock/domestic boreholes/boreholes during test pumping must be monitored.

(d) No spillage of oils or fuel should occur.

Borrow Pits/ Excavation

(a) Permission to dig open pits must be obtained from the Land Board Authorities.

(b) A clear time table, which includes orderly opening up of the pit and the reinstatement of the area after use, needs to be drawn up prior to use of a borrow pit.

(c) Top soil should be carefully removed first and stored separately from the subsoil. After use the pit should be filled with remaining subsoil first, followed by the topsoil, which should be evenly spread across the entire pit area.

Disposal of Rubbish

Rubbish shall not to be burnt, buried or left on or adjacent to the site during test pumping operations or after the field camp has been disassembled and removed.

Test Pumping and Test Pumping Sites

(a) The quality of test pump water should be determined and where such test pump waste water is of acceptable quality for livestock watering crop irrigation, this should be channelled into an appropriate man-made impoundment where it can be utilized for temporary livestock watering crop irrigation or other domestic use.

(b) No earthmoving shall be undertaken to create such impoundments as these must be of a temporary nature and shall be constructed from artificial material.

(c) All temporary structures must be removed from the site once this Temporary water source has been depleted. This water use may only be practical where such test pumping activity takes place in close proximity to settlements.

Noise Level

The contractor has to make sure that the noises levels are minimized and do not unnecessarily disturb persons or wildlife.

DECLARATION

Sir,

I confirm of having read and understood and fully accept the above Environmental Guidelines and Code of Conduct. I hereby certify to STRICTLY ADHERE TO THESE GUIDELINES, to carry out the work in a manner which is environmentally sensitive and which is sensitive to the interest and needs of local communities and to repair any damage resulting from such failure to adhere to the above at my own cost.

Signed ----------Company Date

Name Position