

MINISTRY OF SANITATION AND WATER RESOURCES

COMMUNITY WATER AND SANITATION AGENCY

Terms of Reference

PROVISION OF CONSULTANCY SERVICES FOR FEASIBILITY STUDY AND DESIGN FOR SMALL TOWN SYSTEMS AND COMMUNITY WATER SUPPLY IN THE FLUORIDE BELT IN THE UPPER EAST AND NORTHERN REGIONS OF GHANA

A. BACKGROUND OF THE PROJECT

The Sustainable Rural Water and Sanitation Project (SRWSP) is funded under an IDA credit. During the first phase of the Project (2012-2017) an amount of USD77.34 million was spent in 6 regions of the country.

Under the phase 1, The Upper East Region constructed 13 No. Small Towns Water Supply Systems, 246No.boreholes fitted with handpumps, 65No. Institutional latrines and the promotion of Community Led Total Sanitation as well as building the institutions for the effective and sustained management of the facilities constructed.

Following the completion of phase 1 of the project in 2017, the Government of the Republic of Ghana has received additional credit from the World Bank through the International Development Association (IDA) to complete some of the uncompleted projects in the six targeted regions.

The water supply needs in fluoride prone communities in the Upper East and Northern Regions could not be adequately addressed in the first phase of the project.

Upon the receipt of additional financing, CWSA now wish to include the feasibility studies and design for water supply systems for the fluoride prone small town and rural communities in the Upper East and Northern Regions of Ghana.

B. OBJECTIVES OF THE ASSIGNMENT

The objective of the assignment is to conduct feasibility studies and design for the provision of small town water systems and rural community systems in fluoride prone communities.in the Upper East and Norther Regions of Ghana.

C. SCOPE OF WORKS

The Consultancy Service shall include:

- To review and identify potable sources of water for the communities and small towns within the fluoride zones in the Upper East and Northern regions. The review will include assessment of various options including the possibility of using existing boreholes in fluoride prone communities, and connection to GWCL pipelines, treatment of water with high fluoride content to acceptable levels; connection of communities to boreholes with acceptable levels of fluoride.
- To design water supply systems for the selected option.
- To prepare engineering drawings and produce detail Bill of Quantities

Table 1 below shows some of the Districts, towns and populations for the assignment.

Table 1: Selected Small Towns for feasibility and Design for community and small town water supply systems in the UER and NR

No.	DISTRICT	TOWN	POPULATION	COMMENTS
UPPER EAST REGIONS				
1	Bongo	Balungu	4100	Feasibility Study and design to include fluoride Removal plants
2	Bongo	Bongo-Lungu	4315	
3	Bongo	Feo	4600	
4	Bongo	Gworie-Vea	4500	
5	Bongo	Namoo	5000	
6	Bongo	Dua – Borogo – Adabiya	4500	
NORTHERN REGION				
7	Chereponi	Wonjuga Kudani	4,237	

The assignment shall involve but not restricted to the following to meet its objectives.

- i. Study the background information on fluoride affected areas in the two (2) regions and do detailed assessment of quality of the water resources in those areas, obtaining data on borehole and surface water sources in the geographical area.

This will include collection and review of all relevant data from CWSA, NGOs and other donors including water quality sample results, borehole drilling logs.
- ii. Conduct field research to collect additional data required for analysis and to identify possible sources that could be harnessed for supplies. It should be noted because of the non-continuous nature of aquifers it is possible within short distances two boreholes will give sharp differences in levels of fluoride.

- iii. Identification of existing boreholes within fluoride affected geographical area that has suitable fluoride levels that can be mechanized for supplies.
- iv. Conduct hydrogeological studies for the drilling of new boreholes to augment supplies for cases where the existing boreholes have high fluoride levels or may not be able to meet the demand of the town. Drill test wells to confirm analysis (for costing purposes, it is expected that 40 test wells will be drilled distributed over the three regions. Any additional well required during the project will be priced based on per capita cost of the 40 wells).
- v. Monitor the fluoride levels of the new and existing wells for the project period.
- vi. Explore options for water supply to communities where the groundwater has high levels of fluoride, which may include connecting from sources with favorable fluoride levels, treatment of the fluoride, or connection to GWCL existing pipeline or existing small town water supply with good fluoride levels
- vii. Assess fluoride treatment options available and make recommendations
- viii. Provide feasibility report including recommendations for options of water supply to the areas.
- ix. Upon approval of the Feasibility and Recommendations report, the Consultant will proceed to prepare the design for harnessing water supply to all the communities in the fluoride prone areas taking into consideration CWSA design guidelines.

The guidelines should include the following;

- i. 15 years design period for the sources and 10 years for distribution
- ii. Storage should be based on balancing tank design.
- iii. Distribution should target 100% house connection for the small towns in accordance with SDG6
- iv. Distribution Point for Private Connection (DPPC) shall not be considered in the designs
- v. Integrated photo-Voltaic system shall be explored

Details of the activities

The Consultant shall carry out feasibility study and detailed design of the water supply schemes based on the option approved for water supply in the fluoride prone areas in the UER and NR. Specifically this shall include;

1 Feasibility and baseline survey.

- i. Collaboration with District Assemblies, RWSTs, beneficiary communities in obtaining pre-construction data on water supply and other socio-economic parameters in the

community. The data will include population, sources of water supply, number of people with access to water supply, reliability of water supplies, quality of water supply, people affected by fluoride in water supply.

- ii. Collaboration with District Assemblies and beneficiary communities in the preparation of designs. Such collaboration will be gender responsive to ensure that the opinion of women who are mainly responsible for water supply in the home are taken into consideration.

2 Hydro-geological investigation (siting for drilling of boreholes) and design of pipe water supply systems.

- i. Study and conduct water resources assessment and identify boreholes that can be harvested for mechanization, those that require handpumps, .
- ii. This may involve the removal of handpumps for existing borehole and for a 48hrs pumping test to determine the safe yield, fluoride levels over the period and exploitable pumping regime of the boreholes for water supply.
- iii. At the end of pumping test take samples to two separate laboratories - preferably Water Research Institute Laboratory and World Vision Ghana Laboratory in Savelugu in the Northern Region for full water quality analysis
- iv. Once the fluoride concentrations are ascertained the Consultant shall advise and design appropriate treatment plant that will ensure that the concentrations of the fluoride and other ions are reduced within acceptable limits or recommend a more cost effective option for harnessing potable water supply.
- v. Once the source is ascertained the consultant shall complete the design for supplies and prepare Tender Documents.
- vi. In the towns with existing water supply systems, the Consultant shall assess the inadequacies of the supplies and provide advice on the actions to be taken to meet full coverage of the town.
- vii. The Consultant shall prepare environmental and social management Plans for each of the Towns under consideration.
- viii. connecting communities within fluoride areas to potable water supply boreholes located outside the communities

D. OUTPUTS

The outputs of the assignment should include.

- i. Inventory report of water supply resource of the targeted Towns. This shall include a map of their locations.
- ii. Report on the status of the existing water supply facilities

- iii. Pumping test data and estimation of safe yields of existing boreholes with the potential of augmenting the water supply to the towns.
- iv. Recommendation for further drilling, pumping test and safe yield calculations for the successfully drilled boreholes.
- v. Water Quality Data of all the boreholes earmarked for mechanizations.
- vi. Recommendation on safe discharge rates to meet the water supply needs of the various towns.
- vii. Recommendations for the treatment of fluorides and any other chemical, bacteriological, or physical parameters that needs to be reduced to the acceptable level.
- viii. Detailed design report for the construction of communities and small town water supply system.
- ix. Tender document produced for the purpose of procuring contractor(s) to undertake the construction of the designed systems.
- x. The outputs based on the various stages of the assignment.

I. Feasibility Stage

Hard copy reports –

- a. Eight (8) copies of the fluoride affected area map and hydro geological and site selection report:, 1 each for the 2 regions and 2 for the Chief Executive CWSA, 1 for the Task Team leader, World Bank, 1 each for the M/DAs located within the fluoride belt.

Soft copy reports

- a. Soft copies of the fluoride affected area map hydro geological report and spreadsheets of inventoried boreholes to be distributed to the affected M/DAs and the 3 CWSA Regional Directors and Head Office and the World Bank Task Team Leader. Inventoried boreholes should have all relevant hydraulic and construction details included (to be researched through records) as well as type of pump and present operational condition;
- b. Analyses of geophysical measurements, such as inversion modeling, as well as the raw field data which must be supplied in spreadsheet format distributed to the M/DA and the CWSA.

II. Design of Piped Water Supply Systems

- i. A situation analysis of the extent of the fluoride water, and environmental concerns of the pipe systems has been completed and is available in the community folder;
- ii. The option for water supply that will be used for the community or small town has been adequately identified and/or developed;

- iii. A detailed engineering design and cost estimates are produced for the water system;

III. Supervision of Boreholes Drilling & Construction

- i. Five (5) hard copies of the drilling supervision of the test well report: 1 for the community, 2 for the M/DA and 2 for the Regional Director CWSA; Borehole Completion Reports for the wells that meet the required specifications outlined in the Contractor's Bidding Document, indicating the water quality; detailed drawings and geological sections to be included with the drilling report. A sketch map of drilled borehole locations attached with detailed drawing and geological sections should be included with the final drilling supervision report.
- ii. Community members have improved their knowledge on environmental issues;
- iii. The following documents related to the subproject have been updated and are available in each community:
- iv. Record of all visits conducted by the Consultant with meeting minutes
- v. Consultant's report outlining the lessons learnt and recommendations.

E. ACTIVITIES

The following general activities are to be performed under the consultancy services by the consultant;

- i. Undertake hydro-geological and geophysical investigations, which will lead to the selection of suitable sites for borehole construction. Geophysical investigations will be carried out according to the prevailing local hydro-geological conditions. Ensure Contractors adhere to terms of sub-project contract with the District Assembly, particularly in regard to specifications for drilling, construction, development and pumping test of successful boreholes.
- ii. Ensure quality control of the physico-chemical analysis of water from successful boreholes
- iii. Prepare detailed engineering designs and bidding documents for the construction of boreholes and pipe water supply systems.
- iv. In collaboration with DAs (DWDs/DWSTs) prepare environmental management plans for all subprojects.
- v. Provide technical assistance to District Assemblies in the coordination of construction of the test wells
- vi. Check the Contractors monthly statements and prepare payment certificates.
- vii. Ensure a smooth communication between all parties involved in the project activities

Phase 1 Activities:

The Consultant will carry out the following tasks under phase 1;

- a) Feasibility and baseline survey and water supply option assessment
 - i. Assess from Census data/Statistical Services Dept. supported by field investigation the existing population, existing water supply sources (including quality) and the water demand gap.
 - a. Take an inventory of institutions responsible for the provision of the existing sources of water supply, year of construction and state of facility.
 - ii. Assess any existing water supply management structures in place
 - iii. Assess environmental situation as it relates to water supply.
 - iv. Assess general socio-economic situation of town/community such as schools etc.

b) Environmental, Social and Health and Safety Management Plan

- i. The Consultant will collaborate with WSMTs and DAs (DWDs/DWSTs) to prepare environmental, social and health and safety management plans for all subprojects.
- ii. He will also draw-up an Environmental and Social Safeguard Framework based on the ESMF and RPF documents produced for the project.
- iii. The Consultant shall ensure the compliance of Environmental and Social safeguards during the project implementation by the contractors.
- iv. the Consultant shall prepare and submit reports monthly and quarterly on the implementation of safeguards.

c) Hydro geological investigation including geophysical survey (siting for drilling of boreholes)

- i. Conduct an inventory of all existing boreholes in the surrounding area (within a radius of 2km), both functioning and non-functioning, and locate their positions with a GPS. Data concerning depth, yields, water levels, water quality etc. should be researched among past records.
- ii. Select and discuss with the beneficiary communities locations for borehole drilling and other water supply structures to eliminate any culturally or socially unsuitable sites.
- iii. Prepare a sketch map showing the location of traverse lines and geophysical investigation points.

Suitable geophysical equipment must be mobilized for the services described above. The survey equipment and accessories must be in good operating condition and will be inspected before the commencement of field work.

d) Detailed Design for pipe water supply systems

- i. The Consultant will prepare detail designs ensuring that all CWSA standards and acceptable engineering considerations have been incorporated.
- ii. The Consultant will ensure that the DA and the RWST/CWSA Head Office have approved of the preliminary designs before presenting them to the communities.
- iii. Then on the basis of detailed field information, the Consultant will proceed to prepare the final designs of the pipe water systems.
- iv. The Consultant will also prepare detailed design reports and drawings both soft and hard copies.

A) Consultants Activities Specific to Borehole Drilling

Supervision of drilling and test pumping.

The consultant shall provide quality assurance for the drilling of boreholes and shall be responsible for documenting all data and activities in soft copy electronic format as well as hard copy reports.

Under this component the Consultant will:

- i. administer the drilling contract, and ensure compliance to the specifications;
- ii. determine yields during the course of drilling, and decide upon the final depth;
- iii. design and supervise installation of the boreholes with casing and screens, and supervise test pumping and sampling for water quality analysis;
- iv. organize monthly site meetings to discuss progress, problems and way forward on works
- v. certify for payment, work done in a satisfactory manner as presented in the Daily Drilling Activity Sheet.
- vi. document all results and activities in soft copy electronic format as well as hard copy reports, including geological sections and test pumping analyses. GPS coordinates shall be included as part of the borehole report and ensure that samples are taken for water quality analysis in a manner that preserves the sample for lab analysis and take on-site water quality measurements of unstable parameters.

F. STAFFING

The consulted shall field the following minimum staff indicating the details of the experience and capacity.

These shall be considered as the minimum professional staff required for the assignment.

- (a) Project Manager
- (b) Hydrogeologist–Team Leader for the groundwater exploration and pumping test.
- (c) Water Supply Engineer
- (d) Quantity Surveyor
- (e) Public Health/ hygiene Expert
- (f) Community Development Expert
- (g) Environmental and social Safeguards Expert

EXPERTISE REQUIRED FOR THE CONSULTANCY ASSIGNMENT

The qualification required is provided below;

Project Manager

The Project Manager will be the Team Leader for the assignment. A professional Civil Engineer or hydrogeologist with a minimum of BSc. or its equivalent in Engineering with at least 15 years relevant experience in design and implementation of town or urban water supply schemes and at least 10 years of Project Management. Should have demonstrated experience in engineering design of piped water supply systems based on both groundwater and surface water sources. Specific experience must be in rural/small towns water supply and sanitation sector and should be familiar with the concept and practice of community participation.

Hydrogeologist

The Hydrogeologist shall be the team leader in groundwater exploration with a BSc in Geological sciences and at least 10years working experience in borehole siting and drilling supervision services. Should have appreciation of groundwater quality and familiar with the concept and practice of community participation in groundwater exploration.

Civil/Construction Engineer

A professional Civil Engineer with a minimum of B.Sc. or its equivalent in Civil Engineering with at least 10 years experience in civil works construction supervision with particular emphasis on urban/town water supply systems. Should have demonstrated experience in supervising multiple construction sites. Should also have experience in the design and construction of simple

piped water supply schemes for rural communities and small towns. He/She will be expected to lead in the planning, documentation and reporting on water safety issues.

Quantity Surveyor

A professional Quantity Surveyor with a minimum of B. Sc. or its equivalent in Building Technology specializing in quantity surveying with at least 10 years general experience with strong emphasis in the water supply and sanitation sector.

Community Development Expert

Community Development Expert with degree in social sciences/social work or equivalent and relevant training in community development and at least 10 years post qualification relevant experience in community mobilization for rural water and sanitation schemes in developing countries, skills in the use of participatory planning techniques and must have demonstrated ability in training.

Environmental and Social Safeguards Officer

An Expert in Environmental and Social Safeguards issues with a minimum of First Degree in Social Sciences, Environmental Science, Engineering or other related fields and at least 3 years relevant experience in environmental and social Safeguards.

Health and Safety Officer

An Expert in Health and Safety issues with minimum of First Degree in related field and at least 3 years relevant experience in Health and Safety issues.

Other Experts inputs required as and when needed include:

- Water treatment processes and quality analysis
- Structural engineering for water retaining structures

Other support staff required shall include.

Technician Hydrogeologist

Draftsmen, Secretaries and drivers etc.

Other such staff deem necessary may be proposed in the Consultant's submissions.

G. G. TIME FRAME

The duration of the assignment is estimated to be **twelve (12) calendar months**

The estimated number of Key professional staff-months required for the assignment.

Personnel	No. Required	Man month Each	Man month Required

KEY STAFF			
Project Manager	1		
Civil/Construction Engineer	1		
Hydrogeologist	1		5
	1		
Quantity Surveyor	1		
Community Development Officer	1		
Environmental and Social Safeguard Officer*	1		
Health and Safety Officer*	1		
TOTAL			20
SUPPORT STAFF			
Electro-Mechanical Engineer	1		
Land Surveyor	1		
Clerk of Works (drilling)	2		
AutoCAD Technician	1		
TOTAL			10

The consultancy is expected to be awarded by **April 2018..**

H. REPORTING

The consultant shall report to the Chief Executive of CWSA-Accra or his designated representative at every stage of the consultancy services.

The report generally shall include:

- Water resources inventory report
- Drilling report
- Water quality reports
- Pumping test reports
- Safe yield calculations with advice on recommended abstraction rate for each borehole.
- Design report of treatment plan
- Design report of expected scheme for each Town
- Environmental and Social impact Report
- Project completion Report to include as built drawings

The specific stages of reporting which shall be presented to the contracting Authority shall be as follows:

- a) Inception Report: (5 copies) – Inception report due 4 weeks after signing of contract for assignment. Report will outline approach to assignment, issues for the attention of the client including initial constraints and proposals to address them. Consultant will indicate his set-up, planned activities, reporting schedules and draw a comprehensive workplan/budget for the lifetime of the assignment.
- b) Monthly Progress Reports (5 copies) - Reports will contain progress since last report, schedule and budget reviews, and constraints to progress, if any, and recommendations to overcome such constraints.
- c) Draft Final Report (5 copies) - On completion of the assignment, the consultant will present a detailed Draft Final Report covering (I) each of the Towns, (ii) all activities in the scope of work, (iii) all procedures adopted with as built drawings, final capital costs, variations (if any).
- d) Final Report (5 copies) - Following review and comments of the Draft Final Report by the Client and the World Bank, the Final Report will be submitted within one month after receipt of all comments.

All reports will be submitted in English language. The draft of final report will contain executive summary. All reports with its tables, appendices and drawings shall be provided electronically on pen driver for each Town.

I. PROVISION OF EQUIPMENT AND SERVICES

For the proper execution of the assignment, the Consultant will be expected to set up office at locations deemed strategic enough to facilitate consultations and coordination at each level. The logistics to be provided by the Consultant shall include,

- a) Computing capability as required;

- b) Vehicles for the execution of the assignment
- c) Facilities for day-to-day running, periodic maintenance services for these vehicles and
- d) All office facilities, accommodation and subsistence necessary for the Staff on the assignment.

J. Input from Client

The Client shall provide the following inputs to the Consultant:

- a) Facilitate free, unimpeded access to the project site for the performance of the services;
- b) Participate in meetings to facilitate the successful delivery of services
- c) Provide Design Standards and Guidelines.