

	Scope of Work	Planning and GIS CoE
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Title: **The HD Surveying Services for Eskom.**

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Alternative Reference Number: **N/A**

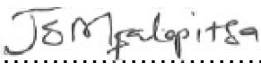
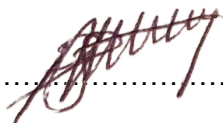
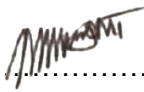
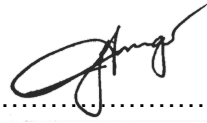
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Compiler	Reviewed by	Functional Responsibility	Authorized by
			
Johannes Mfalapitsa	Slindi Mhlongo	Mmbengeni Makungo	Mfundu Songo
Officer GIS:	Chief GIS Adviser:	GIS Manager:	Senior Manager:
GIS CoE	GIS CoE	GIS CoE	Planning & GIS CoE
Distribution Operations	Distribution Operations	Distribution Operations	Distribution Operations
Date: 08/11/2021	Date: 08/11/2021	Date: 08/11/2021	Date: 8Nov2021

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1. INTRODUCTION

The Geographic Information Systems (GIS) Centre of Excellence, which is part of the Planning and GIS Section within the Distribution Operations Division, is responsible for the provision of Geospatial products and services to all Divisions within Eskom. These services include, but not limited to, GIS and remote sensing, data acquisition, hosting, analysis and deployment. High Definition (HD) Survey is one of the service offered by GIS CoE section throughout the entire Eskom Business.

HD Survey is the single function that ties all the elements of a build engineering project, from conception through design, electrification mapping, land acquisition, construction, As-built surveying, geophysical surveying, drone surveying for topographical survey and site progress reporting. In Eskom projects, high definition surveying provides the foundation, continuity for route control, location, access issues as well as monitoring and inspecting new build and maintenance.

HD surveying in Eskom and/or the physical infrastructure will involve the following:

- Infrastructure, Construction and Monitoring survey
- Control beacons surveys
- Engineering and Topographic survey.
- Electrification Mapping and Reticulation survey
- Coal stockpiles volumetric survey and Ash dump survey
- Drainage and wet season readiness surveying
- Bathymetric and Hydrographic survey for Eskom dams
- GPR and Rebar scanning.
- 3D terrestrial and mobile scanning.

2. SUPPORTING CLAUSES

2.1 PURPOSE

The purpose of this document is to define the scope of work required for the Professional Services of experienced, registered and qualified survey teams, required to do HD surveying spatial data collection for new infrastructure and maintenance of existing asset in all Eskom projects. HD survey teams to use sophisticated surveying technology to acquire and perform Land Surveying services in Eskom.

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2.2 APPLICABILITY

This document is applicable throughout Eskom business.

2.3 EFFECTIVE DATE

This document will be effective from the date of approval and shall apply to all relevant stakeholders.

2.4 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.4.1 NORMATIVE

- [1] ISO 9001 Quality Management System
- [2] 240-44175132 PPE Specification
- [3] 32-520 Occupational Health & Safety Risk Assessment Procedure
- [4] 32-95 Environmental, Occupational Health and Safety Incident Management Procedure
- [5] 32-245 Waste Management Procedure
- [6] 32-418 Working at Height Procedure
- [7] Occupational Health and Safety Act No. 85 of 1993
- [8] 240-62196227 Eskom Lifesaving rules
- (9) 32-1109 LIDAR Specification.
- (10) TMH11_2013 Standard Survey Methods TMH11 Draft Version 2.0 February 2013
- (11) The Land Survey Act, 1997 (Act No. 8 of 1997).

2.4.2 INFORMATIVE

- [1] International Organization for Standardization, Guide 99, International Vocabulary of Basic and General Terms in Metrology, 2007.
- [2] Coal Accounting Methodology-PG/EA/001
- [3] Coal Quantity and Quality Accounting Standard for Thermal Efficiency Determination
- 240-87607698
- [4] Geospatial Positioning Accuracy Standards – Part 3: National Standard for Spatial Data Accuracy. Federal Geographic Data Committee, National Spatial Data Infrastructure (NSDI), 1998.

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2.5 DEFINITIONS

Definition	Description
Employer	Eskom
Contractor	Service provider contracted to provide a specific service to Eskom,
Base	The prepared surface described by the Authorised Base Data and upon which the coal is stockpiled. All material above this level is assumed to be coal and all material below is assumed to be ground.
Authorised Base Data	The stockyard base survey data, which has been authorised by the PED and Power Station Custodian. This data has been established from the original base data plus additional survey points, updates due to base infringement (Fill) and increased area etc. and, edited to cover the whole stockyard available area i.e. a coal base.
Density	Relative mass or a measure of the quantity of such mass per unit volume. For coal surveys, it is expressed as ton / m ³ . The “as found” density, which relates to the top layer of the stockpile, is corrected to be more representative of the average, by considering the variance between the equilibrium and the “as found” moisture.
Fill	For the volumetric survey, that portion of the Ground Data that describes any hollow below Authorised Base Data on exposed Base areas, i.e. Where material has been removed from below the Authorised Base level.
Cut	That portion of coal that is above the authorised base data.
Final Modelled Ground Data	The data file containing the final modelled Ground Data used in the final calculations. The difference between this data with respect to the cut volume and the Authorised Base Data constitutes the surveyed volume.
Ground data	The co-ordinated data of the actual as-surveyed profile of the whole stockpile area up to the physical boundaries.

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Land Survey	A volumetric survey done with "levelling, theodolite, distance ranging or GPS methods. For the purposes of this standard it also includes aerial photography
LiDAR	Land survey technique utilising airborne scanning laser technology.
Local Control Station	An LCS is typically used when there is need to control an actuator locally or at some location nearby, isolating it from the normal control signal.
Seasonal Coal Stockpile	A stockpile constructed for short to medium term storage. A stockpile constructed by either pushing coal away from the Live Coal Stockpile using bulldozers or front-end-loaders (FEL's) or, by truck or haul / dump equipment. The coal is not loose, i.e. some coincidental compaction is exerted by the mobile equipment which is moving the coal and the compacted bulk density is generally between 1,05 and 1,4 ton / m ³ .
Spontaneous Combustion	The ignition of organic matter (e.g. coal) without apparent cause, typically through heat generated internally by rapid oxidation
Strategic Coal Stockpile	A fully compacted stockpile constructed for long term strategic storage. The coal is moved from the Live / Seasonal piles or delivered by truck, spread, layered, watered (if necessary) and compacted with a vibro roller or impact roller according to the site operating instructions to give the specified compaction. The general compacted bulk density is between 1,3 and 1,5 ton / m ³ .
Surveyed volume	The calculated difference between the Authorised Base Data and Final Modelled Ground Data with respect to the Cut volume
Telemetry	is the distribution of belt control and informational signals over significant distances

2.6 ABBREVIATIONS

Abbreviation	Description
CS	Coal Stocks
CoE	Centre on Excellency
DVD	Digital Video Disc
GIS	Geographic Information System
GPS	Global Positioning System
AGPS	Airborne Global Positioning System (See also the application of GPS in this document.)
ASCII	American Standard Code for Information Exchange

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Abbreviation	Description
BOP	Best Operating Practise
CADD	Computer Aided Design and Draughting
CS	Coal Stocks
CoE	Centre on Excellency
DCS	Distributed control system
DEM	Digital Elevation Model
DGN	This is a reference to a Bentley MicroStation file format. The term is based on the file name extension used for this format.
DTM	Digital Terrain Model
DVD	Digital Video Disc
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System (In this document it refers generically to space satellite system positioning.
HMI	Human Machine Interface
Hz	hertz (frequency per second)
INS	Inertial Navigation System
IMU	Inertial Measurement Unit
LAS	This is a reference to an industry standard LiDAR point cloud file format. The term is based on the file name extension used for this format.
LCS	Local Control Stations
LiDAR	Light Detection and Ranging
MTLS	Mobile Terrestrial Laser Scanning
STLS	Stationary Terrestrial Laser Scanning
SY1	Stockyard Link Conveyor
TIN	Triangulated Irregular Network
TSSS	Total Station Survey System
MBES	Multi-beam echo sounders
Radar	A system for detecting the presence, direction, distance, and speed of aircraft, ships, and other objects, by sending out pulses of radio waves which are reflected off the object back to the source.
RGB	Red, Green, Blue, used in reference to parts of the visible light spectrum.
RMSE	Root Mean Square Error (may be followed by lower-case “z” as referred to elevation or an “r” if referencing a radial distance - x & y combined)

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2.7 SCOPE OF WORK/SUPPLY

The scope of work is as follows:

- Appointment of appropriate service providers who specialize in HD surveying.
- Provision of a survey team of professionals for performance of HD Surveying.
 - The team to comprise of the following:-
 - One Technologist/surveyor or professional surveyor or professional land surveyor registered with SAGC.
 - One Technical surveyor registered with SAGC.
 - Two survey assistants

NB: All survey endeavors must be signed off by a SAGC registered surveyor or professional surveyor or professional land surveyor

- Utilization of the required equipment and technology to perform HD Surveying.
- The service provider must ensure that point cloud models or Digital Terrain Models shall be “software independent” for easy transfer into and between software systems.
- The service provider shall Implement all the necessary quality control processes to ensure accurate surveying.
- The high definition survey types that is required for this contract include the following:
 - Infrastructure, Construction and Monitoring survey
 - Control beacons surveys
 - Engineering and Topographic survey.
 - Electrification Mapping and Reticulation survey
 - Coal stockpiles volumetric survey and Ash dump survey
 - Drainage and wet season readiness surveying
 - Bathymetric and Hydrographic survey for Eskom dams
 - GPR and Rebar scanning.
 - 3D terrestrial and mobile scanning.
- Employer must be notified where survey difficulty is experienced because of plant conditions, access to site, availability resources or hazardous locations, etc. where scaffolding and special access control will be required.

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Roles and responsibilities

The scope of this contract will include the following survey activities:

Role	Responsibility
Customer/Client	The business unit in Eskom requiring HD survey services is deemed the Customer/ Client in terms of the service, and as such is responsible for the following: • Initiating the request for HD survey s work to be performed and submitting it into the approved Eskom Engineering Work Management system and associated workflow processes. • Defining the scope of work involved. • Defining the quality of surveying required (based on the purpose for which the data- set will be used). • Providing supporting documentation and drawings for work request.
HD Survey Practitioners/ Employer's Agent for GIS CoE.	• Evaluating the Customer/Client request and routing to the correct resource via the task instruction allocation process and procedure. • Verifying HD survey work request and advising on the most appropriate technology to be applied to the request and scope of work. • Allocating resources to perform the scope of work (external service providers). • Implementation of data quality procedures and controls for HD survey services methods and data-sets. • Approve standard survey methods; as well as approving alternative survey methods (when a project has specific requirements). • Performing ad hoc audits on external 3D laser scanning service providers to confirm their adherence to standards and procedures.

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Service Provider	• To provide the HD Survey team lead by a registered professional with SAGC • Confirm sufficient details are provided in client/customer requests. • Logistical arrangements to ensure access to sites, the required permits are obtained for scanning, etc. • Ensure delivery of the scope of work according to specified standards, timelines and within the budget planned for the project. (Manage the project schedule). • Surveying of identified plant or components to the prescribed standard and according to the methodologies described in this document. • Ensuring that all equipment used are calibrated according to required standard and in line with the minimum frequency specified. • Providing for adequate data storage platforms and mechanisms to capture, process and store the data set. • Adhering to Eskom's site safety procedures, policies and other work requirements. This includes specifically obtaining the required work permits in areas deemed unsafe or high risk (or plant in operation).
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2.8 PROCESS FOR MONITORING

The required HD surveying PCM's, procedures and detailed work instructions shall be developed to support the execution of the standard in Eskom Holdings.

The required quality control and auditing processes will be implemented and invoked on regular intervals to measure adherence of the organisation to the requirements put forth in this standard.

2.9 RELATED/SUPPORTING DOCUMENTS

Not Applicable

3. DOCUMENT CONTENT

Professional services for HD survey Team is required.

HD survey team comprises of the following members:-

- One in a category of professional i.e. professional surveyor or professional land surveyor
- One in a category of Surveyor or Technologist
- One in a category of survey technician
- Two in a category of survey assistance

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The HD Survey team shall adhere to all rules and regulations prescribed by the Employer, which will be made clear during kick-off meetings before any project start.

3.1 DESCRIPTION OF WORKS/ WORKS INFORMATION

The scope of this contract will include the following survey activities:

3.1.1 Infrastructure, Construction and Monitoring survey

The following survey activities are required for infrastructure surveying projects in Eskom:-

- Survey existing conditions of the future work site.
- Conduct early works documentation data capture to support design works
- Ground control establishment, with definition of project-specific coordinate systems
- Survey of underground infrastructure whenever possible.
- Measuring invert elevations and the diameters of sewers and water pipes and positions and conditions of manholes.
- Validation of plant asset projects (verification and validation of “as built” plant to 3D design models).
- Plant refurbishments and Design Base Modifications (Management of Changes to and approved or existing Design Base).
- Surveyed digital alignments of existing roadways and other facilities.
- Stake out infrastructure position and location of construction new assets.
- Verify the location of structures during construction.
- Conduct an As-Built survey
- Ongoing alignment monitoring surveys for structure installation for example conveyors, rolling mills, gantry cranes and other equipment

3.1.2 Control beacons surveys

- The survey will be based on or referenced to the national survey system of South Africa.
- The coordinate system used in Eskom is WGS 84, Hartebeesthoek Ellipsoid, WG LO 29, Transvers Mercator projection.
- The service provider must survey control beacons around specified Area of Interest.
- The service provider shall have to provide the methodology and accuracy used to survey those beacons.

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- All fixed control points shall adhere to the Regulations Promulgated In Terms Of Section 10 of the Land Survey Act, 1997 (Act No. 8 of 1997).
- Professional responsible for this work shall assure that field procedures are consistent with the Eskom specifications for the desired accuracy in 32-1109 LIDAR Specification.

3.1.3 Engineering and Topographic survey.

- A topographical survey with spot shots sufficient to produce contour interval of 0.5m and 0.25m intervals.
- Corner points of all permanent and temporary structures.
- All fence lines including identification of type of fence including positions of all gates.
- All material stockpiles.
- All vegetation including trees, shrubs, etc.
- All embankments to be identified, that is, top and bottom of embankment.
- Open channels or drains including lining type.
- All survey reference markers or beacons.

3.1.4 Electrification Mapping, Pegging, Line design and Reticulation survey.

- Fixing of survey reference markers or beacons.
- Data capturing of fence comers and electrical infrastructure per transformer area.
- Mapping of stands 0.1m accuracy.
- GPS coordinate list.
- Capture the existing MV or LV lines and poles.
- Survey of profiles or crossing using PLSCADD software (profile, conductor, points of attachment & sag).
- The contractor will have to provide the methodology used to determine reticulation survey and calculations procedure.

3.1.5 Coal stockpiles volumetric survey

- Point levels and co-ordinates are required for the entire stockpile areas for both the stockyards the coal stockpiles and the limestone stockpiles.
- The service provider needs to determine volumes of these stockpiles.

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- The service provider will have to provide the methodology used to determine volumes and calculations procedure.
- Point levels and co-ordinates i.e. (x, y, z) are also required for the way bridge area and all the ramp roads and channels of in the stockyard areas at all power stations.
- The surveys of each stockpile shall be conducted on dates as determined by the power station.
- The service provider shall provide their own equipment with the specifications on their accuracy.
- Calibration certificates should be provided for all equipment used.
- Live stockpiles are for short-term storage and have no compaction.
- To survey this type of stockpile safety precautions is important because the stockpile is loose. Bulk density used is generally between 1,05 ton/ m³.
- Seasonal stockpiles have a little compaction and they are designed for storage duration of less than six months. Bulk density is generally between 1,2 ton/ m³ and 1,39 ton/ m³.
- Strategic stockpiles and emergency stockpiles are compacted and they are designed for planned storage duration of more than six months. The general compacted bulk density is between 1,49 ton/ m³ And 1,6 ton/ m³.
- Original Orth-image Pixel size 10 cm is require when using a drone,
- Three Ground points/m² average if laser scanning is used.
- DTM Horizontal Accuracy 10 cm, Vertical Accuracy 8 cm.
- Classification of laser points to ground and above ground classes.
- LiDAR or Laser points to be supplied in ASCII (-Y, -X, Z) format for Tiles and as a single file.
- Coordinates to be on the Lo Cape and WGS84 system for the Ash dump.
- 0.5 m contouring of ground model to be supplied in Micro station V8 .dgn format.
- The advancing slope crest of the ash dump main & standby systems to be picked up with the survey for the review the growth plan for the gap area.

3.1.6 Bathymetric and Hydrographic survey for Eskom dams

- The service provider to study the water system conditions and dams stability.
- HD Survey systems and solutions required for Bathymetric survey are as follows:-
 - Single beam echo sounders (SBES) – single and dual frequency
 - Multi-beam echo sounders (MBES)

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- Attitude and heading reference systems (AHRS)
 - Tide gauges
 - Sound speed sensors and probes
 - Side scan sonars
 - Sub-bottom profilers
 - Real-time data acquisition systems – software and hardware
 - Laser scanners
 - Drop and piston corers
- The service provider will have to provide the methodology used to determine hydrographic survey and calculations procedure.

3.1.7 GPR and Rebar scanning.

- The service provider to use GPR to detect the following:-
 - Underground utility lines and pipes
 - Air pockets or voids,
 - Excavated and back-filled areas,
 - Groundwater tables,
 - Live under pressure condition assessments for all effluent pipelines, pressurized or gravity fed,
- Concrete Scanning.
 - GPR and rebar Surveys on structures and their foundations.

The following information is required for the drainage and wet season readiness surveying:-

- Storm water Plan/Drawings
- Latest Site Development Plan/Layout
- Process piping, Water & Sewer lines; over-land Lines, Underground Lines, Railway and roads infrastructure surveys.
- CCTV Pipeline Inspection Surveys.
- Wet Service outline of the site and Wet Service Audit
- Drawing of Internal water facilities with X, Y and Z co-ordinates.
- DTM surface files (within project subdirectory for large scope)
- Internal storm-water and the related manholes, Grid Inlets, channels, etc, with X,Y,Z co-ordinates
- Plan and drill groundwater-monitoring boreholes representative of the site (min 3) distributed across the site.

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- Survey the site surface drainage to understand storm water control and make recommendations.
- Survey the wet services layout, i.e. water, sewer and storm water and make recommendations.
- Study the vulnerability of the site and evidence of past and current sinkholes, tension cracks and dolomitises.
- Write-up a Monitoring Procedure and must be in simple point form, i.e. what to be monitored, by who, what frequency, what information to be recorded, plan of action if an even event happens, who to contact when an even happens, what steps to be takes, who takes the responsibility, etc.
- The service provider will have to provide the methodology used to GPR/Rebar scanning and calculations procedure

3.1.8 3D terrestrial and mobile scanning

- The contractor shall provide the methodology used to determine 3D terrestrial and mobile scanning and calculations procedure followed.
- Scanning of identified plant or components to the prescribed standard
- Ensuring that all equipment used are calibrated according to required standard
- Providing for adequate data storage platforms and mechanisms to capture process and store the data set.
- Packaging all 3D laser scan data into a format suitable and as prescribed as part of the scope of work.
- Adhering to Eskom's site safety procedures, policies and other work requirements is compulsory
- Performing post processing 3D laser scan work in line with the required standards and methodologies.
- Creating an integrated point-cloud of the data in line with required standard.
- Packaging the integrated point-cloud in suitable formats for further processing and/or 3D modelling activities.
- Ensure that 3D laser scanning data used for 3D solid modelling in CADD applications are suitable and to the correct standard and quality.
- Documenting the meta-data of 3D Laser scanning data used in 3D CADD work to ensure proper reference to the data (and its revision, where appropriate) that was used in the creation of subsequent 3D CADD content (that is dependent on the original 3D Scan data).

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- Establishing (or re-establishing) a suitable 3D laser scan co-ordinate system for any 3D Laser scanning work to be performed, including determination of relevant height datum.
- Confirm common reference points to be used by all scanning contractors for a specific site/plant.
- Review checks and accuracies achieved from scanning after the fieldwork has been completed.
- Review data quality and compliance to required accuracy and tolerances.

3.2 SERVICE PROVIDER SUPPORT REQUIREMENTS

The service provider confirms that:

- a) In terms of geomatics profession Act, the company providing HD Survey services is owned or co-owned by a registered professional in the category of lead by a registered Professional Land Surveyor or Professional Surveyor or a Surveyor (Technologist).
- b) The service provider to provide a team of survey professionals lead by SAGC Registered Professional Surveyor or a Surveyor (Technologist).
- c) The service provider to provide a back-up standby team that can be mobilized on request within twenty-four hours to ensure availability of the complete surveyor functions (in case of sick leave, leave, emergency, etc.). The back-up standby team to be led by a Surveyor must have the same credentials as the full time HD Survey team.
- d) The service provider's Survey Supervisor plans, organizes and manages the surveying activities in order for the required services to be delivered efficiently and cost-effectively.
- e) The service provider confirms that he has been provided with sufficient information regarding the health and safety arrangements applicable to the *works*; the use of Plant, Materials and Equipment, as well as at the Site.
- f) The service provider to use survey equipment appropriate for the required scope of work. All survey equipment must have a valid calibration certificate and shall be provided to the Employer.
- g) The survey shall be delivered in the national survey system (WGS84, Hartebeesthoek94) of South Africa
- h) Fixed control points shall adhere to the Regulations Promulgated In Terms Of Section 10 of the Land Survey Act, 1997 (Act No. 8 of 1997).
- i) The digital terrain model shall have a relative vertical accuracy of 0.10m (σ) and relative horizontal accuracy of 0.2m (σ), for pixel size less than 0.15m.

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- j) The relative horizontal accuracy of the imagery shall not exceed 1.5 pixels (σ) and absolute accuracy shall be no more than 50% of the pixel size.
- k) The equipment manufacturing standards and specifications shall be included: Laser Scanner, Camera and GPS or Total Station.
- l) Professional accountability details and signature of Professional person taking accountability for the project shall be included as per Geomatics Council or South African
- m) For the use of drone technology, the relevant ROC certification from Council of Civil Aviation to be submitted.
- n) Most Eskom Site are National Key Point Areas, permission to use drone should also be obtained before the survey.

3.3 EQUIPMENT REQUIREMENTS

The Service Provider shall equip the surveying team with the following equipment.

- Global positioning system
- Total station
- Robotic total station
- Digital level
- Drone or UAV
- Ground penetrating radar
- 3D laser scanner
- Bathymetric or hydrographic scanner
- Micro station Version 8i
- Usmart
- Smart Plant and Solid Works
- PLSCad power line designer software package
- Model maker, AutoCAD software package

3.4 SAFETY, HEALTH, ENVIRONMENTAL AND QUALITY REQUIREMENTS

3.4.1 Safety requirements

The service provider shall comply with Eskom occupational health and safety, environmental, risk and quality requirements, standards and policies by doing the following:-

3.4.2 Mobile Terrestrial Laser Scanning Mandatory Agreements requirements,

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The service provider confirms that:

- In terms of sections 37(1) and 37(2) of the OHSA, the *Employer* is relieved of any and all of its responsibilities and liabilities pertaining to the activities performed by the service provider (and its employees, agents, Sub-*Consultant* and mandataries) relating to the *works*; the use of plant, materials and equipment; and whilst at the Site for whatsoever reason.
- The service provider confirms that he has been provided with sufficient information regarding the health and safety arrangements applicable to the *works*; the use of Plant, Materials and Equipment, as well as at the Site.

In addition, the service provider shall ensure that:

- a. Prior to The service provider commencing with any operations/ activities relating to the *works* and/or prior to gaining access to the Site, The service provider concludes a written mandatory agreement with the *Employer* in terms of section 37(2) of the OHSA and 5(1)(k) under the construction regulations. The aforementioned agreement constitutes a record of the written arrangements and procedures between the *Consultant* and *Employer* regarding health and safety.
- b. As far as is reasonably practicable, all hazards pertaining to the health and safety of persons and harm to the environment that are attached to any work which is performed, any article or substance which is produced, processed, used, handled, stored or transported and any plant or machinery which is used in its business, is clearly identified and, as far as is reasonably practicable, further establishes what precautionary measures should be taken with respect to such work, article, substance, plant or machinery in order to protect the health and safety of persons and or harm to the environment, and provides the necessary means to apply such precautionary measures;
- c. Such information, instructions, training and supervision as may be necessary to ensure, as far as is reasonably practicable, the health and safety at work of its employees, agents, sub-*Consultants* and mandataries is provided;
- d. As far as is reasonably practicable, no employee, agent, sub-*Consultant* and mandatory performs any work or produces, processes, uses, handles, stores or transports any article or substance or operates any plant or machinery, unless the precautionary measures which may be prescribed have been taken;
- e. Such measures as may be necessary in the interest of health and safety and the environment are enforced;

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- f. Work is performed and that plant, materials or equipment is used under the direct supervision of a person trained to understand the hazards associated with it and who has the authority to ensure that precautionary measures required by the *Employer* are implemented; and
- g. All employees are informed of the scope of their authority as contemplated in OHS Act.

3.4.3 Health and Safety Obligations

In addition to the mandatory agreements, the service provider:

- a. Ensures that all statutory appointments (as required in terms of the Occupational Health and Safety Act, No. 85 of 1993 and all applicable regulations binding in terms thereof, as amended) and other appointments required in terms of the Eskom's Safety Health and Environmental Specification are in place and that all appointees are cognisant of their duties and responsibilities in terms of such appointments;
- b. Ensures that such appointees execute their duties and responsibilities as required by such an appointment.
- c. Ensures that all personnel brought by itself onto site (including employees of *Consultants* and sub-*Consultants*) are suitably qualified and trained for the performance of the task, duties and functions, which will be allocated to them;
- d. Immediately reports any occupational or other injuries, near miss events, property damage, environmental related incidents as well as any potential threat to the health and safety of individuals at the *works* or on the site, as soon as he becomes aware thereof, to the Project Manager;
- e. Complies with the *Employer's* Environmental, Occupational Health & Safety Incident Management Procedure - 32-95 latest revision, relating to the reporting and investigation of incidents. The classification of incidents contained in such document are considered final and must be applied by the *Consultant* relating to any incidents/ injuries relating to its employees, agents, *Consultants*, sub-*Consultants* and mandataries whilst on Site
- f. Conducts a risk assessment regarding the utilisation of PPE and thereafter ensure that PPE of good quality is issued (at its own cost) to its employees, agents, *Consultants*, sub-*Consultants* and mandataries prior to such individuals accessing the site, alternatively performing activities related to the *works* at the site, as specified in the Eskom PPE Procedure /Specification .

3.4.4 SHE Documentation required from the service provider

The service provider shall provide the following documents in terms of Health, Safety and Environmental performance:

- Valid Letter of good standing with COID or any insurance body

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- An organogram indicating the names of all persons that will hold legal appointments on the project in terms of the Act.
- The expected roles, responsibilities and authority of those who are proposed to receive legal appointments.
- A baseline risk assessment to be conducted
- H&S costing/ Budget
- SHE proof Competency
- Acknowledgement of Eskom's lifesaving rules & requirements
- Health, Safety and Environmental Plan
- Medical Certificate
- Signed SHEQ policy
- Provide an overview of the system / program that is utilized to manage Safety, Health and Environment.

3.4.5 Quality Documentation Required From The *Consultant* During Tender Stage.

- Quality Method statement based on scope.
- Quality Policy Approved by top management.
- Documented information for defined roles, responsibilities and authorities.
- Documented information for Control of Externally Provided Processes, Products and Services.
- Training Records of the operators.
- Equipment calibration certificate of compliance.

3.5 DELIVERABLES

The complete and accurate survey report must describe and include:

- Original fieldwork and notes in electronic format. A work plan indicating all the beacons, including the secret survey points;
- An electronic (PDF) and paper version of the report
- A professional surveyor or surveyor (technologist) registered with the South African Geomatics Council must sign off the documents.
- CAD drawings of each stock pile in a DWG,DXF AND DGN file format
- Site plot plan indicating site control beacons survey positions and the area of interest(AOI), numbered accordingly and consistency and comparison
- Contractors, on handover of the project information, will demonstrate to the client and all end-users how to navigate through the information with explanations/presentation of the contents.

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- Related documentation and Project information be submitted on hard drive or Memory Stick

3.6 GUIDELINE FRAMEWORK FOR THE COMPILATION OF SURVEY REPORTS

The survey report should include but not limited to the following:

1. Survey Project Description
2. Name of organisation that performed the survey
3. Description of the project
 - 3.1 Locality of the survey area
 - 3.2 Terrain type description
 - 3.3 Size of the survey
 - 3.4 Date and duration of the survey
 - 3.5 Surveyors involved (Names, qualifications and registration numbers).
4. Execution of the project
 - 4.1 Instrumentation and equipment used
 - 4.2 Projections and Coordinate System and Datum used
 - 4.3 Detail description of methodology applied fixing controls
 - 4.4 Detail description of methodology applied volumetric surveys
 - 4.5 Limits of allowable errors in fieldwork
 - 4.6 Control beacons and comparison Results
 - 4.7 Stockpile Volume Calculations and Results
 - 4.8 Problem situations and solving of problems
 - 4.9 Delays due to unforeseen circumstances
5. Quality control
 - 5.1 Detail description of quality control methodology
 - 5.2 Accuracies (*Provide a summary of accuracies obtained*)
6. Recommendations

(Results from the survey to be kept in mind for future surveys in the same area.)

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7. General information (*Information that the surveyor wants to bring to the attention of the client, and not mentioned elsewhere in the report.*)

SIGNATURE

Printed Name

Designation

South African Geomatics Council Registration Number

Date

NOTE: This report can be supplemented with photographs and bound into the hard copy job file.

Reference is the TMH11_2013 Standard Survey Methods TMH11 Draft Version 2.0 February 2013

3.7 SKILLS & EXPERIENCE

Eskom shall appoint competent service providers with the relevant skills and experience to perform the survey and provide the deliverables stated by the *Scope of Works*.

3.8 DESIGN TOOLS

The *service provider* shall use high quality calibrated equipment and instruments to produce accurate data and drawings. The tools to be used for producing the survey drawings and associated data will be delivered by GIS in accordance with specific data take-on procedures to facilitate easy migration to Microstation later.

4. AUTHORISATION

This document has been seen and accepted by:

Name	Designation
S'lindi Mhlongo	Chief Advisor GIS
Mmbengeni Makungo	Middle Manager GIS
Mfundi Songo	Senior Manager Asset Creation

5. REVISIONS

Date	Rev.	Compiler	Remarks
January 2021	0	JS Mfalapitsa	Scope of Works

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6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

- a) Johannes Mfalapitsa
- b) Xolani Ndlovu
- c) Buhle Nedzungani
- d) Boitumelo Motaung
- e) Tshisikhawe Mphaphuli
- f) Dumisani Sibande

7. ACKNOWLEDGEMENT

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