Request for Quotation: Supply and installation of hydrometric equipment in Mozambique and Zimbabwe, Buzi, Pungwe and Save Basins (BUPUSA GEF Contract ITB No. T004/11/2021)

Global Water Partnership Southern Africa
Hatfield, Pretoria

Background

The (Global Environmental Facility) GEF-funded project "Management of competing water uses and associated ecosystems in Buzi, Pungwe and Save (BUPUSA) basins" will be implemented by the International Union for Conservation of Nature (IUCN) and executed by Global Water Partnership Southern Africa (GWPSA) together with the Government of Mozambique (GoM) and Government of Zimbabwe (GoZ). It targets the conservation and sustainable use of the transboundary water resources, including their risk mitigation components within the Buzi, Pungwe and Save river basins shared bilaterally by Mozambique and Zimbabwe. The 3 basins are located along the Beira corridor, an important economic corridor that links Beira harbour to the hinterland, with associated impacts on the environment (pollution from mining activities, intensive agriculture, deforestation, saline water intrusion etc.). Populations in the basins have become highly vulnerable to climate hazards (i.e., floods, droughts, cyclones) whose occurrence is likely to increase with climate change aggravation. The project has a double focus of developing capacities for managing water resources and designing participatory and community–based strategies.

Objectives

The project aims to strengthen the hydrometric network for the Buzi, Pungwe and Save watercourses through the reinforcement of monitoring systems, the development of real-time operational tools and the improvement of rating tables. The ultimate goal is to improve transboundary water resources management for the rivers shared exclusively between Mozambique and Zimbabwe.

The Mozambique and Zimbabwe Governments have with the support of the GEF BUPUSA project identified 12 Hydrological stations to be equipped with Telemetry equipment. The objective of the project is to provide real-time data to support flood management as well as support the operationalization of the signed agreements between Mozambique and Zimbabwe, and also intends to improve the accuracy of flow measurement between the two countries, through procurement of appropriate equipment.

GWPSA, on behalf of the beneficiary, is pleased to invite you to take part in a Request for Quotation for the GEF BUPUSAs. This opportunity will be in the form of an open competitive bidding process. A quotation based on a fixed price and proposed activity schedule is requested in Annex 1A and B.

Please find below the requirements for your response and pricing, The scope of works, the scoring system and health and safety requirements.

The deadline for submissions is **8 December** 2021 **at 12:00 CAT** and it is our intention to award the contract shortly thereafter. Any quotation queries must be raised before **17:00hrs on 22 November 2021** and should be directed to gwpsaprocurement@gwp.org and copied to mark.naidoo@gwpsaf.com. The Bids will be opened on **10 December 2021**. Bidders will be advised on the results within **3 working days** after the bids are reviewed. Bids received after the final date of receipt of tenders may be disregarded. GWPSA may extend the final date for submission of bids for any reason it deems necessary and will notify all bidders in this event.

Bid submissions should be addressed to:

The Manager
GWPSA
Ground Floor, Block A
Hatfield Gardens
333 Grosvenor Street
Hatfield, Pretoria
Reference no.: T004/11/2021

and emailed to gwpsaprocurement@gwp.org and copied to mark.naidoo@gwpsaf.com (**note email submissions should be in batches each less than 10Mb**)

The project activity is anticipated to commence in second week of December 2021, and it is expected that all tasks will be completed within a 10 (2) week period from date of award.

The Work will be administered under a bespoke Supply Agreement compliant with the Global Water Partnership South Africa (GWP SA) Procurement Policy.

A Scope of Work

Following a scoping exercise, GWP SA on behalf of the member states (herein represented by the Government of Mozambique and Government of Zimbabwe, and Government being the beneficiary entity) wishes to procure the services of an experienced contractor as itemized below:

A1: Telemetry equipment and Software

The contractor shall supply and install telemetry equipment and software in Mozambique and Zimbabwe as follows:

i. Mozambique

- Supply hydrometric equipment as specified in annex 1A;
- Supply and install Server with appropriate software at Direcção Nacional de Gestão de Recursos Hídricos (DNGRH)
- Supply and install appropriate receiving software at Administração Regional de Águas do Centro (ARA-Centro), IP (Pungwe and Buzi Units); and, Administração Regional de Águas do Sul (ARA-Sul), IP (Save Unit);
- Conduct test runs and ensure that the system is running efficiently;
- The contractors should provide detailed manual for equipment and processes thereof

ii. Zimbabwe

- Supply hydrometric equipment as specified in annex 1B;
- Supply and install Server with relevant software at Zimbabwe National Water Authority (ZINWA) Headoffice
- Supply and instal relevant Software (receiving software) at ZINWA Save and ZINWA Runde;
- Conduct test runs and ensure that the system is running efficiently;
- The contractors should provide detailed manuals for equipment and processes thereof.

A2: Training/Capacity Building

The contractor shall organise and undertake oral and practical training sessions as follows:

- Undertake one oral training session followed by one practical training session with relevant staff on installation, operation and maintenance of data loggers, Radar, Acoustic Doppler Current Profiler (ADCPs) and software in Mozambique (DNGRH, ARA Centro, IP, ARA-Sul).
- Undertake one oral training session followed by one practical training session with relevant staff on installation, operation and maintenance of data loggers, Radar, ADCPs and software in Zimbabwe (ZINWA Head office, ZINWA Save and ZINWA Runde)
- The supplier should also be reachable for technical support in case of technical problems arising.

A3: Technical Backstopping

The contractor shall provide technical backstopping for a period of at least one 1 year after the installation.

A4: Proposed Time/Activity Schedule

The contractor shall supply all equipment and accessories as per the Global Water Partnership (GWP) procurement guidelines; favouring the very shortest lead time allowable thereof. Due to the nature and geographical spread of the proposed work, the installation process for loggers at demo sites (4); 1 site for radar and 1 site for data logger for each country; is expected to take a maximum of 2 weeks. The contractor shall provide with this quotation a proposed programme of works accounting for any COVID-19 supply chain disruptions and key milestones.

A5: Responsibilities

i. The Client

For the execution of the assignment, GWPSA/GoM/GoZ shall ensure the following:

- Provision of proposed sites for training
- Provision of staff for training
- Covering of costs related to training
- Provision of transport for equipment and staff to demo sites

ii. The Contractor/Service Provider

For the execution of the assignment, the Contractor/Service Provider shall ensure the following:

- Deliver services in accordance with the contract documents.
- Carry out the relevant training on installation, operation and maintenance
- Carry out all site works and off-site works
- Achieve the key milestones of the programme
- Propose a detailed work plan for the intended works before commencement of works
- The Contractor/Service Provider and his/her team will make their own arrangements on transport, security, accommodation, meals, equipment import permits and any other costs associated with the assignment.
- The contractor/service provider shall notify the GWPSA in writing of all subcontracts awarded under this contract if not already specified in the Quotation. Such notification shall not relieve the supplier from any liability or obligation under the contract. The Contractor shall remain responsible for providing the subcontracted portion of the works as if the work had not been subcontracted.

B Contractor / Service Provider's Response

The Contractor/Service Provider shall provide a quotation consisting of the following information:

Section 1	Proposed technical details, warranties offered, methodology and approach to implement the proposed scope, i;cluding schedule of works.
Section 2	Outline programme for delivery of the scope including material procurement timescale. The potential phasing of activities and milestones should also be discussed.
Section 3	Outline assessment of Contractor/Service Provider -owned risks, including any assumptions that the Bidder makes in developing their outline programme and price, and border crossing risks and requirements.
Section 4	Fixed price activity schedule for the project (see Section D), with a breakdown of all key cost components. Where the Bidder believes any taxes are applicable, including withholding tax and VAT, this must be clearly identified by the Bidder in the submission.
Section 5	Contractor/Service Provider company documents including • Company registration documents • Quality control plan / quality certifications • Health and safety policy / statement
Section 6	Adhere to National regulatory provisions as they apply to the supply, installation, operation training or any activities that may apply

C Pricing

GWPSA seeks the most economical programme of works and budget. The bidder is assumed to have taken into account all materials over and above those in the pricing documents.

Bid totals should be inclusive of all applicable taxes. All prices must be in United States Dollars

D Bidding Lots

This tender has two bids, one for Mozambique and one Zimbabwe. Bidders may bid for one lot or both. See Annex 2 for the table and map of location of 6 stations in Mozambique and 6 stations in Zimbabwe

E Basis of Evaluation

The assessment of the Quotations will be on the basis of price, programme and technical compliance. Only bids fully compliant with the scope and specification will be considered for award.

Award will be made to the lowest priced tender that is both technically compliant and proposes a timescale for delivery that the Client deems both reasonable and in alignment with the wider project development programme.

The Client is not bound to accept the lowest or any tender submitted.

F Further Information

Health and Safety is a very important priority. The Contractor/Service Provider will promote and adopt safe working methods and shall strive to deliver solutions that provide optimum safety to all. The Contractor/Service Provider shall include their Health & Safety Policy, or a Health & Safety Statement to accompany their submission.

G Defect Liability

The contractor shall ensure that the equipment supplied shall be defect free. The equipment should be tested on arrival at the proposed delivery site.

H Relevant Experience

For a contractor to be accepted to participate in the tender process, they must have:

- A team of experienced personnel whose composition has an expert with ideally 5 years or more of experience in installation, operation, maintenance and training on hydrometric equipment and software.
- Demonstrated experience of having worked in either of the countries (Mozambique and Zimbabwe) will be an aided advantage
- Proficiency reporting with a variety of systems
- A working knowledge of area regulations and compliance requirements
- Excellent safety record
- Familiarity with various processes of inquiry, research, consultations, and application of due diligence and safeguards in various public and private sector projects
- Analytical and organizational skills, sound judgment, tactful and diplomatic, and be capable of working **under strict timelines**; and

- The bidder shall provide evidence of satisfactory contract completion certificates.

By submitting a Quotation, the bidder confirms that the company:

- Is registered in the professional and trade registers in the country where the supplier is based (certificate may be requested by GWPSA);
- Has not been convicted of any criminal offence and is, if requested, able to produce an extract from a legal register, or in the absence of such a register, a certificate issued by an authorised legal or administrative authority in the country of origin or in the country where the supplier is based, as means of proof;
- Is not in debt with either the tax authority or the enforcement service regarding the payment of any required taxes and/or social security contributions (certificate(s) may be requested by the Buyer where appropriate). VAT-number, if any, should be stated;
- Is, if requested, able to present adequate papers proving that they have not been convicted of any crime concerning the exercising of a profession, been the subject of a legal verdict or been found guilty of gross misconduct whilst providing a professional service; and
- Is not bankrupt or currently the subject of bankruptcy proceeding, compulsory liquidation, compulsory management arrangement or accord. The bidder also confirms that they have not cancelled payments or been made the subject of a trading ban or any other similar arrangement.
- The bidder also confirms that the company has the financial capacity, as well as the technical, quality assurance, and abilities for the fulfilment of the bidder's contractual obligations.

Certificates and other proof, as stated above, may be requested by the GWPSA where appropriate. Please note that certificates should only be supplied upon request from GWPSA. Bidders failing to produce proof if requested by GWPSA may be disqualified.

ANNEX 1A: LOT FOR SPECIFICATIONS AND QUANTITIES FOR MOZAMBIQUE

1.0 Data Loggers and Sensors

Equipment	Quantity	Description / Requirements
Water level sensors including Cables (+150m)	2	- Range: 0 - +10 m, unless otherwise specified in the gauging station schedule. - Resolution: 1mm - Accuracy: ≤ 0.1% of full range = 10 mm for a 10 m range sensor. - Minimum of specification: IP 68 protection. - Operating temperature: -10 to +70°C. - Power consumption: sleep - < 600 µA; active - < 4.0 mA. - Maximum dimensions of sensor head: 200 mm long and 25 mm diameter - The pressure transducer shall be vented to atmosphere - Provision shall be made to prevent the ingress of moisture into the breather vent tube e.g. changeable desiccant container with reusable desiccant. - The pressure sensors shall be calibrated by the Contractor prior to installation. - All necessary accessories and cabling
GPRS/GSM telemetry loggers	2	- The logger must be robust, reliable and well proven in similar environments. - The data logger must be universal i.e., it can be used for various hydrological field station parameters – the minimum shall be water level, and rainfall, therefore it must have impulse in-put for the rain gauge. - Operating temperature: -10°C to +70°C. - Recording frequency shall be changeable (minimum 5 minutes), but 1 hour is probably adequate for the majority of gauging stations. - A multichannel data logger with integrated GSM/GPRS modem and power supply is the basic requirement. - Facility to set alarms into the GPRS logger e.g., if the water level rises to a certain threshold or a certain rainfall amount occurs in a given time; if battery levels are getting below a critical level. - The alarm management system shall include the ability to undertake SMS messaging to at least 8 different mobile phone numbers or by email (GPRS) or to a fax.

		- Suitable web-based software shall be provided with the telemetry/GPRS loggers so that the data can be reviewed, checked, quality controlled checked and transferred to the DNGRH, Instituto Nacional de Meteorologia (INAM) and ARAs database at the appropriate receiving office.
		  - The data logger must be compact and should if possible be able to fit into a small diameter pipe (< 100 mm diameter) or small box.
		  - The data logger must be universal i.e. it can be used for various hydrological field station parameters – the minimum shall be water level, and rainfall. Therefore, it must have impulse input for the rain gauge.
		  - Minimum protection IP65 – higher specification preferred (It should be noted that the loggers may need to be installed in a tube on a river bank).
		  - Power supply internal lithium battery, sufficient for > 5 years preferred. Preference will be given to systems that do not require the use of solar panels and external batteries.
		  - Serial flash; no loss of data in case of power failure.
		  - Minimum memory capacity of 4 MB (more than 250,000 values).
		  - Real time clock, battery buffered, with accuracy of +/- 1 minute per month.
		  - Exact free definable time range for downloading of data without erasing old data.
		  - Must have an integrated GSM/GPRS modem with FTP data push option (different protocols). Contractor will be responsible for ensuring that the proposed system is compatible with Mozambican and Zimbabwean networks.
		  - Option for Bluetooth interface. User friendly, robust and intuitive software.
		  - Optional external antenna.
		  - Automatic reset of modem in case of network failure.
		  - All control and set up options, data download and programming of data logger shall also be done by online session similar to all functions at site by direct connection to a PC without any difference.
		  - Different recording modes: min. time-, and event controlled.
		  - Ability to download data without ceasing measurement.
		  - At least one RS232 interface for operation, one RS485 sensor interface.
		  - Options for SDI-12 sensor and Bluetooth interfaces.

		- Full control, operation and adjustment of data logger by palmtop, portable PC or via online connection. - Lightning protection to be provided. - All necessary accessories and cabling. - Training required for installation, troubleshooting and operation in both Mozambique and Zimbabwe.
Radar Sensors		
Radar Sensor	4	– Measuring range up to +30 m (98.43 ft) - Deviation ≤ 2 mm - Beam angle 4° - Measuring frequency W-band (80 GHz technology) - Output signal 4 … 20 mA/HART - Mounting connection Thread G1, 1 NPT, R1 - Process pressure -1 … +3 bar (-100 … +300 kPa/- 14.5 … +43.51 psig) - Process temperature -40 … +80 °C (-40 … +176 °F) - Ambient temperature -40 … +80 °C (-40 … +176 °F) - Bluetooth standard Bluetooth 5.0 (downward compatible to Bluetooth 4.0 LE) - Effective range Bluetooth typ. 25 m (82 ft) - Operating voltage 12 … 35 V DC - Protection rating IP66/IP68 (3 bar) acc. to IEC 60529, Type 6P acc. to UL 50 - Data storage for at least 5 years - Data logger should have a display - Cellular Communication Modem (GPRS/GSM) - Direct communication with the data logger to download data using a laptop with not more than 1 hour delay. E.g. 1000 hrs reading to be viewed latest by 1100 hrs. - Should be able to send a signal or alarm when a river reaches a certain threshold to at least 20 stakeholders/ people. - Battery in built and long lasting for at least 3 years and an additional spare battery (N.B) solar powered system susceptible to vandalism) - Single channel (water/ river level) data logger with high resolutions - Critical spare components should be provided - Radar logger should be mounted under the bridge and with a waterproof protection device and anti-vandalism protection

		- Training is required for installation, troubleshooting and operation in both Mozambique.

2.0 Acoustic Dopplers

Equipment	Quantity	Description & Specifications
Larger ADCP	2	Transducer frequency: – 1200 kHz (possibly 600 KHz) ; – depth range 0.3 m – 25 m; – velocity range ± 5 ms^{-1}; – accuracy 2 mms^{-1}; – resolution 1 mms^{-1}; – number of cells > 100; – cell size 0.05m to 2m; – blanking distance 0.05m. Data output rate 1-2Hz (typical) Bottom Tracking: – velocity range 9.5m/s; – depth range 0.5m to 30m; – accuracy 2 mms^{-1}; – resolution 1mms^{-1}; Depth Measurement: – range 0.5 m to 30 m; – accuracy 1% or 1 cm; – resolution 1 mm Standard Sensors: – temperature tilt (pitch and roll) compass; – range -5°c to 40°c , 15° 0-360° ; – accuracy 0.4°c to 0.5° , 2°; – resolution 0.01°c 0.01° 0.01°; – operating temperature -5°C to 45°C; – storage temperature -20°C to 60°C. The equipment shall be supplied with a differential GPS. – the ADCP shall be supplied with a Bluetooth modem; – the equipment shall be supplied with the appropriate software;

		– the instrument shall be supplied with a flotation device that is robust and can be deployed from the side of a boat, using tow ropes and from current meter gauging cable-ways.
D-GPS	2	General Requirements: - compatible with ADCP system - hardware and software as an integrated solution - based on satellite augmentation systems (SABS) - same or stand-alone power supply - position accuracy: <0.30 m - update rate: <20Hz - position conversion to co-ordinate system used for the streams - accurate referencing to boat in order to allow conversion of Doppler velocity into actual water velocity and direction. Receiver Type - Frequency: Dual L1/L2, C/A Code. - No. of channels: 12 Channels - Initializations: Real time on the fly, 10seconds. - Measurement techniques: Multi path and interference rejection - Memory: removable USB of 1GB or more - Data recording time: 0.1 to 60 sec., 20Hz or more. - Data downloading: cable RS 232 or card reader. GPS Antenna - Type: L1/L2 Antenna - Mounting: Tripod/ Pole Power - Operating time: > 6 hours of continuous work time or supplied with extra battery. - Input Voltage Range: 6 to 30 VDC Environment - Operating and storage Temperature: -10° to + 60° C. - Protection against water, humidity, dust: IP67
Floating device	2	The Floating device shall be able to carry the instruments with the following specifications: - Dive-resistant; - Flexible and rugged body; - Resistant to high velocities: >5m/s; - Should fit all the instruments, including the GPS; - Resistant to flipping and submersion; - Lightweight and easy to transport; - Recommended dimensions(L/W/H): 130 / 68 / 11 cm.

3.0 Server and Software

Equipment	Quantity	Description / Requirements
Office computers and software for the telemetry	**1**	Computer Server: - Processor -- 3.2 GHz Quad-core - Intel Xeon 4C E3-1270v2 69W with 16GB or more RAM - Motherboard -- Server grade with 4 x ECC DDR4 RAM - Memory -- 16 GB with expansion slots for additional memory - OS Disks -- (2 in RAID 1 mirror) 500 GB, 7200 RPM, 16 MB cache, SATA - Data disks -- (2 in RAID 1 mirror) 1 TB, 7200 RPM, 16 MB cache, SATA - Power supply -- 400 watts - DVD -- Combo DVD +/- RW, (DVD-ROM, DVD-RW, CD-RW) - Available Expansion Slots -- 1 PCIe 3.0 x8 full height 1 PCIe 2.0 x 4 after any cards installed - Sound -- Basic sound card or on-board, supplied with speakers - Video Monitor -- LCD 17 inch, 1280X1024 - Ports -- 6 USB 2 ports with additional support for PS/2 Keyboard and Mouse, 2 RJ-45 Network ports - Network -- Two 10/100/1000 Mbps Ethernet - Form factor – Full tower - Keyboard – Standard full size (US English and Portuguese) - Mouse -- 2 button optical wheel mouse – USB - Additional Cooling -- Extra dual ball bearing case fans - Electrical Supply -- 220V AC 50 HZ, Mozambican socket - External drive (for backups) -- 500 GB USB external hard drive - UPS – For 4 hours operation. - The Operating System Requirements must meet or exceed the following: Microsoft Windows Server 2012, Microsoft SQL Server 2012, SQL Server Management Studio, and IIS Server for web browser access to the database(s).
Desktop Computer	**2**	Desktop Computer: - Design Type: All-in-One (Optiplex) - RAM: 16 GB - Screen Size: 27 inches or more - Hard Drive: M.2 128 GB-1TB SATA Class 20 Solid State Drive - Graphics Coprocessor: Intel Core™ i5/7-8500 - Operating System: Windows 10 Pro 64bit - Processor -- 2.4 GHz (or above) - Power supply - Available Expansion Slots - Sound -Basic sound card or on-board

		- Ports -4 USB Ports, (1) audio in, (1) audio out, (1) VGA, (1) Display Port, (1) RJ- 45 Ethernet, (1) serial, PS/2 keyboard, PS/2 mouse - Network -- 10/100/1000 Mbps Ethernet - Keyboard – Standard full size (US English and Portuguese) - Mouse - 2 button optical wheel mouse – USB - Media card reader -- Multiple formats - Microsoft office tools-- Microsoft Professional Office Suite - Electrical Supply Nominal 220V AC 50 HZ - UPS – For 4 hours operation
Office modems and software	2	Modem: - Type -- GSM & GPRS Class 10 & Edge mobile station Class B - Processor – 64/32 bit - Air Interface -- Quad Band; 900 MHz & 1800 MHz - Max. Output Power -- 2W @900 MHz & 1W @1800 MHz - Antenna -- 3dB gain; Magnetic mount passive with 5M cable length - Power Consumption – Active: 320 mA (typical Average+); dle: 30 mA; Stand by: 8m A - Non Volatile Memory -- SD Card up to 8GB to store records - PC Interface -- For Settings and Configuration - Field Interface -- For Data collection from the Logger - GPS Interface -- In built GPS Receiver - Power Requirement -- 5-24VDC; 3W (average) - Power Inputs -- TWO Software: - The central receiving station has a fast broadband internet connection with a static IP address to receive remote station data through GPRS and a GSM modem with SIM to receive remote station data through SMS. The central receiving station runs a FTP server application to receive the GPRS data from the remote station. - A database management system with good compatibility with other databases and data formats. - The central data processor should have capacity to detect missing data, process data in predefined statistics (mean, maximum, minimum, standard deviation), transfer/export to the main database in appropriate formats (e.g ASCII, CSV), carry scheduled backup of configuration and data, display the data in different formats, by graph, table, or GIS layers. - The software used should have capabilities to automatically process and display real time data as well as “Archived” historical data. - The data management software should have capacity to process data on several time steps (minute, hourly, daily, and monthly).

		- The central telemetry gateway should be able to control many units to enable future expansions. - The base station must support multi-user access and have GUI configuration facilities to enable full configuration and management of remote stations. Also, it should be able to manage each remote station in an easily organized manner and be able to configure, amongst others, data sample processing, data sensing frequency, modems, and resetting remotely from the central station. - Be able to check the functioning of each sensor and battery voltages, communications, etc. remotely. The telemetry gateway should have different connection ports for the LAN and the central data server.

ANNEX 1B: LOT FOR SPECIFICATIONS AND QUANTITIES FOR ZIMBABWE

1.0 Data Loggers and Sensors

Equipment	Quantity	Description / Requirements
Water level sensors including Cables (+150m)	4	– Range: 0 - +10 m, unless otherwise specified in the gauging station schedule. – Resolution: 1mm – Accuracy: ≤ 0.1% of full range = 10 mm for a 10 m range sensor. – Minimum of specification: IP 68 protection. – Operating temperature: -10 to +70°C. – Power consumption: sleep - < 600 µA; active - < 4.0 mA. – Maximum dimensions of sensor head: 200 mm long and 25 mm diameter – The pressure transducer shall be vented to atmosphere – Provision shall be made to prevent the ingress of moisture into the breather vent tube e.g. changeable desiccant container with reusable desiccant. – The pressure sensors shall be calibrated by the Contractor prior to installation. – All necessary accessories and cabling

GPRS/GSM telemetry loggers	4	– The logger must be robust, reliable and well proven in similar environments. – The data logger must be universal i.e., it can be used for various hydrological field station parameters – the minimum shall be water level, and rainfall. Therefore, it must have impulse in-put for the rain gauge. – Operating temperature: -10°C to +70°C. – Recording frequency shall be changeable (minimum 5 minutes), but 1 hour is probably adequate for the majority of gauging stations. – A multichannel data logger with integrated GSM/GPRS modem and power supply is the basic requirement. – Facility to set alarms into the GPRS logger e.g., if the water level rises to a certain threshold or a certain rainfall amount occurs in a given time; if battery levels are getting below a critical level. – The alarm management shall include the ability to undertake SMS messaging to at least 8 different mobile phone numbers or by email (GPRS) or to a fax. – Suitable web-based software shall be provided with the telemetry/GPRS loggers so that the data can be reviewed, checked, quality controlled checked and transferred to the DNGRH, INAM and ARAs database at the appropriate receiving office. – The data logger must be compact and should if possible be able to fit into a small diameter pipe (< 100 mm diameter) or small box. – Minimum protection IP65 – higher specification preferred (It should be noted that the loggers may need to be installed in a tube on a river bank). – Power supply internal lithium battery, sufficient for > 5 years preferred. Preference will be given to systems that do not require the use of solar panels and external batteries. – Serial flash; no loss of data in case of power failure. – Minimum memory capacity of 4 MB (more than 250,000 values). – Real time clock, battery buffered, with accuracy of +/- 1 minute per month. – Exact free definable time range for downloading of data without erasing old data. – Must have an integrated GSM/GPRS modem with FTP data push option (different protocols). Contractor will be

		responsible for ensuring that the proposed system is compatible with Mozambican and Zimbabwean networks. – Option for Bluetooth interface. User friendly, robust and intuitive software. – Optional external antenna. – Automatic reset of modem in case of network failure. – All control and set up options, data download and programming of data logger shall also be done by online session similar to all functions at site by direct connection to a PC without any difference. – Different recording modes: min. time-, and event controlled. – Ability to download data without ceasing measurement. – At least one RS232 interface for operation, one RS485 sensor interface. – Options for SDI-12 sensor and Bluetooth interfaces. – Full control, operation and adjustment of data logger by palmtop, portable PC or via online connection. – Lightning protection to be provided. – All necessary accessories and cabling. – Training required for installation, troubleshooting and operation in both Mozambique and Zimbabwe.
Radar Sensors		

Radar Sensor	2	– Measuring range up to +30 m (98.43 ft) – Deviation ≤ 2 mm – Beam angle 4° – Measuring frequency W-band (80 GHz technology) – Output signal 4 … 20 mA/HART – Mounting connection Thread G1, 1 NPT, R1 – Process pressure -1 … +3 bar (-100 … +300 kPa/- 14.5 … +43.51 psig) – Process temperature -40 … +80 °C (-40 … +176 °F) – Ambient temperature -40 … +80 °C (-40 … +176 °F) – Bluetooth standard Bluetooth 5.0 (downward compatible to Bluetooth 4.0 LE) – Effective range Bluetooth typ. 25 m (82 ft) – Operating voltage 12 … 35 V DC – Protection rating IP66/IP68 (3 bar) acc. to IEC 60529, Type 6P acc. to UL 50 – Data storage for at least 5 years – Data logger should have a display – Cellular Communication Modem (GPRS/GSM) - Direct communication with the data logger to download data using a laptop with not more than 1 hour delay. e.g. 1000 hrs reading to be viewed latest by 1100 hrs. - Should be able to send a signal or alarm when a river reaches a certain threshold to at least 20 stakeholders/ people. - Battery in-built and long lasting for at least 3 years and an additional spare battery (N.B solar powered system susceptible to vandalism) - Single channel (water/ river level) data logger with high resolutions - Critical spare components should be provided - Radar logger should be mounted under the bridge and with a waterproof protection device and anti-vandalism protection - Training required for installation, troubleshooting and operation in both Mozambique and Zimbabwe.

2.0 Acoustic Dopplers

Equipment	Quantity	Description & Specifications
Larger ADCP	2	Transducer frequency: – 1200 kHz (possibly 600 KHz) ; – depth range 0.3 m – 25 m; – velocity range ± 5 ms-1; – accuracy 2 mms-1; – resolution 1 mms-1; – number of cells > 100; – cell size 0.05m to 2m; – blanking distance 0.05m. Data output rate 1-2Hz (typical) Bottom Tracking: – velocity range 9.5m/s; – depth range 0.5m to 30m; – accuracy 2 mms-1; – resolution 1mms-1; Depth Measurement: – range 0.5 m to 30 m; – accuracy 1% or 1 cm; – resolution 1 mm Standard Sensors: – temperature tilt (pitch and roll) compass; – range -5°c to 40°c , 15° 0-360° ; – accuracy 0.4°c to 0.5° , 2°; – resolution 0.01°c 0.01° 0.01°; – operating temperature -5°C to 45°C; – storage temperature -20°C to 60°C. The equipment shall be supplied with a differential GPS. – the ADCP shall be supplied with a Bluetooth modem; – the equipment shall be supplied with the appropriate software; – flotation device – the instrument shall be supplied with a flotation device that is robust and can be deployed from the side of a boat, using tow ropes and from current meter gauging cable-ways.
D-GPS	2	General Requirements: - compatible with ADCP system - hardware and software as a integrated solution - based on satellite augmentation systems (SABS) - same or stand-alone power supply - position accuracy: <0.30 m - update rate: <20Hz - position conversion to co-ordinate system used for the streams

		- accurate referencing to boat in order to allow conversion of Doppler velocity into actual water velocity and direction. Receiver Type - Frequency: Dual L1/L2, C/A Code. - No. of channels: 12 Channels - Initializations: Real time on the fly, 10seconds. - Measurement techniques: Multi path and interference rejection - Memory: removable USB of 1GB or more - Data recording time: 0.1 to 60 sec., 20Hz or more. - Data downloading: cable RS 232 or card reader. GPS Antenna - Type: L1/L2 Antenna - Mounting: Tripod/ Pole Power - Operating time: > 6 hours of continuous work time or supplied with extra battery. - Input Voltage Range: 6 to 30 VDC Environment - Operating and storage Temperature: -10° to + 60° C. - Protection against water, humidity, dust: IP67
Floating device	2	The Floating device shall be able to carry the instruments with the following specifications: - Dive-resistant; - Flexible and rugged body; - Resistant to high velocities: >5m/s; - Should fit all the instruments, including the GPS; - Resistant to flipping and submersion; - Lightweight and easy to transport; - Recommended dimensions(L/W/H): 130 / 68 / 11 cm.

3.0 Server and Software

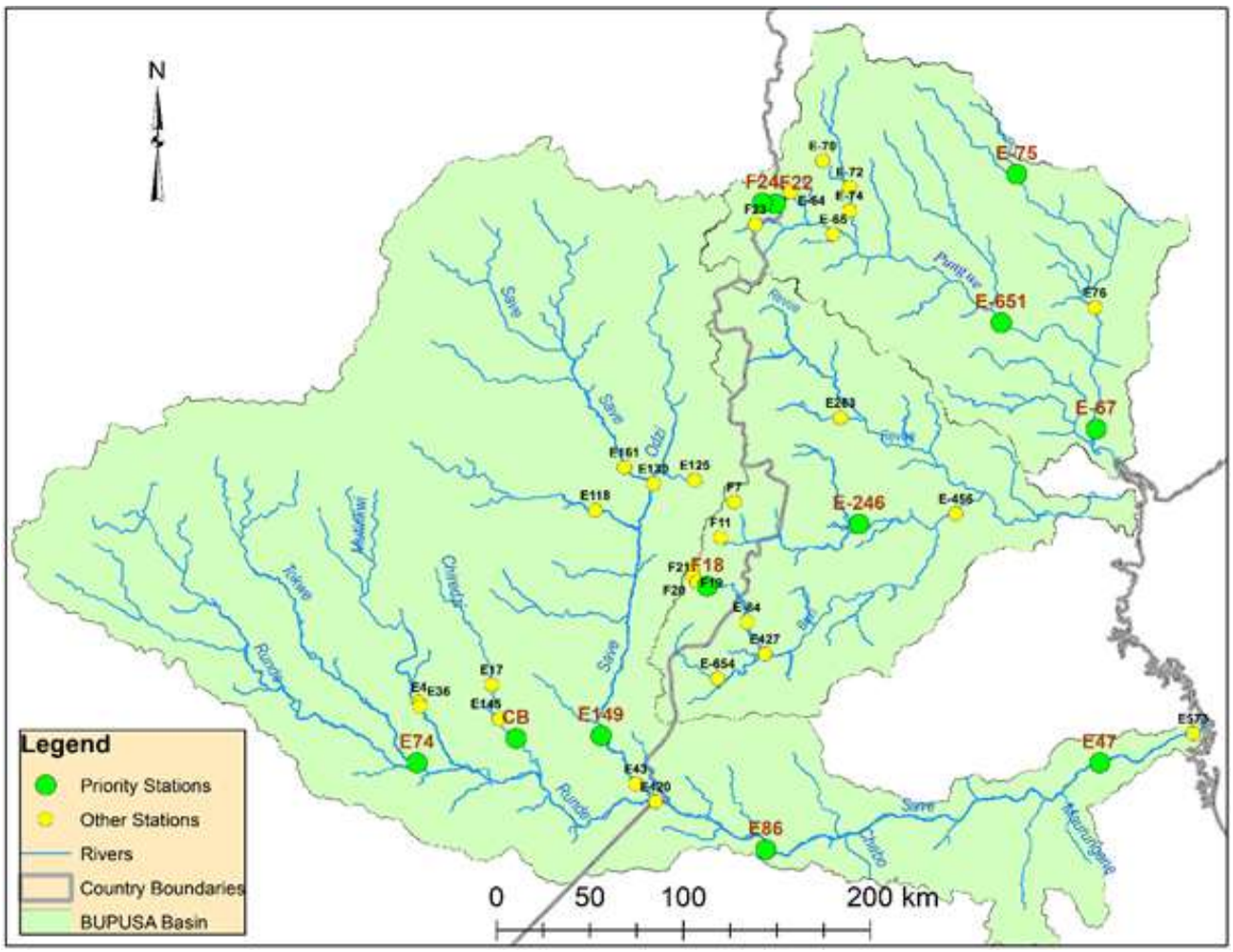
Equipment	**Quantity**	**Description / Requirements**
Office computers and software for the telemetry	1	Computer Server: - Processor -- 3.2 GHz Quad-core - Intel Xeon 4C E3-1270v2 69W with 16GB or more RAM - Motherboard -- Server grade with 4 x ECC DDR4 RAM - Memory -- 16 GB with expansion slots for additional memory - OS Disks -- (2 in RAID 1 mirror) 500 GB, 7200 RPM, 16 MB cache, SATA

		- Data disks -- (2 in RAID 1 mirror) 1 TB, 7200 RPM, 16 MB cache, SATA - Power supply -- 400 watts - DVD -- Combo DVD +/- RW, (DVD-ROM, DVD-RW, CD-RW) - Available Expansion Slots -- 1 PCIe 3.0 x8 full height 1 PCIe 2.0 x 4 after any cards installed - Sound -- Basic sound card or on-board, supplied with speakers - Video Monitor -- LCD 17 inch, 1280X1024 - Ports -- 6 USB 2 ports with additional support for PS/2 Keyboard and Mouse, 2 RJ-45 Network ports - Network -- Two 10/100/1000 Mbps Ethernet - Form factor – Full tower - Keyboard – Standard full size (US English and Portuguese) - Mouse -- 2 button optical wheel mouse – USB - Additional Cooling -- Extra dual ball bearing case fans - Electrical Supply -- 220V AC 50 HZ, Mozambican socket - External drive (for backups) -- 500 GB USB external hard drive - UPS – For 4 hours operation. - The Operating System Requirements must meet or exceed the following: Microsoft Windows Server 2012, Microsoft SQL Server 2012, SQL Server Management Studio, and IIS Server for web browser access to the database(s).
Desktop Computer:	2	Desktop Computer: - Design Type: All-in-One (OptiPlex) - RAM: 16 GB - Screen Size: 27 inches or more - Hard Drive: M.2 128 GB-1TB SATA Class 20 Solid State Drive - Graphics Coprocessor: Intel Core™ i5/7-8500 - Operating System: Windows 10 Pro 64bit - Processor -- 2.4 GHz (or above) - Power supply - Available Expansion Slots - Sound -Basic sound card or on-board - Ports -4 USB Ports, (1) audio in, (1) audio out, (1) VGA, (1) Display Port, (1) RJ- 45 Ethernet, (1) serial, PS/2 keyboard, PS/2 mouse - Network -- 10/100/1000 Mbps Ethernet - Keyboard – Standard full size (US English and Portuguese) - Mouse - 2 button optical wheel mouse – USB - Media card reader -- Multiple formats - Microsoft office tools-- Microsoft Professional Office Suite - Electrical Supply Nominal 220V AC 50 HZ - UPS – For 4 hours operation.

Office modems and software	2	**Modem:** - Type -- GSM & GPRS Class 10 & Edge mobile station Class B - Processor – 32 bit - Air Interface -- Quad Band; 900 MHz & 1800 MHz - Max. Output Power -- 2W @900 MHz & 1W @1800 MHz - Antenna -- 3dB gain; Magnetic mount passive with 5M cable length - Power Consumption – Active: 320mA (typical Average+); dle: 30mA; Standby: 8mA - Non Volatile Memory -- SD Card upto 8GB to store records - PC Interface -- For Settings and Configuration - Field Interface -- For Data collection from the Logger - GPS Interface -- In built GPS Receiver - Power Requirement -- 5-24VDC; 3W (average) - Power Inputs -- TWO Software: - The central receiving station has a fast broadband internet connection with a static IP address to receive remote station data through GPRS and a GSM modem with SIM to receive remote station data through SMS. The central receiving station runs a FTP server application to receive the GPRS data from the remote station. - A database management system with good compatibility with other databases and data formats. - The central data processor should have capacity to detect missing data, process data in predefined statistics (mean, maximum, minimum, standard deviation), transfer/export to the main database in appropriate formats (e.g ASCII, CSV), carry scheduled backup of configuration and data, display the data in different formats, by graph, table, or GIS layers. - The software used should have capabilities to automatically process and display real time data as well as "Archived" historical data. - The data management software should have capacity to process data on several time steps (minute, hourly, daily, and monthly). - The central telemetry gateway should be able to control many units to enable future expansions. - The base station must support multi-user access and have GUI configuration facilities to enable full configuration and management of remote stations. Also, it should be able to manage each remote station in an easily organized manner and be able to configure, amongst others, data sample processing, data sensing frequency, modems, and resetting remotely from the central station. - Be able to check the functioning of each sensor and battery voltages, communications, etc remotely. The telemetry

		gateway should have different connection ports for the LAN and the central data server.

ANNEX 2: Location Map and Table of the 12 priority stations



Country	River Name	Station Number	Station Name
Mozambique	Pungwe	E67	Mafambisse
Mozambique	Pungwe	E651	Gorongosa
Mozambique	Buzi	E246	Goonda
Mozambique	Pungwe	E75	Metuchira EN1
Mozambique	Save	E86	Massangena
Mozambique	Save	E47	Vil Franca do Save
Zimbabwe	Save	E149	Save Causeway G/W
Zimbabwe	Buzi	F18	Ypress
Zimbabwe	Pungwe	F22	Katiyo Natural Control
Zimbabwe	Runde	E74	Runde Tokwe Confluence
Zimbabwe	Honde	F23	Honde
Zimbabwe	Chiredzi	Chiredzi Bridge	Chiredzi Bridge