

**Project Proposal**

**For**

**Rural Water Supply System Development**

**At**

**Asetah Village,**

**Segeneiti Subzone, Debub Region,**

**Eritrea**

**March, 2019**

**Asmara, Eritrea**

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# Introduction

## Project Area Background

The project intervention area is the village of Asetah, located in Segeneiti subzone in Debub Region. It is situated at 33 kilometers distance to south of Dekemhare Town. The village’s population is estimated at 1,250; which hugely depend on subsistent agriculture, cattle herding, and small scale trade as source of livelihood income. The population is largely of Christian religion with very few Muslims. Most dominant ethnic population is Tigrigna with very few Saho tribes. The village is easily accessible via the Asmara-Segeneiti main asphalt route and all weather gravel road (one hour trip). The geographic location and spatial extent of the survey area is depicted in **figure 1**.

Primary Scool and Health Center are both 3 kms far from the village in opposite directions.

One bus route connects the village to Dekemare daily.

## Scope

The project will comprise ***groundwater availability survey, groundwater source and rural water supply system development***.

The groundwater resources investigation survey will be undertaken within the 3 kilometers radial distance from the village. By this survey, sustainable water source will be identified, priority will be set amongst potential sources, and appropriate approaches and techniques for source development will be presented. The groundwater source will be developed at optimum distance from the settlement area, and standardized water supply system will be designed and established.

Comprehensive report document(s) on undertaking related to project components will be presented. In addition, work progresses briefing will be made to the relevant stakeholders at a regular basis. When the need arises, study findings will be shared to the relevant stakeholders and personnel designated by stakeholders via discussion forum.

## Objectives

This project will cover the groundwater source development and establishment water supply system and the main objectives are to:

* Improve people access to safe and adequate drinking water;
* Minimize prevalence of water born and related diseases and improve community health; and
* Avoid time-consuming water fetching, and promote community to engage in activities that bring improved socioeconomic standing.

# Methodology and Approaches

1. **Desk Study**: At desk level, previous similar study reports and relevant publications/literatures will be looked and reviewed. Additional desk study will be undertaken using remotely sensed data (Landsat TM images, Quick Bird images, SPOT images and DEM), topographic maps, regional geological, tectonic or structural, and hydrogeological/groundwater maps, and resource maps. Where available, water quality testing results for groundwater samples, hydrogeological or groundwater availability survey reports, mineral resources exploration survey reports, well log and drilling data etc…for sites within specified survey areas will be analyzed.
2. **Conceptual Model and Pre field tour program**: Based on the desk study findings, conceptual hydrogeological model will be defined. Within three kilometers radial distance from the settlement area, some potential spots or areas will be delineated or located on 1: 40,000 scale map using Arcview3.3/ArcGIS 9.3 software.
3. **Field Study**
	1. **Consultation with Local people**: - Where found or available, local people, inhabitants or village elders will be consulted/interviewed at each spot/site on existing water supply condition and groundwater resources. This will also enable us to gather historical (observational) data on the nature of groundwater resources distribution over space and certain period time.
* Seasonal change or fluctuation/variation in groundwater availability and quality
* Annual change or fluctuation/variation in groundwater availability and quality
* Groundwater use/utilization
* Information on the overall change in groundwater resources or availability all the way through time they lived there, or since the establishment of settlement area or back to few hundreds of years
* Village’s opinion on position of reservoir, public fountains, and pipeline laying paths
	1. **Groundwater resources potential:** to assess the availability of potential groundwater flow, field data or information on
* Geological and hydrogeological setting
* Post and current groundwater use/utilization
* Future or planned groundwater source development and utilization
* Groundwater quality: - water quality testing will be carried. Onsite physical quality measurements will be undertaken right at the site. Some representative water samples will be collected for full physiochemical analysis.
* Socioeconomic background or status of the people with very existence or livelihood that directly or indirectly related or relied or sustained on the presence or existence of the groundwater resources.
* As water source for irrigation, downstream wetland, pasture or grazing land, enclosures
* For therapeutic purposes with significant healthcare value
* As potential site for other water related economic activities
* Socioeconomic benefits (short and long term) gained from direct and indirect groundwater use or utilization.
	1. **Water supply system:** field data or information will be collected on;
* Current and projected water demand;
* terrane accessibility and terrain suitability for access;
* availability of construction material at optimum distance from the project area;
* survey data on slope, relief, head, distance, altitude, spatial extent and distribution of the settlement area; and
* best location for reservoir, public fountain, solar system.
1. **Data processing, analysis and interpretation:** acquired data or information at all levels or stages of the survey will be processed, analyzed, and interpreted using appropriate methods or approaches. Then,
2. Potential sites for groundwater well development will be identified on the basis of a) geological and hydrogeological setting of the area b) its relative position with respect to existing wells c) Site or terrane accessibility and transportation distance between the water source and village, d) Potential groundwater flow and water quality, and e) initial and projected future water demand.
3. Profile map and pipeline network layout will be constructed on the basis of surveying data. Bill of quantity and material cost for each system component will be prepared. Best location for reservoir, public fountains, solar system will be defined.
4. Survey results will be compiled in a form comprehensive report document(s). The report will incorporate details on physical, geological and hydrogeological setting, potential groundwater sites, water quality, socioeconomic and business aspect, priority setup, the requirement for sustainable source development, detail water supply system design, bill of quantity, and cost. The results will be accompanied by descriptive analysis, maps, tables, figures, and schemes, designs etc…First draft report will be submitted for feedback and discussion. After presenting the draft report and having the constructive information incorporated, last and final report will be given.

# Water Supply Condition

In Asetah village, the people are solely dependent on groundwater sources for their water demand for domestic and livestock. Since the village is located in axial highland, which is largely underlain by Precambrian basement, the availability of potential groundwater resources is quite limited. Thus, there is strong competition between different users over limited groundwater resources. Besides, recurrent drought and poor rainy seasons have caused significant drop in groundwater level and potential groundwater resources available for use.

In the village, there is an old hand pump operated borehole. Currently the hand pump is broken or nonfunctional. As a result, for the past 22 years, the people has used to travel 2-3 hours to fetch water from unprotected and untreated shallow hand dug well, dam and stream base flow. The people employ traditional rope supported buckets to bring water from existing water sources. Women and children fetch water either using Jerrican or local container – ‘Jirba’. They transport to their home either by carrying on back/shoulder or donkeys. A well inventory data is included in ***table 1***.



**Figure 1**. Location map of the project area

Water born and/or related diseases such as Diarrhea (bloody diarrhea), intestinal parasites, skin infection and Gastritis (PUD) are prevalent and represent among the top five main diseases (health data from Engela and Segeneiti health centers). Diarrhea is the most common water born diseases in the village. Diarrhea infection is more frequent on children below five years of age and women.

**Table 1**. Existing well data or information

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Well type** | **Easting** | **Northing** | **Altitude (a.m.s.l)\*** | **Well depth (m)** | **Well diameter (m)** | **SWL (m)(b.l.r.d)\*\*** | **Reference Datum (m)(a.l.g.l)\*\*\*** | **Well Yield (l/sec)** | **Pump Type** | **Well purpose** | **Drilling date** |
| AS-BH-1 | BH | 517079 | 1651641 | 1790 | > 40 | 0.15 | - | 0.5 | - | Hand pump-Broken | Domestic  | 1993 |
| **\*a.m.s.l** abbreviated for above mean sea level**\*\*b.l.r.d** abbreviated for below local reference datum**\*\*\*a.l.g.l** abbreviated for above local ground level, AS for Asetah, BH for Borehole |

# Project Overview

By this project, appropriate water supply system will be established for the village community. After the completion of the project, about 1680 people (projected population for 2029) will have access to safe and adequate water (***see table 2***). The water supply system will ***incorporate groundwater well, solar pump system, water reservoir, pipeline (transmission and distribution lines), two public fountains, and supply access for existing public institutions.*** Detail information on the engineering construction and cost estimation of the project is appended in ***annex 1***.

Groundwater will be pumped via pipeline to the reservoir, which will be founded at appropriate height within or nearby the settlement area so that smooth distribution of water via gravity flow will be maintained at the public fountains. The groundwater availability survey, groundwater well and water supply system design and development process will comply the minimum regulatory requirements instituted by the Department of Water Resources.

**Table 2.** Project area description

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.N** | **Project Area** | **Population (2019)** |  **Projected Population (2029)\*** | **Beneficiaries (2029)** |
| **1** | Asetah | 1250 | 1680 | 1680 |

As per the regulatory prerequisite, the community ***will cover at least 10% of the overall project cost in form of labor.*** This is done to raise community belongingness feeling for the water supply project, and promote effective community level management of the system. In order to improve management skills of the community, WASH training will rendered to village level water committee, which will be established prior to the initiation of project implementation. Among the training’s key themes are:

1. WASH committee setup and mandate,
2. WASH management constitution,
3. water and sanitation - personal hygiene and environmental sanitation, and
4. financial management of water tariff and other incomes.

The WASH training will be facilitated by the ***Department of Water Resources-Water Resources Use and Management Division*** and ***Regional Water Division***.

# Water Source and Demand

Water source will be groundwater well, which will be located within 3 kilometers radial distance from the village settlement area. A well with sustained yield of 1.5-2 l/sec will be required to meet the projected daily water demand, which is 34 m3/day (see table 3). The estimated water demand also includes public institutions’ water needs for domestic use. Six hours of pumping is only needed to satisfy the projected daily maximum water demand, and it will be adopted for pump design.

**Table 3.** Water Demand

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.N** | **Project Area/Village** | **Population-(Year-2019)** | **Population (Year-2029)\*** | **Water Demand (m3/day)\*\*** | **Maximum Water Demand (m3/day)** |
| **Current** | **Projected** | **Current** | **Projected** |
| 1 | Asetah | 1250 | 1680 | 25 | 33.6 | 37.5 | 50.4 |
| \*Population projection rate of 3% is adopted. **\*\*** at20 litre/day/capita |

During the feasibility tour visit, onsite water quality measurements were undertaken on existing shallow irrigation wells along Sebene stream banks. In general, it is readily palatable for drinking purposes.

# Team Composition and Organization

The project implementation process requires consultation and consolidation with key stakeholders. To fulfill the requirements of project, the study team will be composed of four specialists that include:

1. **Senior Hydrogeologist and Water Resources Management Practitioner (B.Sc.)** with more than 17 years of profound work experiences mainly on specific fields of geology, hydrogeology and geophysics as well as on water resources assessment in Eritrea. He has also deep knowledge in hydrogeological GIS, interpretation of Remote Sensing Data for Groundwater Assessment and Aquifer Classifications, and Planning and Development of groundwater resource Infrastructures (borehole drilling, dams, diversions and water supply) all over the country. Moreover, during this period he conducted groundwater exploration and investigation studies, drilling, pumping test and supervision of different scale water supply projects in the country.
2. **Two Civil Engineers (B.Sc.)** with good practical experience in water supply system design for rural, suburban and towns.
3. **Senior Hydro-chemist (B.Sc.)** with deep knowledge in soil and water analytical analysis has over 12 years of practical experience in sediment and water analysis both in the field and in the laboratory. Moreover, he has deep knowledge of surface water monitoring and conducted several water quality analyses throughout the country since 2006.
4. **Senior Water Resources Management Practitioner (B.Sc)** with over 13 years of work experience in water resources management in general, and WASH training and promotion in particular.

Further, the five team members have deep knowledge in project preparation, apprising, implementation, supervision, monitoring and evaluation.

#

# Budget (Budget Breakdown)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.N** | **Activity** | **Unit** | **Qty** | **Total Cost** | **Remarks** |
| **Nakfa** | **Dollar** |  |
| **1** | **Groundwater availability survey** | site | 1 | 26,000.00 | 1,733.33 | Including 20% income tax |
| **2** | **Well drilling (60 m depth)** | well | 1 | 400,000.00 | 26,666.67 | Including income tax |
| **3** | **Well drilling supervision** | Lumped sum | 7 | 12,000.00 | 800.00 | Including 17% income tax |
| **4** | **Pumping test, analysis, and reporting** | well | 1 | 60,000.00 | 4,000.00 | Including income tax |
| **5** | **Surveying and Water Supply System Design** | Lumped sum | 1 | 32,500.00 | 2,166.67 | Including 25% income tax |
| **6** | **Construction of Water Supply System** |  |  |
| 1. Reservoir (PE)\* with tree system pole and ridged coated steel fencing, and shed net
 | m3 | 24 | 51,200.00 | 3,413.33 | (8m3\*3) Three polyethylene reservoir (PE) of 8m3, interconnected |
| 1. Cement basement for Reservoir
 | Lumped sum | 1 | 33,255.00 | 2,217.00 |  |
| 1. Two public fountains with tree system pole and ridged coated steel fencing
 | pcs | 2 | 115,538.55 | 7,702.57 | One public fountain per 500 people |
| 1. Pipeline (transmission, distribution and fittings)\*
 | kms | 3.8 | 248,137.50 | 16,542.50 | Transmission line (2.8 km) and distribution line (1.0 km) |
| 1. Plumbing works for piping &fittings
 | Lumped sum | 1 | 40,000.00 | 2,666.67 | Including income tax |
| 1. Site clearing, trenching, excavation and pipe burying
 |  |  |  |  | To be covered in form of community contribution (***Total cost in Nakfa = 420,000.00***) |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.N** | **Activity** | **Unit** | **Qty** | **Total Cost** | **Remarks** |
| **Nakfa** | **Dollar** |  |
| **6** | 1. Submersible pump system, Solar system and Inverter\*
 | Lumped sum | 1 | 668,820.00 | 44,588.004 | Full or complete set with all its accessories |
| 1. Installation of the FV (solar panels), solar pump, lightening arresters and system test
 | Lumped sum | 1 | 45,000.00 | 3,000.00 | Including income tax |
|  | 1. Inverter box/control house\*
 | set | 1 | 6,400.00 | 400.00 |  |
| **7** | **Supervision and Monitoring during water supply system installation** | trips | 5 | 15,640.00 | 1,042.67 | * Including 17% income tax
* Excluding transportation cost
 |
| **8** | **WASH training for WASH Management Committee** |  | 1 | 21,000.00 | 1,400.00 | * Including 17% income tax
* One week standard training will be given to WASH Committee (with 7 members) by two trainers
 |
| **9** | **Import Tax and Fees** | percent | 12 | 121,321.98 | 8,084.93 |  |
| **10** | **Shipping costs from Italy** | Containers-40ft | 3 | 320,000.00 | 21,333.33 |  |
| **11** | **Transportation costs in Eritrea****(Massawa-Decamare-Asetah)** | Containers-40ft | 3 | 75,000.00 | 5,000.00 |  |
| **TOTAL** |  |  | **2,291,813.03** | **152,757.67** |  |
| **12** | **CONTINGENCY** | percent | 10 | **229,181.30** | **15,275.76** |  |
| **GRAND TOTAL** |  |  |  **2,520,994.33** | **168,033.43** |  |
| **\* Imported Items from Italy, Dollar for Nakfa is taken at 15.00** |

# Implementation Schedule

|  |  |  |
| --- | --- | --- |
| **S.N** | **Activities** | **Project (Starting – Ending) Month** |
| **1st** | **2nd** | **3rd** | **4th** | **5th** | **6th** | **7th** | **8th** | **9th** | **10th** | **11th** | **12th** |
| **1** | **Prefeasibility-Feasibility Survey**  | **X** |  |  |  |  |  |  |  |  |  |  |  |
| **2** | **Protocol (Briefing on project proposal and contract agreement signing)**  |  |  | **X** |  |  |  |  |  |  |  |  |  |
| **3** | **Groundwater resource assessment** |  | **X** |  |  |  |  |  |  |  |  |  |  |
| **4** | **Well drilling** |  | **X** | **X** |  |  |  |  |  |  |  |  |  |
| **5** | **Pumping test** |  |  | **X** |  |  |  |  |  |  |  |  |  |
| **6** | **Surveying and Community consultation** |  |  |  | **X** |  |  |  |  |  |  |  |  |
| **7** | **Water Supply System Design Report** |  | **X** | **X** | **X** |  |  |  |  |  |  |  |  |
| **8** | **WASH Management Committee establishment** |  | **X** | **X** | **X** |  |  |  |  |  |  |  |  |
| **9** | **Construction of Water supply system** |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Reservoir
 |  |  |  |  |  |  |  | **X** | **X** |  |  |  |
| 1. Submersible pump installation
 |  |  |  |  |  |  |  |  |  |  | **X** | **X** |
| 1. Installation of solar system
 |  |  |  |  |  |  |  |  |  |  | **X** | **X** |
| 1. Trenching
 |  |  |  |  | **X** | **X** | **X** |  |  |  |  |  |
| 1. Pipeline lying (Transmission and distribution pipelines)
 |  |  |  |  |  |  |  | **X** | **X** | **X** |  |  |
| 1. Public fountains
 |  |  |  |  |  |  |  | **X** | **X** | **X** |  |  |
| 1. Supervision and monitoring
 |  |  |  | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |

|  |  |  |
| --- | --- | --- |
| **S.N** | **Activities** | **Project (Starting – Ending) Month** |
| **1st** | **2nd** | **3rd** | **4th** | **5th** | **6th** | **7th** | **8th** | **9th** | **10th** | **11th** | **12th** |
| **10** | **Shipping from Italy** |  |  |  |  |  | **X** | **X** |  |  |  |  |  |
| **11** | **WASH training for WASH Management Committee** |  |  |  |  |  |  |  |  |  |  | **X** | **X** |

# ANNEX

# Annex - Engineering Construction and Cost Estimation

A unit priced based cost is estimated on the current basis of construction. These prices may be regarded as the year 2019 market prices. However the construction cost may change depending on the market situation.

## Annex 1 - Reservoir

|  |
| --- |
| EARTH WORK |
| **NO.** | **ITEM DESCRIPTION** | **UNIT** | **QTY** | **UNIT PRICE (DOLLAR)** | **TOTAL PRICE (DOLLAR)** |
| 1.1.1 | Site preparation, clear up and removal of top soil up to 30cm depth | m2  | 50 | 31.00 | 1,550.00 |
| 1.1.2 | Cart away surplus excavated material and deposit at an appropriate tip | m3  | 15 | 22.00 | 330.00 |
| 1.1.3 | Excavate for the hard core fill to depth of 20cm from the cleared surface (NGL). | m3  | 3 | 14.00 | 42.00 |
| 1.1.4 | 25cm thick basaltic or equivalent hard core blended with stone chips and aggregates. | m3  | 12.5 | 14.00 | 175.00 |
| 1.1.5 | Excavation 1m downstream of the waste manhole and soak-away-pit of 1.5x2x2m filled with gravel and boulders and connected by PVC drainpipe. | m3  | 6 | 20.00 | 120.00 |
| **Subtotal** |  |  |  | **2****,****2****1****7****.****0****0** |
| CONCRETE WORK |
| 1.2.1 | Lean concrete C-5, 5cm thick above the hard core. | m2 | 50 | 10 | 500.00 |
| 1.2.2 | 10cm thick concrete for floor slab class C-25, with minimum cement content ratio of 360Kg/ m3 of concrete. | m3 | 5 | 200 | 1,000.00 |
| 1.2.3 | Construct manhole (valve chambers) in HCB walls with lockable cover metal of internal size 60X60cm and depth 70cm. | Pcs | 1 | 350.00 | 350.00 |
| **Subtotal** |  |  |  | **1****,****8****5****0****.****0****0** |
| PE RESERIVIOR |
| 1.3.1 | Reservoir (PE)\* Each Reservoir is 7,800Ls for a total amount of 31,200 L | Pcs. | 4 | 900.00 | 3,600.00 |
| 1.3.2 | Metal fences (each m2x2,40) for reservoier fencing tree system | set | 15 | 70.00 | 1,050.00 |
| **Subtotal** |  |  |  | **4,650.00** |
| **TOTAL** |  |  |  | **8,717.00** |

## Annex 2 – Public Fountain (Single Public Fountain)

|  |
| --- |
|  EARTH WORK |
| **NO.** | **ITEM DESCRIPTION** | **UNIT** | **QTY** | **UNIT PRICE (DOLLAR)** | **TOTAL PRICE (DOLLAR)** |
| 2.1.1 | Site preparation and clearing to remove the topsoil to a depth of 20cm. | m2  | 28.5 | 2.01 | 57.285 |
| 2.1.2 | Excavate for the hard core fill to depth of 20cm from the cleared surface (NGL). | m3 | 5.7 | 16.00 | 91.20 |
| 2.1.3 | Excavation 1m downstream of the waste manhole and soak-away-pit of 1.5x2x2m filled with gravel and boulders and connected by PVC drainpipe. | m3 | 6 | 1.50 | 9.00 |
| **Subtotal** |  |  |  | **157.485** |
|  CONCRETE WORK |
| 2.2.1 | Lean concrete C-5, 5cm thick above the hard core. | m2  | 18.8 | 10.00 | 188.00 |
| 2.2.2 | 10cm thick concrete for floor slab class C-25, with minimum cement content ratio of 360Kg/.m3 of concrete | m3 | 1.88 | 200.00 | 376.00 |
| **Subtotal** |  |  |  | **5****6****4****.****0****0** |
|  STONE WORKS |
| 2.3.1 | 25cm thick basaltic or equivalent hard core blended with stone chips and aggregates. | m3 | 4.7 | 13.00 | 61.10 |
| 2.3.2 | Construction of tap stand stone masonry | m3 | 4 | 158.00 | 632.00 |
| 2.3.3 | Construction of dry masonry structure for soak away pit with thin cover mass concrete | m3 | 4.5 | 14.00 | 63.00 |
| **Subtotal** |  |  |  | **7****5****6****.****1****0** |
| **NO.** | **ITEM DESCRIPTION** | **UNIT** | **QTY** | **UNIT PRICE (DOLLAR)** | **TOTAL PRICE (DOLLAR)** |
|  PLASTERING AND COPPING |
| 2.4.1 | Cement screed for bottom slab to create a slope of 1% for drainage towards the outlet. | m2 | 18.8 | 43.00 | 808.40 |
| **Subtotal** |  |  |  | **808.40** |
|  PIPES AND FITTINGS |
|  | Supply and install all necessary materials with accessories and equipment required to connect the distribution pipe. |  |  |  |  |
| 2.5.1 | i. 1 ’’ diameter GI | m | 6 | 3.15 | 18.90 |
|  | ii.3/4’’ diameter GI | m | 12 | 2.60 | 31.20 |
| 2.5.2 | Supply of GI sewer pipe 100mm for soak away pit. | m | 6 | 15.00 | 90.00 |
| 2.5.3 | Gate valve, 2 ” | Pcs | 2 | 12.20 | 24.40 |
| 2.5.4 | Waste not tap, 3/4’’ | Pcs | 18 | 2.60 | 46.80 |
| 2.5.5 | Water meter 2” | Pcs | 2 | 182.00 | 364.00 |
| 2.5.6 | Reducer 2 ”- 1” | Pcs | 2 | 3.00 | 6.00 |
| 2.5.7 | Reducer 1”- 3/4” | Pcs | 10 | 2.00 | 20.00 |
| 2.5.8 | Elbow 1 ” | Pcs | 2 | 3.00 | 6.00 |
| 2.5.9 | Cross Tee 1” | Pcs | 9 | 4.00 | 36.00 |
| 2.5.10 | Union 1 ” | Pcs | 4 | 3.00 | 12.00 |
| **Subtotal** |  |  |  | **6****5****5****.****3****0** |
|  MANHOLES (VALVE CHAMBERS) |
| 2.6.1 | Construct manhole (valve chambers) in HCB walls with lockable cover metal of internal size 60x60cm and depth 70cm. | Pcs | 1 | 350.00 | 350.00 |
| **Subtotal** |  |  |  | **3****5****0****.****0****0** |
|  STANDARD FENCING |
| 2.7.1 |  Metal fences (each m 2x2,40) for FV system fencing | set | 8 | 70.00< | 560.00 |
| **Subtotal** |  |  |  | **5****6****0****.****0****0** |
| **TOTAL** |  |  |  | **3,851.285** |

## Annex 3– Piping, Fitting and Trenching

|  |
| --- |
|  TRENCHING AND PIPE LAYING  |
| **NO.** | **ITEM DESCRIPTION** | **UNIT** | **QTY** | **UNIT PRICE (DOLLAR)** | **TOTAL PRICE (DOLLAR)****)** |
| 3.1.1 | Trench excavation in ordinary soil to a depth of 70cm and minimum width of 60cm\* | m3 | 25 | 18.16 | 454.00\* |
| 3.1.2 | Trench excavation in hard rock soil to a depth of 80cm and minimum width of 50cm\* | m3 | 25 | 71.76 | 1,794.00\* |
| 3.1.3 | Spread of sand bedding on bottom of pipe trench to a depth of 10cm\* | m3 | 190 | 17.76 | 3,374.40\* |
| 3.1.4 | Normal back fill from excavated material\* | m3 | 1,260 | 17.76 | 22,377.60\* |
| 3.1.5 | Construct manhole (valve chambers) in HCB walls with lockable cover metal of internal size (60x60) cm and depth 70cm. | pcs | 4 | 350.00 | 1,400.00 |
| **Subtotal** |  |  |  | **1,400.00** |
| ***\* To be covered in form of community contribution to the project (28,000.00USD)*** |
| 3.1.6 | Pipe laying (pumping works) | Lumped sum |  |  | 2,666.70 |
| **Subtotal** |  |  |  | **2****,****6****6****6****.****7****0** |
|  TRANSMISSION AND DISTRIBUTION PIPES |
| 3.2.1 | HDPE75mm 10bar,100m role with 2 couples fitting \* | pcs | 30 | 272.00 | 8,160.00 |
| 3.2.2 | HDPE63mm 10bar,100m role with 2 couples fitting | pcs | 8 | 195.00 | 1,560.00 |
| 3.2.3 | Flexible riser pipe grey 1 ½ ’’, | m | 60 | 144.00 | 144.00 |
| **Subtotal** |  |  |  | **9****,****8****6****4****.****0****0** |
|  PIPE FITTINGS |
| **NO.** | **ITEM DESCRIPTION** | **UNIT** | **QTY** | **UNIT PRICE (DOLLAR)** | **TOTAL PRICE (DOLLAR))** |
| 3.3.1 | HDPE elbow 900,75mm | pcs | 4 | 8.00 | 32.00 |
| 3.3.2 | HDPE elbow 900,63mm | pcs | 6 | 11.00 | 66.00 |
| 3.3.3 | HDPE adaptor 75mm | pcs | 4 | 30.00 | 120.00 |
| 3.3.4 | HDPE adaptor 63mm | pcs | 4 | 22.00 | 88.00 |
| 3.3.5 | HDPE Tee 75mm | pcs | 2 | 18.00 | 36.00 |
| 3.3.6 | HDPE Tee 63mm | pcs | 3 | 6.00 | 18.00 |
| 3.3.7 | GI Elbow 900,3’’ | pcs | 4 | 12.00 | 48.00 |
| 3.3.8 | GI Elbow 450,3’’ | pcs | 4 | 12.00 | 48.00 |
| 3.3.9 | GI Union 3’’ | pcs | 4 | 12.00 | 48.00 |
| 3.3.10 | GI tee 3’’ | pcs | 4 | 53.00 | 212 |
| 3.3.11 | GI reducer 2 ½ ’’-2 ’’ | pcs | 4 | 9.60 | 38.40 |
| 3.3.12 | GI nipples 3’’ | pcs | 20 | 2.80 | 56.00 |
| 3.3.13 | GI nipples 2 ½ ’’ | pcs | 10 | 2.00 | 20.00 |
| 3.3.14 | GI Socket 3’’ | pcs | 10 | 2.80 | 28.00 |
| 3.3.15 | GI elbow 90, 2½ ’’ | pcs | 10 | 4.00 | 40.00 |
| 3.3.16 | GI Tee 3’’ | pcs | 4 | 4.20 | 16.80 |
| 3.3.17 | pipe saddle 75mm\*1’’ | pcs | 4 | 1.90 | 7.60 |
| 3.3.18 | Air release valve 1’’ | pcs | 4 | 70.00 | 280.00 |
| 3.3.19 | Teflon | pcs | 100 | 0.20 | 20.00 |
| 3.3.20 | Well head cover 2’’ | pcs | 1 | 100.00 | 100.00 |
| 3.3.21 | Gate valves 75DN + flanges  | pcs | 4 | 20.00 | 80.00 |
| 3.3.22 | Gate valves 63DN + flanges  | pcs | 2 | 13.00 | 26.00 |
| 3.3.23 | Couples fitting 75mm | pcs | 30 | 5.50 | 165.00 |
| 3.3.24 | Couples fitting 75mm | pcs | 6 | 3.00 | 18.00 |
| 3.3.25 | Water meter 3” | pcs | 1 | 500.00 | 500.00 |
| 3.3.26 |  DN 80mm uPVC strainer | pcs | 1 | 500.00 | 500.00 |
| **Subtotal** |  |  |  | **2,611.80** |
| **TOTAL** |  |  |  | **16,542.50** |

## Annex 5– Pump and Solar Panel Modules

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NO.** | **ITEM DESCRIPTION** | **UNIT** | **QTY** | **UNIT PRICE (DOLLAR)** | **TOTAL PRICE (DOLLAR))** |
| 5.1 | Submersible Pump | Pcs | 1 | 3,662.00 | 3,662.00 |
| 5.2 | Panel Modules 230 W; | Pcs | 36 | 265.00 | 9,540.00 |
| 5.3 | Inverter 5.5kW output voltage: 380 – 400 VAC; output frequency: 50 Hz (the inverter should function alternatively for solar and electric power)  | Pcs | 1 | 350.00 | 350.00 |
| 5.4 | Junction box with lightning arrester and DC switch | Pcs | 1 | 106.00 | 106.00 |
| 5.5 | Electrodes  | Pcs | 2 | 106.00 | 212.00 |
| 5.6 | Volcanizing kit | Pcs | 2 | 159.00 | 318.00 |
| 5.7 | Cable 4\*6 | meter | 100 | 11.00 | 1,100.00 |
| 5.8 | Cable for electrodes | meter | 200 | 2.10 | 420.00 |
| 5.9 | Solar bearing structure (FV system) | Set | 1 | 1,880.00 | 1,880.00 |
| 5.10 | Metal fences (each m2x2,40) for FV system fencing | Set | 30 | 70.00 | 2,100.00 |
| 5.11 | Plastic boxes for electric junction (10x20cm each) for tank level sensor control | Pcs | 34 | 3,000.00 | 3,000.00 |
| 5.12 | Electric cables coils of 100 m each for FV connection from solar system to the reservoir level sensor | Coil | 30 | 600.00 | 18,000.00 |
| 5.13 | Plastic tube cover for electric cable, each 50m, for tank level sensors from solar system to reservoir | Coil | 60 | 50.00 | 3,000.00 |
| 5.14 | Control house  | Set | 1 | 400.00 | 400.00 |
| 5.15 | Battery  | Set | 1 | 200.00 | 200.00 |
| 5.16 | Regulator/ Charge controller | Set | 1 | 100.00 | 100.00 |
| 5.17 | CO2 fire extinguisher | Pcs | 1 | 100.00 | 100.00 |
| 5.18 |  Sensors for full tanks | Set | 1 | 100.00 | 100.00 |
| **Subtotal** |  |  |  | **4****4****,****5****8****8****.****0****0** |
| 5.17 | Installation of the FV (solar panels), solar pump, lightening arresters and system test | Lumped sum | 1 | 3,000.00 | 3,000.00 |
| **Subtotal** |  |  |  | **3,000.00** |
| **TOTAL** |  |  |  | **47,588.00** |

## Annex 5 – Project Cost Summary

**(Materials, installation and setup)**

|  |
| --- |
| **BILL OF QUANTITIES IN DOLLAR (SUMMARY)** |
|  |
| **NO.** | **ITEM/COMPONENT DESCRIPTION** | **COST (DOLLAR)** |
| **1** | **CONSTRUCTION OF RESERVIOR** | **8,717.00** |
| **2** | **CONSTRUCTION OF TWO PUBLIC FOUNTAIN** | **7,702.57** |
| **3** | **PIPING, FITTINGS**  | **16,542.50** |
|  | **TRENCHING (community contribution to the project)** | **28,000.00** |
| **5** | **PUMP AND PANNELS MODULES COST** | **47,588.00** |
|   | **GRAND TOTAL** | **1****0****8****,****5****5****0****.****07** |