

ANNEX C- TECHNICAL SPECIFICATIONS AND SCOPE OF WORKS

Rehabilitation of Shallow Wells and Boreholes in Galmudug and South West States of Somalia

C1. INTRODUCTION

The Contractor shall undertake the rehabilitation, construction, installation, testing, and commissioning of the water sources and associated infrastructure specified under the respective lots. All works shall be executed in accordance with the approved engineering drawings, Bill of Quantities (BoQ), project requirements, and instructions issued by the supervising engineer.

The works shall include, as applicable, site preparation, cleaning and rehabilitation of existing water sources, deepening of shallow wells, well lining, construction of sanitary seals and aprons, installation of pumping equipment, solar power systems, elevated water storage tanks, communal water points, distribution pipelines, livestock watering troughs, protective fencing, generator rooms, drainage facilities, and all associated civil, mechanical, electrical, and plumbing works.

The Contractor shall provide all necessary labor, materials, equipment, tools, transportation, supervision, temporary works, testing facilities, and incidental items required to complete the works and deliver fully functional, safe, and durable water supply facilities.

All materials shall be new, fit for their intended purpose, and approved by the supervising engineer before installation. Materials and workmanship shall comply with the approved specifications, applicable engineering standards, and recognized good construction practices.

The Contractor shall be responsible for protecting the water sources against contamination, ensuring the structural stability of all constructed elements, and delivering facilities capable of reliable operation and straightforward maintenance by the designated users.

C2. SCOPE OF WORKS

The Contractor shall undertake all activities necessary to complete and commission the water supply facilities under the awarded lot. The scope shall include, but shall not be limited to, the following activities:

- Mobilization of personnel, equipment, construction materials, tools, and machinery to the designated sites.
- Site inspection, preparation, setting out, and verification of existing water source conditions.
- Cleaning, desilting, dewatering, rehabilitation, and deepening of existing shallow wells, where applicable.
- Installation or rehabilitation of well linings, sanitary seals, reinforced concrete covers, aprons, foundations, and associated masonry works.
- Supply and installation of pumping equipment, electrical cables, control panels, sensors, valves, and associated accessories.
- Supply and installation of solar photovoltaic systems, including solar panels, mounting structures, inverters, combiner boxes, disconnect switches, cabling, earthing, and protective enclosures, as applicable.
- Construction of elevated water storage tanks, supporting structures, foundations, and associated pipework, where specified.
- Construction of communal water points and installation of water distribution pipelines, taps, meters, valves, and fittings.
- Construction of livestock watering troughs for camels, cattle, donkeys, sheep, and goats, as specified in the BoQ.

- Construction or rehabilitation of protective fencing, access structures, drainage facilities, soakaways, and sanitary protection measures.
- Construction of generator rooms and associated foundations, walls, roofing, doors, windows, ventilation, and finishes, where specified.
- Testing, disinfection, commissioning, and verification of the completed water supply systems.
- Restoration and cleaning of the construction sites, removal of surplus materials, and disposal of waste.
- Training of designated users or operators on basic operation, routine maintenance, and safety procedures.
- Preparation and submission of completion records, test results, equipment manuals, warranties, and handover documentation.

The exact quantities, dimensions, equipment ratings, and construction details for each lot shall be as specified in the corresponding BoQ and approved drawings.

C3. LOT 1: REHABILITATION OF FIVE SHALLOW WELLS IN CEELBUR DISTRICT

C3.1 Scope of Works

The Contractor shall rehabilitate five existing shallow wells in Ceelbur District, Galmudug State of Somalia.

The works shall include the following principal activities:

- Mobilization and site preparation at each designated well.
- Cleaning, desilting, and dewatering of the existing well shaft.
- Excavation for sanitary seals, aprons, foundations, and associated structures.
- Construction or rehabilitation of wellhead protection, masonry, concrete foundations, aprons, and access covers.
- Installation of the specified 3.5 kW submersible pump and associated accessories.
- Supply and installation of the solar power system.
- Construction or rehabilitation of livestock watering troughs.
- Installation or repair of protective fencing.
- Construction of drainage facilities, including soakaways and associated drainage fittings.
- Installation of a four-tap community stand.
- Disinfection, testing, commissioning, and handover of each completed water source.

C3.2 Pumping Equipment

The Contractor shall supply and install one submersible pump rated at 3.5 kW for each well, complete with the accessories specified in the BoQ.

The installation shall include the necessary power cables, electrical connections, protective equipment, and associated fittings required for safe operation.

The pump shall be suitable for the actual well depth, static and dynamic water levels, required discharge, and available solar power supply.

The Contractor shall verify pump compatibility with the proposed solar system before installation. Any technical incompatibility identified between the pump, inverter, cables, and other equipment shall be reported to the supervising engineer before procurement or installation.

The pump shall be installed securely and in accordance with the manufacturer's recommendations.

C3.3 Solar Power System

The solar system shall comprise the equipment specified in the BoQ, including:

- Ten JA Solar 620 W monocrystalline solar panels, or an approved equivalent.
- One 5 kW solar pump inverter.
- One well probe sensor.
- One PV disconnect unit of the specified rating.
- Approximately 40 metres of 16 mm² three-phase power cable.
- One solar panel combiner box.
- Structural steel mounting frames and associated supports.
- Reinforced concrete mounting bases, nominally 400 mm × 400 mm × 650 mm, as specified in the BoQ.
- Underground cables, wiring accessories, connectors, earthing, and other necessary electrical components.

The panels shall be installed in the specified single-string arrangement, subject to confirmation that the string configuration complies with the inverter manufacturer's operating voltage and current limits.

The solar mounting structure shall be fabricated from suitable structural steel and provided with the specified protective primer and finishing paint. The lowest end of the mounting structure shall be approximately 2 metres above ground level, subject to the approved design.

The inverter and control equipment shall be housed in a lockable protective enclosure with adequate ventilation. The installation shall protect the equipment against weather, tampering, and accidental damage.

All cables shall be appropriately rated, securely supported, and protected against mechanical damage and environmental exposure.

The Contractor shall provide effective earthing and electrical protection in accordance with the approved design and applicable electrical safety standards.

C3.4 Livestock Watering Troughs

The Contractor shall construct the livestock watering troughs specified in the BoQ.

The works shall include site clearance, excavation, foundation preparation, hardcore filling, blinding concrete, reinforced concrete foundations, floor slabs, walls, reinforcement, formwork, and finishing.

For the camel trough, the BoQ specifies a reinforced concrete floor slab approximately 150 mm thick and reinforced concrete walls approximately 200 mm thick. The internal surfaces shall be plastered using cement-sand mortar incorporating waterproofing material where specified. External surfaces shall receive the specified protective finish. The trough shall be watertight, structurally stable, and free from sharp edges or defects that could injure animals.

The Contractor shall install the specified 2-inch galvanized iron drainage pipe and provide suitable drainage arrangements. The completed trough shall be filled and inspected to verify that it does not exhibit unacceptable leakage.

C3.5 Protective Fencing

The Contractor shall repair or replace damaged fencing components around the designated water sources.

The works shall include replacement of damaged circular hollow section steel posts, installation of bracing posts, anchoring rods, chain-link mesh, barbed wire, and associated fittings. The BoQ specifies steel posts approximately 2,100 mm high above ground and heavy-gauge chain-link fencing approximately 2,500 mm high. Steel posts shall be securely fixed in concrete bases and aligned to provide a stable fence line. Metal surfaces shall receive the specified protective primer and finishing coats.

The Contractor shall ensure that the fence is properly tensioned, securely anchored, and free from dangerous protruding components.

C3.6 Drainage, Soakaway, and Community Tapstand

The Contractor shall construct or rehabilitate the drainage arrangements associated with the well apron and livestock trough.

The soakaway shall be excavated to the required dimensions and filled with clean hardcore as specified in the BoQ.

The apron, trough, and associated surfaces shall receive the specified cement-sand screed or render, including waterproofing to the trough where required.

A four-tap community stand shall be erected adjacent to the designated well and connected to the approved water supply arrangement.

The Contractor shall verify the stability, alignment, operation, and leak-tightness of the tapstand and associated fittings before handover.

C4. LOT 2: REHABILITATION OF FIVE SHALLOW WELLS WITH HAND PUMPS IN BURHAKABA DISTRICT

C4.1 Scope of Works

The Contractor shall rehabilitate five shallow wells in Burhakaba District, South West State of Somalia.

The works shall include:

- Mobilization and site preparation.
- Provision of temporary shaft support, lifting equipment, ventilation, fall protection, and emergency rescue arrangements.
- Cleaning and desilting of the existing wells.
- Deepening of the wells from approximately 26 metres to a target depth of 30 metres, subject to actual site conditions and approval.
- Dewatering during excavation and lining works.
- Construction or rehabilitation of reinforced well lining and sanitary seals.
- Construction of concrete aprons, foundations, access covers, drainage facilities, and soakaways.
- Supply and installation of Afridev hand pumps and associated components, as specified in the BoQ.
- Construction or rehabilitation of protective structures and fencing.
- Disinfection, water-quality testing, commissioning, and handover.

C4.2 Well Deepening and Rehabilitation

Each well shall be assessed before rehabilitation to confirm its existing condition and the required depth.

The Contractor shall undertake the specified additional excavation of approximately 4 metres to achieve the target depth of 30 metres. Deep-shaft work shall be undertaken only with appropriate safety measures, including stable access, secure lifting equipment, suitable ventilation, excavation support, fall protection, and emergency rescue arrangements.

The Contractor shall prevent loose materials from falling into the well and shall ensure that all lifting equipment is suitable for the loads imposed. Any significant changes in geological conditions, water inflow, shaft stability, or other unforeseen conditions shall be reported to the supervising engineer.

C4.3 Well Lining and Sanitary Protection

The Contractor shall construct or repair the well lining to provide structural stability and protect the well against collapse.

Reinforced concrete lining shall be constructed in accordance with the approved structural details, including the required reinforcement, formwork, concrete placement, and curing. The sanitary seal shall be constructed around the wellhead to prevent contaminated surface water from entering the well. Concrete aprons and associated drainage structures shall be finished to direct spilled water away from the well and toward the designated soakaway. All wellhead protection structures shall be completed before installation of the hand pump and final commissioning.

C4.4 Afridev Hand Pumps

The Contractor shall supply and install complete Afridev hand pump assemblies in accordance with the BoQ and approved specifications.

Each assembly shall include the pump head, pedestal, cylinder, rising main, pump rods, seals, fasteners, and all other components required for complete operation. Pump components shall be new, compatible, corrosion resistant, and suitable for the required installation depth and operating conditions. The rising main and pump rods shall be installed to the required depth, with secure connections and proper alignment. The pump pedestal shall be firmly fixed to the concrete platform or approved mounting structure. After installation, the Contractor shall operate the pump and verify smooth movement, reliable water delivery, and the absence of unacceptable leakage or mechanical defects.

The Contractor shall confirm that the selected pump configuration is suitable for the final well depth and actual groundwater level.

C4.5 Aprons, Drainage, and Soakaways

The Contractor shall construct concrete aprons around the wells and provide suitable drainage to prevent stagnant water and erosion.

The BoQ provides for a compacted hardcore foundation approximately 300 mm thick, with a 50 mm concrete blinding layer where specified. Stone masonry shall be constructed using cement-sand mortar at the specified mix ratio and reinforced where required by the approved details. Soakaways shall be excavated to the specified dimensions and filled with clean hardcore to promote drainage.

The completed drainage system shall direct spilled water away from the well and prevent backflow or accumulation around the wellhead.

C4.6 Watering Troughs and Protective Structures

All foundations, reinforced concrete slabs, walls, reinforcement, formwork, plastering, and waterproofing shall comply with the approved drawings and the concrete works requirements in this Annex.

The Contractor shall ensure that the troughs are watertight, durable, and suitable for their intended livestock use.

Protective fencing and other associated structures shall be securely installed and finished to provide safe access and protection against unauthorized entry.

C5. LOT 3: REHABILITATION OF XAREED BOREHOLE IN CEELBUR DISTRICT

C5.1 Scope of Works

The Contractor shall rehabilitate the Xareed borehole in Ceelbur District, Galmudug State of Somalia, and complete the associated water supply infrastructure.

- The works shall include:
- Inspection and rehabilitation of the existing borehole.
- Supply and installation of the specified submersible pumping equipment.
- Installation of the solar photovoltaic power system and electrical controls.
- Construction of an elevated water storage tank and supporting structure.
- Installation of water supply and distribution pipelines.
- Construction of communal water points and installation of associated fittings.
- Construction of twin generator rooms.
- Construction of livestock watering troughs.
- Construction or repair of fencing, foundations, drainage, and associated protective structures.
- Testing, disinfection, commissioning, and handover of the completed water supply system.

C5.2 Borehole Pumping Equipment

The Contractor shall supply and install the submersible pump specified in the BoQ, identified as a Grundfos SP17-20 Rp2 with an 11kW motor, or an approved equivalent were permitted by the procurement requirements.

The equipment shall include the specified pump accessories, cut-off electrodes, drop cables, control panel, riser pipe, valves, fittings, and other components required for a complete installation.

The BoQ specifies a 3-inch riser main. The Contractor shall confirm the compatibility of the pump outlet, riser pipe, valves, and associated fittings before installation.

The pump shall be installed at a depth determined by the approved design and verified borehole conditions.

The Contractor shall ensure that the pump is adequately submerged under operating conditions and that the installation does not cause excessive drawdown, dry running, or damage to the equipment.

The control panel shall provide the protective and control functions required by the pump manufacturer and approved electrical design.

C5.3 Solar Photovoltaic System

The Contractor shall supply and install the solar power system specified in the BoQ, including:

- Sixty-two monocrystalline solar panels.
- One 15 kW solar pump inverter.
- Solar mounting structures and associated foundations.
- DC solar cables and required electrical connectors.
- Protective enclosures for the inverter and control equipment.
- Electrical distribution, isolation, earthing, and other required accessories.

All photovoltaic panels shall be securely fixed to the approved mounting structures and positioned to maximize solar exposure while avoiding unnecessary shading.

The mounting structures shall be designed and installed to withstand the applicable environmental conditions and loads.

The Contractor shall ensure that the solar array configuration is compatible with the inverter's permitted input voltage, current, and operating range.

All electrical connections shall be properly terminated, protected against weather exposure, and installed in accordance with the approved electrical design.

The inverter and control equipment shall be housed in a suitable protective enclosure with adequate ventilation and access for maintenance.

The completed system shall be tested to verify correct operation of the solar array, inverter, pump controls, protective devices, and associated electrical equipment.

C5.4 Elevated Water Storage Tank

The Contractor shall construct the elevated water storage tank in accordance with the BoQ and approved engineering drawings.

The BoQ identifies a tank height of approximately 12 metres and a stated storage capacity of 40 m³. These dimensions and capacity shall be verified against the approved drawings before construction.

The works shall include excavation, foundations, reinforced concrete or other specified structural components, supporting columns or structure, tank installation, access provisions, inlet and outlet pipework, overflow arrangements, drainage, and associated fittings.

The foundation shall be constructed on competent ground and shall be capable of supporting the tank, its supporting structure, and the full operating water load.

All reinforced concrete works shall be constructed using the specified concrete grades, reinforcement, formwork, and curing procedures.

The elevated tank and supporting structure shall be constructed in accordance with the approved structural design. No changes to structural dimensions or reinforcement shall be made without written approval from the supervising engineer. The tank shall be watertight, protected against contamination, and fitted with suitable inlet, outlet, overflow, drain, and access arrangements as indicated in the approved design.

The Contractor shall conduct the required structural inspections and leakage testing before the tank is accepted for operation.

C5.5 Water Distribution Pipelines

The Contractor shall supply and install the distribution pipelines specified in the BoQ, including the stated pipeline extension of approximately 300 metres to the Xareed water point.

Pipes shall be of the type, diameter, pressure rating, and material specified in the BoQ and approved drawings.

The Contractor shall provide all necessary fittings, bends, tees, connectors, valves, joints, and accessories required for a complete and operational system. Trenches shall be excavated to the required depth and alignment. Pipe bedding shall be prepared as required by the approved specification.

Pipes shall be installed without excessive bending, damage, or contamination of internal surfaces. Joints shall be assembled in accordance with the manufacturer's instructions. Before backfilling, the Contractor shall inspect the installation and conduct the specified pressure or leakage tests.

After successful testing and approval, trenches shall be backfilled and compacted in suitable layers.

C5.6 Communal Water Points

The works shall include foundations, concrete platforms, plumbing connections, water meters, taps, valves, and all other fittings necessary for complete operation.

The water points shall be positioned and constructed in accordance with the approved layout and drawings. All pipework shall be securely supported, and all connections shall be leak-tight.

The completed water points shall provide safe and convenient access to water and shall be finished to facilitate cleaning and routine maintenance.

C5.7 Twin Generator Rooms

The Contractor shall construct the twin generator rooms in accordance with the BoQ and approved architectural and structural drawings.

The works shall include excavation, foundations, hardcore filling, concrete blinding, reinforced concrete floor slabs, plinths, masonry or concrete block walls, damp-proofing, ring beams, roofing, doors, windows, ventilation, plastering, painting, and associated finishes.

The BoQ includes solid concrete block walls, reinforced concrete ring beams, treated timber roof members, galvanized corrugated roofing sheets, metal doors, and ventilated metal windows. These components shall be installed in accordance with the approved drawings.

Foundations shall be constructed on stable ground and shall include the specified reinforcement, damp-proof membrane, damp-proof course, and protective coatings where required.

The roof shall be weather-resistant and properly secured. Doors and windows shall be fitted with suitable hinges, locks, ironmongery, and protective finishes.

The rooms shall provide suitable ventilation and access for the intended generator installation and maintenance activities.

Generator equipment, fuel storage, exhaust systems, electrical installations, and fire protection shall be provided only to the extent specified in the BoQ or approved design. Any additional requirements shall be confirmed by the supervising engineer.

C5.8 Livestock Watering Troughs

The Contractor shall construct the camel and mixed-livestock watering troughs specified in the BoQ.

The works shall include site clearance, excavation, foundations, hardcore filling, concrete blinding, reinforced concrete floor slabs, reinforced concrete walls, formwork, reinforcement, plastering, waterproofing, and plumbing connections.

Internal trough surfaces shall be finished with the specified waterproof cement-sand plaster to facilitate cleaning and reduce leakage.

The Contractor shall install the specified inlet pipes, draw-off pipes, valves, and other plumbing fittings.

All troughs shall be structurally sound, watertight, and suitable for their intended livestock use.

C6. LOT 4: REHABILITATION OF BARABULLE BOREHOLE IN BURHAKABA DISTRICT

C6.1 Scope of Works

The Contractor shall rehabilitate the Barabulle borehole in Burhakaba District, South West State of Somalia, and complete the associated water supply infrastructure.

The works shall include:

- Inspection and rehabilitation of the existing borehole.
- Supply and installation of the specified submersible pump and associated accessories.
- Installation of the solar photovoltaic system and electrical controls.
- Construction of an elevated water storage tank and supporting structure.
- Construction of two communal water points.
- Installation of water distribution pipelines to the designated water points.
- Construction of twin generator rooms.
- Construction of camel and mixed-livestock watering troughs.
- Construction or rehabilitation of protective fencing, foundations, drainage, and associated structures.
- Testing, disinfection, commissioning, and handover of the complete water supply system.

C6.2 Borehole Pumping Equipment

The Contractor shall supply and install the submersible pumping equipment specified in the BoQ, identified as a Grundfos SP17-20 Rp2 with an 11kW motor, or an approved equivalent where permitted.

The installation shall include the specified cut-off electrodes, drop cables, control panel, riser main, gate valves, fittings, and other accessories required for complete operation.

The BoQ specifies a 3-inch riser main. The Contractor shall confirm compatibility between the pump outlet and the pipework before installation.

The pump shall be installed at the approved depth and shall operate within the manufacturer's specified operating conditions.

The Contractor shall verify that the pump, control panel, electrical supply, and solar inverter are compatible and that all protective devices operate correctly.

C6.3 Solar Photovoltaic System

The Contractor shall supply and install the solar power system specified in the BoQ, including:

- Eighty-six monocrystalline solar panels.
- One 18 kW solar pump inverter.
- Solar mounting structures and associated foundations.
- DC solar cables, connectors, and electrical accessories.
- Inverter protection enclosure.
- Earthing, isolation, and other required electrical protection equipment.

The solar panels shall be securely mounted and arranged to comply with the inverter manufacturer's electrical limits. The mounting structure shall be designed and installed to withstand the applicable environmental conditions and loads.

All cables shall be properly sized, routed, terminated, and protected against mechanical damage and weather exposure.

The inverter and associated controls shall be installed in a suitably ventilated and protected location.

The Contractor shall test the solar array, inverter, pump, control panel, and protective devices before commissioning.

C6.4 Elevated Water Storage Tank

The Contractor shall construct the elevated water storage tank and supporting structure in accordance with the BoQ and approved drawings.

The BoQ identifies a tank height of approximately 12 metres and a stated capacity of 40 m³. These details shall be verified against the approved engineering drawings before construction.

The works shall include foundations, structural supports, tank installation, inlet and outlet pipework, overflow and drain arrangements, access provisions, and associated fittings.

The supporting structure and foundations shall be designed and constructed to carry the full water load and other applicable loads safely.

Concrete works shall comply with the specified concrete grades, reinforcement details, formwork, placement, compaction, and curing requirements. The completed tank shall be watertight, protected against contamination, and fitted with the required operational accessories.

The Contractor shall undertake the required structural inspections and leakage testing before commissioning.

C6.5 Water Distribution Pipelines

The stated pipeline lengths include approximately 200 metres to the first water point and 800 metres to the second water point.

The Contractor shall verify the routes and connection points against the approved layout before excavation.

All pipelines shall be of the specified material, diameter, and pressure rating and shall be installed with compatible fittings, valves, joints, and accessories. Pipe trenches shall be prepared to the approved depth and alignment. Pipes shall be properly bedded and installed without damage. All joints shall be completed in accordance with the manufacturer's recommendations.

The Contractor shall carry out the required pressure or leakage tests before backfilling and shall submit the results to the supervising engineer. Trenches shall be backfilled and compacted, and the affected ground shall be restored.

C6.6 Communal Water Points

The Contractor shall construct two communal water points in accordance with the BoQ and approved drawings.

The works shall include foundations, concrete platforms, plumbing connections, water meters, taps, valves, and all other fittings required for complete operation.

The water points shall be positioned to provide convenient access to the intended users. All pipework and fittings shall be securely installed and protected against damage. The completed installations shall be tested for leakage and verified to provide reliable water delivery.

C6.7 Twin Generator Rooms

The Contractor shall construct the twin generator rooms in accordance with the BoQ and approved drawings.

The works shall include site preparation, excavation, foundations, hardcore filling, blinding concrete, reinforced concrete slabs and plinths, masonry walls, damp-proofing, ring beams, roofing, doors, windows, ventilation, plastering, painting, and finishing.

All structural elements shall be constructed using the specified materials and dimensions. The rooms shall be weather-resistant and provide suitable access and ventilation for the intended equipment. Metal doors, windows, and other steel components shall receive the specified protective coatings. All works shall be inspected and approved before handover.

C6.8 Livestock Watering Troughs

The Contractor shall construct the camel and mixed-livestock watering troughs specified in the BoQ.

The works shall include excavation, foundation construction, compacted hardcore filling, blinding concrete, reinforced concrete floors and walls, reinforcement, formwork, plastering, waterproofing, and plumbing fittings.

The camel trough shall incorporate the specified reinforced concrete floor slab and wall construction. The mixed-livestock trough shall incorporate the floor slab, reinforced concrete walls, internal waterproof plastering, and the specified galvanized mild steel inlet pipes and PVC draw-off pipe with gate valve. All troughs shall be watertight, durable, easy to clean, and suitable for their intended use.

C7. WATER QUALITY, DISINFECTION, AND HYGIENE

The Contractor shall take all necessary measures to protect the water sources from contamination during construction and installation.

No fuel, lubricants, chemicals, construction debris, wastewater, or other contaminants shall be allowed to enter the wells or boreholes.

Upon completion of rehabilitation works, the Contractor shall disinfect the relevant water source and associated water-retaining components in accordance with the approved procedure.

For chlorination, the Contractor shall use an appropriate chlorine product and determine the required dosage based on the measured water volume, product concentration, and instructions issued by the supervising engineer.

The Contractor shall allow the required contact time, flush the system where necessary, and record the disinfection procedure and residual chlorine checks.

Water-quality samples shall be collected and tested by a competent laboratory or approved testing service. Testing shall include microbiological parameters and the basic physical and chemical parameters required by the project specifications or supervising engineer. The water source shall not be declared fit for drinking until the relevant test results have been reviewed and accepted by the responsible authority or supervising engineer.

C8. TESTING AND COMMISSIONING

The Contractor shall carry out all tests necessary to demonstrate that the completed facilities are safe, functional, and compliant with the BoQ and approved design.

Testing shall include, as applicable:

C8.1 Shallow Wells

- Inspection of the well lining, sanitary seal, apron, covers, and drainage arrangements.
- Verification of the installed pump and associated equipment.
- Yield and recovery testing.
- Verification of pumping operation and discharge.
- Inspection of the solar system and electrical connections, where applicable.
- Inspection of the livestock troughs and drainage facilities.
- Water disinfection and water-quality testing.

C8.2 Boreholes

- Inspection of the installed submersible pump, riser main, valves, cables, and control panel.
- Verification of pump operation under the available operating conditions.
- Pump discharge and water-level measurements.
- Assessment of pumping performance and recovery, as required by the supervising engineer.
- Verification of solar array and inverter operation.
- Inspection of tank foundations, supporting structures, and associated pipework.
- Water tank leakage testing.
- Pipeline pressure or leakage testing.
- Functional testing of communal water points and livestock troughs.
- Water disinfection and water-quality testing.

C8.3 Solar Systems

The Contractor shall verify that all panels, mounting structures, inverters, cables, disconnect devices, sensors, and protective equipment are installed correctly.

The Contractor shall check electrical connections, earthing, protective devices, inverter settings, and pump controls. The solar pumping system shall be operated under suitable conditions to demonstrate

that it can start, operate, and stop correctly in accordance with the approved design and equipment manufacturer's requirements.

C8.4 Water Storage and Distribution

The elevated tank shall be inspected for structural defects and tested for leakage.

Pipelines shall be tested before final backfilling, where practicable, and any leakage or defective joints shall be rectified.

The Contractor shall demonstrate that water can be conveyed from the source to the storage tank and from the tank to the designated water points.

The completed system shall be checked for proper valve operation, secure connections, and acceptable water delivery.

All test results shall be recorded and submitted to the supervising engineer for review and approval.

C9. QUALITY ASSURANCE AND MATERIAL APPROVAL

All materials shall comply with the BoQ, approved drawings, and technical specifications. The Contractor shall submit samples, product data sheets, equipment specifications, and other supporting documentation for approval where required.

The supervising engineer shall be permitted to inspect materials, equipment, workmanship, and completed installations at appropriate stages of the works.

The Contractor shall not cover up or conceal structural elements, buried pipelines, reinforcement, or other work requiring inspection before approval has been obtained. Any materials or workmanship found to be defective, unsuitable, or inconsistent with the approved specifications shall be replaced or corrected at the Contractor's own expense.

The Contractor shall keep records of material approvals, inspection requests, concrete works, equipment installations, testing, and corrective actions.

Approval of materials or works by the supervising engineer shall not relieve the Contractor of responsibility for the quality, safety, and performance of the completed facilities.

C10. HEALTH, SAFETY, AND ENVIRONMENTAL PROTECTION

The Contractor shall comply with applicable health, safety, environmental, and safeguarding requirements throughout the construction period.

The Contractor shall provide appropriate personal protective equipment, safety training, first-aid arrangements, warning signs, barriers, and emergency procedures for all relevant activities.

Deep-well excavation and rehabilitation shall be undertaken with appropriate shaft support, ventilation, lifting arrangements, fall protection, and rescue procedures. Electrical and solar installation works shall be undertaken by competent personnel using appropriate isolation and protection procedures.

The Contractor shall store fuel, lubricants, cement, chemicals, and other hazardous materials safely and shall prevent spills and contamination of the water sources. Waste materials, excavated spoil, packaging, and construction debris shall be collected and disposed of at approved locations.

The Contractor shall minimize disruption to the local community and livestock and shall restore areas disturbed by the works.

All incidents, unsafe conditions, and environmental concerns shall be reported promptly to the supervising engineer and managed in accordance with the approved procedures.

C11. OPERATION AND MAINTENANCE TRAINING

Before handover, the Contractor shall provide practical training to the designated community representatives, operators, or responsible personnel.

Training shall cover the basic operation and maintenance of the installed equipment, including:

- Operation and routine inspection of pumps and hand pumps.
- Safe operation of solar panels, inverters, and associated electrical controls.
- Basic inspection of water tanks, valves, and pipelines.
- Cleaning and maintenance of communal water points.
- Cleaning and maintenance of livestock watering troughs.
- Identification and reporting of leaks, abnormal pump operation, and other faults.
- Basic hygiene measures to protect water quality.
- Procedures for reporting equipment failures and arranging repairs.

The Contractor shall provide the available equipment manuals, maintenance instructions, warranty information, and contact details for relevant suppliers or service providers.

C12. DEFECTS LIABILITY AND CONTRACTOR'S RESPONSIBILITIES

The Contractor shall remain responsible for the quality and performance of the completed works in accordance with the contract and the applicable defects liability provisions. Any defects arising from poor workmanship, defective materials, improper installation, or failure to comply with the approved specifications shall be corrected by the Contractor at its own expense within the period directed by the supervising engineer.

The Contractor shall protect completed works and installed equipment against damage until formal handover.

The Contractor shall ensure that all components are properly installed, operational, and accessible for routine maintenance.

The Contractor shall not substitute specified equipment or alter approved structural designs without prior written approval.

The Contractor shall coordinate all civil, mechanical, electrical, and plumbing activities to ensure that the completed facilities function as an integrated water supply system.

C13. DELIVERABLES AND HANDOVER

Upon completion, the Contractor shall submit and deliver the following:

- Fully rehabilitated shallow wells or boreholes under the awarded lot.
- Completed well linings, sanitary seals, aprons, covers, drainage structures, and protective measures, as applicable.
- Installed and operational pumping equipment and associated accessories.
- Completed solar power systems and electrical controls, where specified.

- Completed elevated water storage tanks and supporting structures, where specified.
- Completed communal water points and distribution pipelines, where specified.
- Completed livestock watering troughs and associated plumbing facilities.
- Completed protective fencing and generator rooms, where specified.
- Water-quality test results and disinfection records.
- Pump testing, pipeline testing, and commissioning records.
- Equipment manuals, warranties, and available maintenance documentation.
- Records of operator or community training.
- A list of installed equipment, including make, model, capacity, and serial numbers where applicable.
- A clean and restored construction site.
- Any required as-built drawings and completion records.
- Written confirmation that the completed works have been inspected and approved by the supervising engineer and the Client's representative.

Formal handover shall take place only after the required inspections, tests, corrective works, and documentation have been completed and accepted.

The bidder is signing this annex C as compliance to the technical specifications and scope of works;

Contractor/Supplier Name: _____

Authorized Representative: _____

Position/Title: _____

Signature: _____

Company Stamp: _____

Date: _____

Place: _____