



**DRILLING AND COMMISSIONING OF TWO (2) X SOLAR POWERED-BOREHOLES IN  
THE NORTH-WEST  
TECHNICAL SPECIFICATIONS**

**Phase 1: Water Survey**

<b>Specifications Item</b>	<b>Specifications Details</b>
Site establishment	Initial preparation of a construction site for borehole drilling
Borehole sitting and geophysical surveys by Geohydrologists ((Use Advanced Electronics Survey Machines)	<p>The survey report must be a detailed analysis of the groundwater potential, and the following must be reflected in the survey report:</p> <ul style="list-style-type: none"> <li>• location of the site to be drilled through the use of Geohydrologist expertise, geological and hydrogeological maps, and advanced geophysical instrumentation</li> <li>• The correct <b>drilling method/rig</b></li> <li>• <b>Drilling depth/target</b></li> </ul> <p>The hydro-geological report must be signed off by a professional Certified Natural Scientist that is registered with SACNASP</p> <p>Note: <b>Survey report</b> to be handed to ARC Personnel. The survey report must include the instruments and methods used</p> <p>No drilling work will be conducted without a professional survey report</p> <p>If the geohydrologists report no groundwater availability in the farm, then no borehole water drilling work will continue. The service provider will be paid for only survey work.</p>

**Phase 2: Borehole Drilling, Casing and Capping**

<b>Borehole drilling</b>	150m borehole (165mm diameter) Drilling work to be conducted according to SANS 10299-: 2003 – Development, Maintenance and Management of Groundwater Resources
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<b>Casing</b>	12m steel casing: Casing 177mm x 3mm, Steel casings must be welded together one by one while lowering them down the borehole
<b>Concrete collar around a borehole</b>	The Drilling Contractor will construct a shallow circular concrete collar around a successfully completed borehole. This collar shall have the dimensions set out in the attached Drawing, yielding a volume approaching 0.08 m <sup>3</sup> . The concrete mixture shall consist of water, Portland cement, stone aggregate (10 mm), and river sand. Quantities of these materials sufficient to make 0.1 m <sup>3</sup> of concrete with the required strength of 30 MPa after 28 days are: (1) 20 litre of water, (2) 42 kg (0.8 bag) of Portland cement, (3) 0.07 m <sup>3</sup> of stone aggregate and (4) 0.07 m <sup>3</sup> of river sand
<b>Cap</b>	The drilling contractor must put a <b>borehole cap</b> to prevent any foreign material from entering the borehole
<b>Drilling Machine Requirements</b>	The equipment must be of a suitable size and capacity to deal, on occasion, with: <ul style="list-style-type: none"> <li>• Deep boreholes (up to 200 m)</li> <li>• Larger than average borehole diameters (up to 254 mm)</li> <li>• Large quantities of groundwater and</li> <li>• Potentially onerous drilling conditions</li> </ul>
<b>Borehole drilling report</b>	A driller's log gives details of the construction of the borehole. As a minimum the report must include <b>Borehole depths and diameters, Casing depths and diameters, Water level, and so on.</b> A full borehole drilling report must be handed to ARC personnel.
<b>Unsuccessful Borehole</b>	A borehole will be declared unsuccessful at the discretion of the Hydrogeological Consultant who is supervising the borehole drilling. At any time during the course of the work, The Hydrogeological Consultant can order the abandonment of a borehole in progress. When such an unfortunate incidence occurs, ARC will cover only the costs of work done as determined in the bill of quantities (Total costs will be recalculated according to costs per item, e.g. costs per meter of casing/drilling).
<b>Requirements</b>	<b>Geohydrologist</b> must be registered with SACNASP

	Additionally, but not compulsory, the service providers may consider Geohydrologist who are members of the <b>Ground Water Division Specialist Directory</b>
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If soil formation needs less Steel casing, costs must be adjusted accordingly. If soil formation requires more Steel casing, costs can be adjusted to use the contingency amount.

Similarly, cost adjustments must apply if sufficient water is found at less than 150 m or at more than 150 m.

Screening (Steel type can be put under contingency amount should a need arise).

**Phase 3: Borehole Yield and Water Tests**

<b>24-Hour Borehole Yield Tests- Sustainable yield</b>	<p>Step draw-down and constant discharge tests, and water level recovery tests</p> <p>Determine correct sustainable yield according to the South African National Standard for Water Borehole Test Pumping (SANS 10299-4:2003)</p> <p>The borehole yield test serves as a certificate of compliance and as proof that the borehole installation meets the <b>SANS 10299-4:2003</b> specifications, thus a Borehole Yield Tests Certificate must be issued</p>
<b>Water tests-Chemical and microbial analysis</b>	<p>Tests must be according to the SANS 241-1: 2015 standards. Test report must be supplied with the conclusion</p> <p style="text-align: center;"><b>1. Drinking Water Tests</b></p> <p>SANS241 Chemistry + Microbiology Testing (Tests to be conducted at SANAS Accredited Laboratory). EC, pH, SAR, Langelier, Ryznar, Turbidity, Colour, Odour, TDS, TSS, Free Cl, F, Cl, SO<sub>4</sub>, NH<sub>4</sub>-N, NO<sub>3</sub>-N, NO<sub>2</sub>-N, Acidity, Alkalinity, Ca, Mg, Na, K, Mn, Fe, Al, HPC Heterotrophic Plate Count, Total coliforms, Faecal Coliforms</p> <p style="text-align: center;"><b>2. Irrigation Water Tests</b></p> <p>Chemistry &amp; Microbiology Testing (SANS241 Accredited Laboratory)</p> <p>EC, pH, COD, SAR, Langelier, Ryznar, TSS, F, Cl, SO<sub>4</sub>, NH<sub>4</sub>-N, NO<sub>3</sub>-N, NO<sub>2</sub>-N, Alkalinity, CO<sub>3</sub>, HCO<sub>3</sub>, Ca, Mg, Na, K, B, Mn, Fe, P, Faecal coliforms, TDS</p>

## **Water Distribution System**

### **1. Supply and Installation of Tank and Stand**

- Supply, deliver, and install 1 x 10,000L JoJo tank (or equivalent).
- Supply, deliver, and install 1 x 1.5m steel tank stand designed to support a fully filled 10,000L tank.
- Construct a robust reinforced concrete plinth/foundation to securely support the steel tank stand.
- The steel stand must be:
  - Coated with two protective layers:
    - One layer of anti-rust (corrosion-resistant) primer
    - One layer of thick protective topcoat, or alternatively, the stand must be fully galvanized for corrosion resistance.

### **2. Piping and Connections**

- Supply and install a complete pipe network from the borehole outlet to the tank, including all required:
  - Fittings, valves, elbows, reducers, and couplings.
- Install a high-quality ball valve at the bottom outlet of the tank for water flow control.
- All couplings and fittings must be properly assembled and buried together with the pipework in trenches.

### **3. Trenching and Installation**

- Excavate trenches for all pipework from the borehole to the tank site.
- Lay and connect all pipes and fittings, ensuring:
  - Correct gradient and alignment for optimal flow
  - Backfilling and compaction of trenches after pipe installation
- All installations must comply with applicable engineering and safety standards.

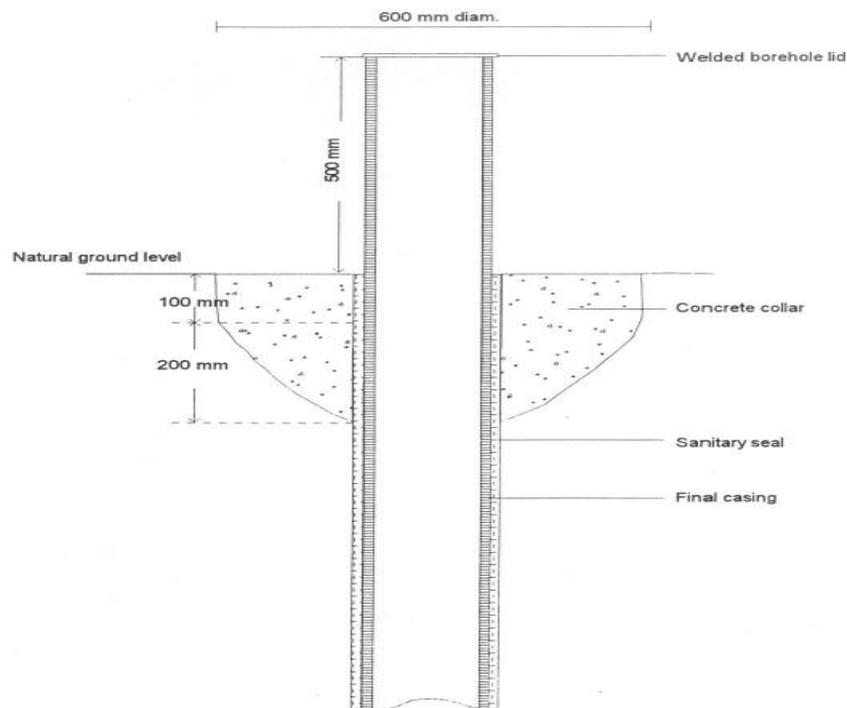
### **4. Location and Distance Constraints**

- The tank and stand must be installed within a maximum distance of 25 meters from both the borehole and the solar PV system, ensuring minimal pressure loss and efficient system operation.

### **5. Pipe Specification**

- Supply and deliver 4 rolls x 100 meters each of 32mm Class 16 HDPE pipe.
- Alternatively, depending on the borehole outlet discharge diameter, 40mm or 50mm HDPE pipes may be used to ensure compatibility and adequate flow capacity.

**Drawing: Concrete collar around a borehole**



**Figure 1 Concrete Collar Dimensions**

**Phase 4: Renewable Energy-Solar PV installations and**

**Solar System**

Specifications Item	Specifications Details
Monocrystalline Solar modules (3.33kW) <b>(555W x 6 solar modules)</b>	Monocrystalline solar modules aligned to face True North Employ the services of a Geomatics Professional (GPr) or Geomatics Technologist (GTg) Optimum tilt angle must be from 20 to 35 degrees  Brands: Solar modules: Jinko Solar, Canadian Solar, JA solar, RenewSys, Trinasolar, SunPro, Risen, Haitai Solar, Astroenergy or Equivalent
2.2 kW Centrifugal Solar borehole pump and a 2.2kW Solar pump controller with a Built-in MPPT (Maximum Power Point Tracking) technology)  Pump pressure head = 243m Flow = 4m <sup>3</sup> /hour	Water pumping at specified depth (Depth as per drilling contractor advice)  Use pump data sheets to select the correct pump that fit the required flow and pressure drop

Level sensor for the submersible pump (to be installed in the borehole)	Dry-run protection
Float level switches	Installed in the 10000-litre tank for controlling the pump and the level of water in the tank
Protection cabinet	Protect equipment from overload (fuses) Switch off the installation to perform maintenance via a main switch ON / OFF Protect the installation from lightning strikes and surges (surge arresters - SPD) <b>Create a central point of grounding</b>
Grounding	Equipment and System Grounding  <b>Equipment Grounding:</b> Connect the solar module frame, solar array mounting structure (Steel support structure), enclosures, metal frames and conduits of the system to a grounding electrode (metal rod or plate buried in the soil).  <b>System Grounding:</b> Connects the current-carrying conductors/electrical components of the system, to negative/ the neutral, to the grounding electrode.
Enclosures	All enclosure must have suitable protection against outdoor conditions
Mounting Structure	Solar modules will be mounted on poles (use steel structure, painted, minimum of 4 poles), The steel structure stand for solar modules must be covered with two layers of paint, one made with a rust-proof paint and the other made with a thick paint finish or galvanized.  Mount structure height=3.5m The structure must be structurally strong to withstand winds
Supply all cables	Red and black solar cables, pump power supply cable-submersible wire (10mm <sup>2</sup> , 4 core), grounding wires and other related cables
Sundries	All accessories

### **Lightning Protection and Earthing for Solar PV**

Apply measures to prevent catastrophic damage and failure of the installed PV system due to lightning. South Africa is in a highly lightning-dense region when compared to the rest of the world. Therefore, lightning strikes can still pose a risk to any electrical system, including solar panels, so **installing lightning protection is specific to the installed solar PV system.** Proper grounding, surge protection, and adherence to safety guidelines are crucial to minimizing the potential damage caused by lightning strikes. Grounding involves connecting solar panels and other electrical components to the Earth's surface, creating a path for

electrical currents to safely dissipate into the ground. **Use earthing, electrical configurations, and protection products based on standard compliance and protection.**

Note: Only an electrical contractor will be allowed to work on electrical installation, thus a registered qualified electrician, either **Installation Electrician (IE)** or a **Master Installation Electrician (MIE)** will be required to submit his/her registration certificate from the Department of Labour to ARC before electrical work commences. IE or NIE must issue a **COC** when electrical work is completed. **The IE or NIE who will be signing off the electrical CoC must be in control on site. He must carry out or supervise the work effectively.**

Further note that a licensed Single-Phase Tester (SPT) cannot work with DC and will therefore not sign off on DC installations, which would include PV and any three-phase installations. Therefore, a person with SPT qualification cannot issue a Certificate of Compliance for solar installations.

**Fencing-Supply and Installation of Security Fencing around the Borehole and Solar System for 2 sites: Fencing perimeter per site=24m, for 2 sites=48m**

<b>Fencing Materials</b>	<ul style="list-style-type: none"> <li>• 3000mm x 1800mm steel palisade panels</li> <li>• Palisade Fencing Pale 30mm x 30mm x 2mm/40mm x 40mm x 3mm</li> <li>• Steel posts (square tubing):76mm x 76mm x 2 mm with 2.4m height (Includes concrete mix)</li> <li>• 1800mm x 1000mm Steel pedestrian gate, hinges and locks</li> <li>• Two layers of paints</li> </ul>
Installation	Installation of posts, fencing, and paintwork

**Product Compliance**

Solar PV modules must have a Certificate of Compliance with the SANS/ IEC standards. Therefore, the solar modules must conform to the following:

- IEC61215(2016), IEC61730(2016)
- ISO9001:2015: Quality Management System
- ISO14001:2015: Environment Management System
- ISO45001:2018
- Occupational health and safety management systems

The above IEC standards must be reflected in the solar modules data sheets.

All other solar-powered system components must comply with IEC/SABS standards, and proof/certificates of compliance will be required for quality assurance.

**System Commissioning**

Commissioning which includes documentation, inspection, and testing should be carried out in accordance with applicable codes of practice and regulations. Commissioning documentation should include a single line diagram, individual component documentation, an O&M manual, and equipment warranty information. Warranties against defective components or poor workmanship must be submitted. Under the defects period, any items that fail, and are

not installed to standard, or are damaged, must be corrected on site at cost to the contractor/supplier/installer.

Electrical Installation must be done by a qualified electrical wireman with a valid registration with the Department of Labour. A valid electrical certificate of compliance must be issued once installed, specific to the installation of the solar system. The installation must comply with all warranty claim processes specific to each brand of equipment.

The service provider must submit warranty certificates as guided by the following table:  
Warranties Periods:

Component	Warranty Period
Solar modules	12 Year product warranty 25 Years linear power performance Warranty
Pump/motor	Minimum of 2 years
MPPT solar pump controller	Minimum of 2 years
Remaining components	Minimum of 1 year
Workmanship warranty/guarantee for all installations	1 Year
Structural: Solar module structural support	5 years

**Data sheets** for solar modules, solar pump controller, and submersible pump must be submitted in advance before installation commences.

## Compulsory Requirements

### CIDB Grading

Bidders must be registered with the Construction Industry Development Board (CIDB) and hold a minimum grading of **2CE or higher**.

### Relevant Experience

Service providers must demonstrate proven experience in similar work. A minimum of **three reference letters** must be submitted, each confirming completion of projects of similar size and scope. These letters must include **traceable contact details**. The projects should specifically relate to **borehole drilling and commissioning or bulk water infrastructure installation**.

### Contingency Provision

A **contingency amount equal to 10%** of the quoted price must be included. This reserve will be held by the **Agricultural Research Council (ARC)** to address any unforeseen circumstances. The use of this amount will be subject to the prior **written agreement between ARC and the appointed Contractor/Service Provider**.

### Compulsory Site Briefings

Attendance of the site briefing is **mandatory** for all prospective bidders.

### Site Briefing:

**Location:** Odessey Chicken Farm (PTY), North-West Province

**Coordinates:** 25°18'29.6"S, 28°01'49.0"E

**Date & Time:** 23 June 2025 at 10:00 AM

**The drilling locations (sites)**

<b>Province</b>	<b>Site Locations</b>	<b>No. of boreholes</b>
<b>North West</b>	40ha of land, Odessey Chicken Farm (PTY) 25°18'29.6"S 28°01'49.0"E  50ha of land, Thobela Scenic Agriholdings 25°27'48.4"S 27°55'37.5"E	<b>2</b>