



A GLENCORE MANAGED OPERATION

RHO-QT-W267

Solar Panel Cleaning

Annexure A

Scope of Work & Technical Specifications

Rhovan

AN OPERATION OF THE **RHOVAN PSV** MANAGED BY **GLENCORE**

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The Rhovan Pooling and Sharing Venture is a pooling and sharing venture between Glencore Operations South Africa (Pty) Ltd (Reg No 1997/017998/07) and the Bakwena-ba-Mogopa Community Trust

VAT Reg No 4270257969

Senior General Manager – C vd Westhuizen

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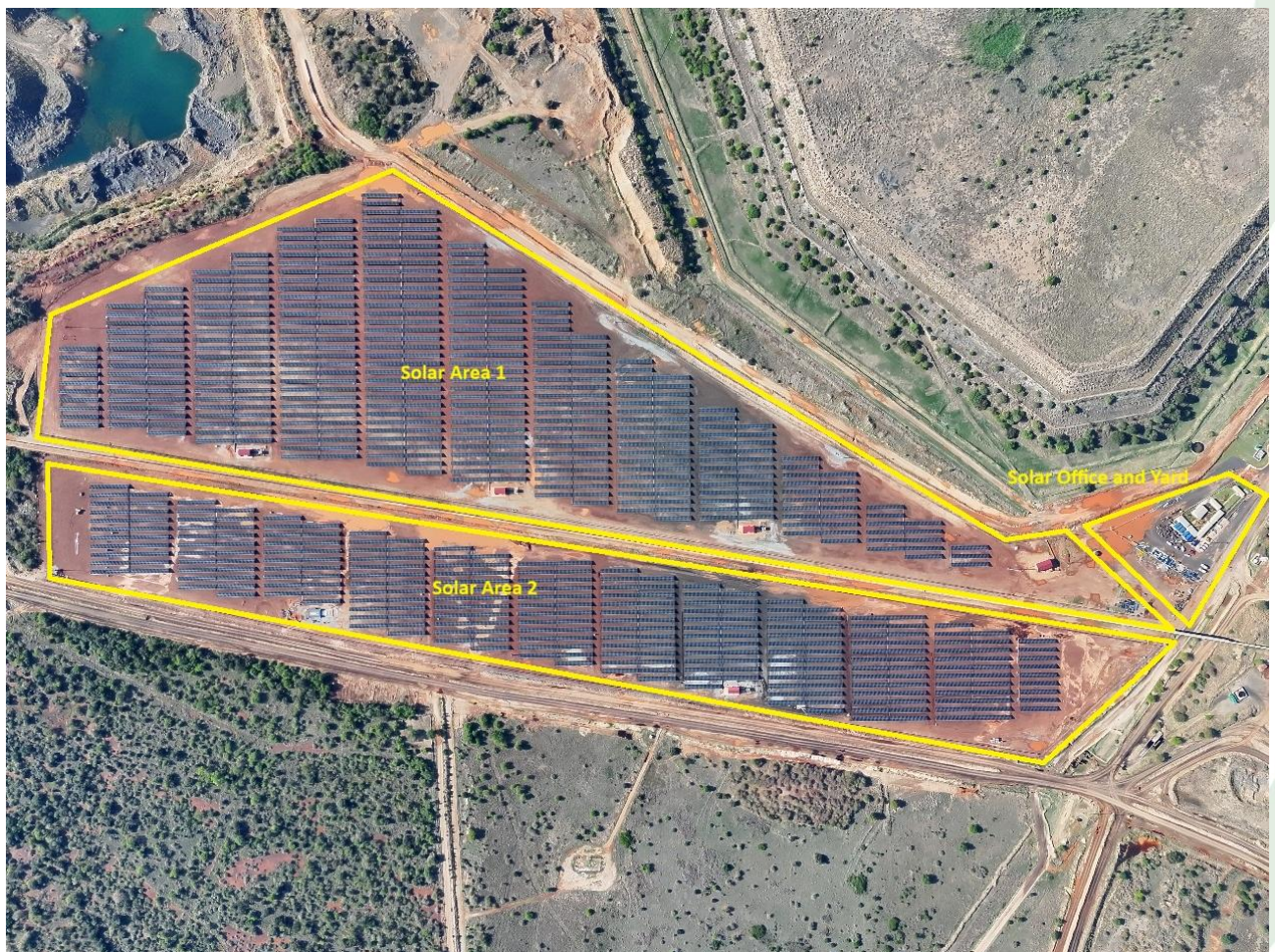
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1) Introduction

The scope of work includes the supply and rendering of solar panel cleaning services for the Solar Farm Project. The site is located at Rhovan, near Bethanie, close to Brits in the North West Province.

2) Project Description

The primary objective of the project is to ensure the efficient maintenance of solar panels by providing a suitable cleaning solution that enhances energy output and prolongs the lifespan of the panels.



Solar Farm Layout

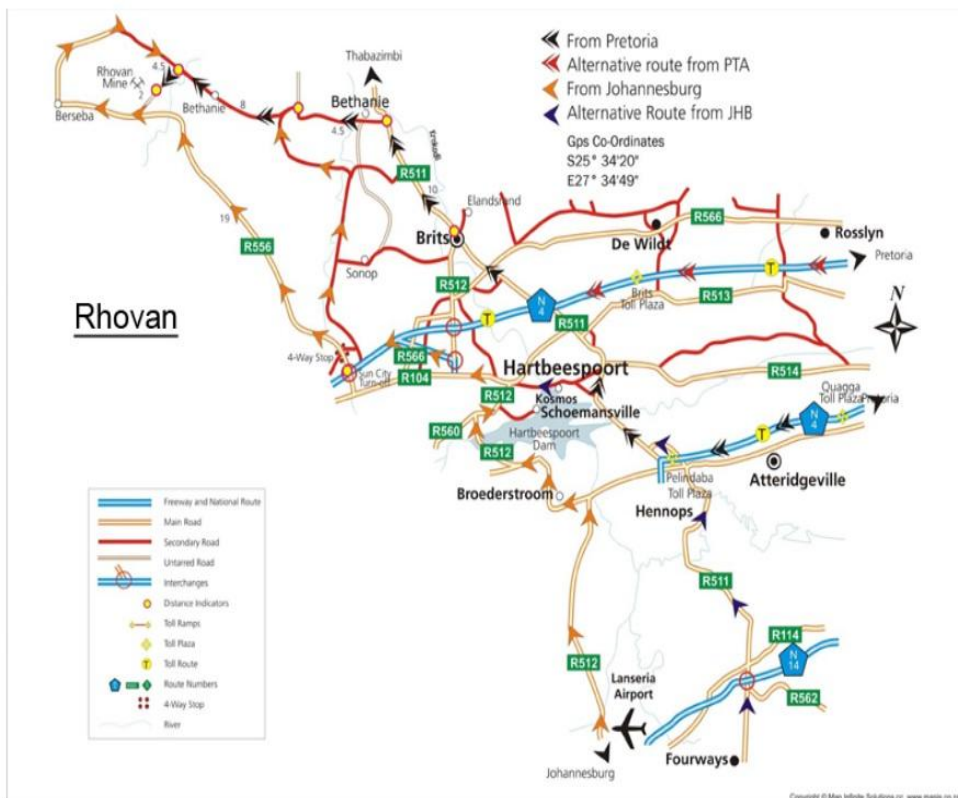
3) Location

The site is situated next to Bethanie, approximately 35 km from Brits in the North West Province.

Address: Plot Road, Bamagopa Mine, Bethanie, Brits, 0250, South Africa

GPS: S 25°34'20" E 27°34'49"

Map to Rhovan



4) Scope of Work

Supply and delivery of a solar panel cleaning solution for commercial solar panel tables.

The cleaning of the 37,800 photovoltaic (PV) modules shall be undertaken using manual telescopic water-fed solar panel brushes, in accordance with the Original Equipment Manufacturer (OEM), Trina Solar, module cleaning recommendations and the approved site cleaning methodology.

The cleaning operation shall be conducted during the cooler periods of the day to minimise thermal stress on the PV modules. A total shift duration of 9 hours shall be allowed, including water-bowser filling, equipment inspection, preparation, mobilisation, cleaning, water replenishment, and

demobilisation. Depending on the season and prevailing site conditions, approximately 5–6 hours of the shift shall be allocated to productive panel washing.

The Contractor shall report to the designated Rhovan Supervisor responsible for the work area.

4.1) OEM Cleaning Requirements

The following OEM requirements shall be strictly observed:

Early morning / late afternoon cleaning: Wet cleaning shall be scheduled during the early morning, late afternoon or under suitable overcast conditions. Modules shall not be washed when they are excessively hot or exposed to direct midday sunlight, as rapid temperature changes can create thermal stress and potentially damage or shatter the module glass.

CLEANING METHODS

Method A: Compressed water

Requirement for water quality:

- PH: 6–8;
- Water hardness-Calcium carbonate concentration : ≤ 600 mg/L
- Recommend to use soft water to wash.
- The recommended maximum water pressure is 4 bar



Water



Absolute ethyl alcohol



Gloves



Dust-free paper

No high-pressure washing: High-pressure washers shall not be used. Where pressurised water is required, the operating pressure shall remain within the OEM's specified limits and shall not exceed 4 bar.

No abrasive cleaning materials: Abrasive cloths, metal scrapers, hard brushes or any other cleaning tools capable of scratching the module surface shall be strictly prohibited. Particular care shall be taken to protect the module's anti-reflective coating.

Approved cleaning tools: A dry or wet, clean and soft cloth, sponge or soft-bristled brush shall be used to clean the photovoltaic modules. Cleaning tools shall not cause wear or damage to the glass, EPDM, silicone, aluminium alloys or steel components.

Prohibited chemicals: Alkaline and strong acidic cleaning agents shall not be used. The use of hydrofluoric acid, alkalis, acetone or other aggressive solvents is prohibited.

Water temperature: When cleaning the modules, the temperature difference between the cleaning water and the module shall be maintained within 5°C to minimise thermal shock and thermal stress.

Bifacial module rear surface: When cleaning the rear side of bifacial modules, particular care shall be taken to prevent damage to the rear surface. Sharp objects or tools that could penetrate or damage the base material shall not be used.

No cleaning during the hottest period: Cleaning shall not take place during the hottest part of the day. The cleaning programme shall be scheduled to avoid excessive module temperatures.

No walking on modules: Personnel shall not step, stand or walk on PV modules under any circumstances.

No water to module backs or cables: Water shall not be deliberately directed onto the rear side of the modules, cables or electrical connections.

Connectors: All connectors shall be kept clean and dry. Water ingress or contamination of connectors shall be prevented to minimise the risk of electric shock, electrical faults and fire.

4.2) Shift and Cleaning Programme

Each cleaning shift shall consist of approximately 7 hours, structured to maximise productive cleaning time while maintaining the OEM requirements.

The shift shall include:

- **Water bowser filling:** All required bowsers shall be filled at the designated water point before deployment to the cleaning areas.
- **Equipment inspection:** Water-fed poles, soft brushes, hoses, pumps, fittings, water tanks, PPE and associated equipment shall be inspected before each shift.
- **Water quality and temperature check:** Cleaning water shall be checked to ensure it is suitable for use and that the temperature difference between the water and PV modules is within the OEM's 5°C limit.
- **Pre-start safety briefing:** Personnel shall receive the daily toolbox talk covering PV electrical hazards, working around live equipment, manual handling, slip hazards and the OEM cleaning restrictions.
- **Mobilisation:** Cleaning teams shall move to their designated cleaning zones.
- **Productive washing:** Approximately 5–6 hours shall be allocated to actual panel washing, subject to seasonal conditions, module temperature, available daylight and weather conditions.

- **Water replenishment:** Bowsers shall be refilled at the designated water point, located 1.8 km away, as required.



Route too water point ■ 1.8km away

- **Inspection:** Cleaned modules shall be visually inspected for remaining soiling, streaking, water marks or damage.
- **Demobilisation:** Equipment shall be collected, cleaned, inspected and safely stored for the next shift.

4.3) Manpower and Resources

For the proposed 37,800-module PV plant, comprising two portrait rows of 28 modules per table (56 modules per table), the following resources are provided as indicative guidance for tender planning and pricing purposes.

The list is not exhaustive and shall not be construed as limiting the Contractor's responsibility to provide all labour, plant, equipment, materials, and other resources necessary for the proper and timely execution of the Works.

Supply and Operate

(The table below is provided as a recommendation only. The supplier/operator is expected to use their own resourcefulness and professional judgment where necessary.)

Resource	Recommended Allowance
Duration	36 Months
Shift Time – Predicted Summer months (Oct-March)	17h00 – 00H00 (Monday to Thursday) 4 days week

Shift Time – Predicted Winter months (April-September) weather conditions might alter shift time.	14h00 – 21H00 (Monday to Thursday) 4 days week
PV modules	37 800
Modules per table	56
Approximate tables	671
Cleaning rate per cycle	6720 per shift
Cleaners	12 (1 per brush)
Hose operators	12 (3 per hose)
Supervisors / Team Leaders	2
Coordinator	1
Total personnel	Approximately 27
Shift duration	7 hours
Productive washing time	5.5 hours
Water allowance	4–6 L/module
Estimated water per shift cleaning cycle	33 600L
Recommended water capacity	36 000 L
High pressure cleaning hoses, couplings, nozzles and accessories	X 4; 50m in length (cater for spares)
Cleaning method - Manual telescopic pole brushes with min. reach of 5m. with min brush width of 300mm	X 12 (cater for spares)
PPE	As stated in 6.2) 12
Own Transport to Rhovan	27 people
Site LDV on Site for equipment per Rhovan Spec (if required)	1
Detergent	(Free Issue when needed)
Water Bowser x 2; Interim until fixed water connection point are install net to PV Panels	(Free Issue when needed)

Recommended Team Size:

1 truck: 2 teams

Each team: 3 hose operators and 3 brush cleaners

1 supervisor: Per truck

1 water bowser/cart operator: Per truck

The 36 000-litre water allowance provides approximately 5 litres per module and allows for normal operational losses, hose flushing and variations in water consumption. Actual consumption shall be confirmed through a site cleaning trial.

4.4) Quality and Safety Control

The cleaning contractor shall ensure that all personnel are trained in the OEM cleaning requirements before commencing work. Any cleaning method, chemical, equipment or tool that could damage the PV modules, anti-reflective coating, frame, seals, cables or electrical connections shall be prohibited.

Cleaning shall be suspended where module temperatures, weather conditions, wind, rain or other site conditions prevent compliance with the OEM requirements.

The cleaning supervisor shall maintain daily records covering:

- Number of modules cleaned
- Cleaning zones completed
- Water consumed
- Bowser refills
- Equipment inspections
- Weather and module-temperature conditions
- Personnel deployed
- Defects or damaged modules identified
- Any deviation from the approved cleaning methodology
- No cleaning activity shall compromise the integrity, performance or electrical safety of the PV modules.

4.5) Solar Panel Table Configuration:

- 37m in length x 4m width
- 25-degree tilt
- 2 x portrait rows of 690W Trina Solar Panels. (28 panels per row)
- 1 metre (1000mm) Gap, spaced between tables
- Photos for reference



Example of manual telescopic brush with operator.



Solar Modules Configuration.



A maximum gap of 1000 mm between tables, with cable racks installed in some instances.



Aluminium clamps are used to secure the panels to the tables.

4.6) Exclusions

The following will be excluded from the Scope of Works

- Offloading of equipment, Rhovan will be responsible for offloading.

5) Services

5.1) Electrical Power Supply

- 1) The Contractor must make his own arrangements concerning the supply of electrical power and all other services. The cost of providing these services will be deemed to be included in the rates and amounts tendered for the various items of work for which these services are required.
- 2) The Contractor must supply his own generator of suitable size at his own cost.
- 3) Diesel driven generators are preferred. No petrol driven machinery of any kind will be allowed on Site without the prior permission of Glencore.

5.2) Water Supply

- 1) The Contractor may utilize water points on Site free of charge. However, water points are limited, and no special temporary water points and/or water point re-locations and/or water point extensions will be provided or supplied by Glencore. Should the Contractor require water points at special locations, the Contractor may provide such points at his own cost. Such temporary points must be approved by Glencore.
- 2) Water will be provided free of charge by Glencore.
- 3) Glencore always has the first right of use of a specific water point.
- 4) Should water not be available, the Contractor must supply his own water by means of a water cart/truck at his own cost.
- 5) **SPECIAL IMPORTANT NOTE:**
PROCESS WATER or other contaminated water at the plant may NOT BE USED for mixing concrete, grouts, screeds, or any other cementitious product, and NOT for cleaning of concrete

pumping equipment and formwork. Only clean uncontaminated water may be used from water points as indicated by the Glencore.

5.3) Ablution Facilities

- 1) An Ablution block is available at the site office.
- 2) The contractor may utilize these facilities free of charge.

6) Compliance to Mine Health and Safety Procedures

6.1) Medical Examination

- 1) Prior to commencement of work on site the contractor's employees must undergo a COMPULSORY medical examination at a medical clinic in Brits or Rustenburg as determined by the mine.
- 2) No employee of the contractor will be allowed on site without such medical examination declaring them fit to work on the site.
- 3) The contractor/tenderer shall include in his price (in the rates and P & G's) all costs related to these requirements.

6.2) Compulsory Health and Safety Training

- 1) Prior to commencement of work on site the contractor's employees must undergo COMPULSORY suitable training in respect of health and safety issues including emergency procedures.
- 2) General site induction course. (One day)
- 3) VRT (Virtual Reality Training). (One day)
- 4) Site specific induction. (Approx. 3 Hours, depending on amount of people)
- 5) Cost of training courses
- 6) The general site induction course and VRT will be offered by Rhovan, contact Rebecca Ramakutwane at 012 318 0747.
- 7) The site-specific induction training will be done in the department where the work will be done, also free of charge.
- 8) All employees need to complete the applicable SWP training which needs to be marked by an approved facilitator and moderator.
- 9) The contractor must load all documentation on HSEC Online and achieve a score of 100%.
- 10) No employee of the contractor will be allowed on site without successful completion of these courses.
- 11) The contractor/tenderer shall include in his price (in the rates and P & G's) all costs related to these requirements.

- 12) **PPE** requirements shall include, but are not limited to, a hard hat, safety glasses, two (2) sets of two pieces reflective stripe overalls, safety boots with metatarsal guards, safety gumboots with metatarsal guards, two (2) rain suits, and rubber gloves. All PPE shall be suitable for the work activities and maintained in good condition.

6.3) Contractors Information

Contractors General Information - Annexure C.

6.4) Operators & Machinery

All operators to have a valid CETA approved license see government gazette attachment. Rhovan training centre can assist with more information & training. **Contact Rebecca Ramakutwane on 012 318 0808.** The contractor shall carry out the cost for training & licensing.