Eskom	Environmental Maintenance Management Plan	Central East Cluster- Free State

Title: **MAINTENANCE MANAGEMENT PLAN: 1VIRGINIA TERMINAL-VIRGINIA TOWN 44kV LINE REPAIR**

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1. INTRODUCTION

As part of Eskom's Environmental Management System (ISO14001: 2015), there is a commitment to the development & implementation of an Environmental Management Plan for all existing infrastructure. The infrastructure specific Environmental Management Plan should be implemented throughout the life span of the infrastructure. In cases where there is not an existing Environmental Management Plan for the infrastructure an Environmental Maintenance Management Plan is drawn up to ensure duty of care is taken on all maintenance activities specific to the infrastructure.

The maintenance activities listed in this document comply to the maintenance standards within Eskom and are required to ensure that assets meet their design performance over their life cycle. This Environmental Maintenance Management Plan is specific to the restoration activities associated with the 1 Virginia Terminal-Virginia Town 44kV power line

2. SUPPORTING CLAUSES

2.1 SCOPE

The scope of this document is to list maintenance activities related to the asset and to prescribe how the environmental impacts will be managed and monitored. This document also includes details on environmentally sensitive areas in close proximity to the asset that might be impacted on by maintenance activities and how rehabilitation should be done.

According to the National Environmental Management Act (NEMA), 107 of 1998, Environmental Impact Assessment (EIA) Regulations of 2014 (as amended), listing notice 1 activity 19, an approved Maintenance Plan, which is based on the scope of the proposed maintenance of infrastructure should be in place for maintenance activities to commence lawfully within a watercourse where the thresholds are met. Based on this, Eskom Distribution Central East Cluster's Free State Operating unit has drafted this Environmental Management Maintenance Plan (EMMP) which outlines the scope of maintenance of the 1 Virginia Terminal-Virginia Town 44kV powerline. This is inclusive of a work method statement and mitigation measures, which will contribute to environmental best practice to optimize environmental benefits and minimize the negative environmental effects that may arise.

2.1.1 Purpose

The purpose of this document is to guide all maintenance activities to be performed on the existing 1 Virginia Terminal- Virginia Town 44kV power line to ensure activities are done within reasonable duty of care to the environment.

Secondly, to fulfill the requirements of requesting adoption of a maintenance management plan for the above-mentioned powerline by the Department of Forestry, Fisheries and Environment (DFFE). This is as per listing notice 1, activity 19 of the Environmental Impact Assessment (EIA) regulations of 2014(as amended) which outlines the following:

The infilling or depositing of any material of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from:

(i) *A watercourse*

- *But excluding where such infilling, depositing, dredging, excavation, removal or moving-*
- *(b)* ***is for maintenance purposes undertaken in accordance with a maintenance management plan***

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Distribution, Central East Cluster Free State Operating Unit and its subsidiaries, and entities wherein Eskom Dx Central East Cluster, Free State has a controlling interest, including identified contractors, suppliers, and service providers, wherever work is related to maintenance activities to be performed on the 1Virginia Terminal-Virginia Town 44kV power line.

2.2 NORMATIVE/INFORMATIVE REFERENCES

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

2.2.1 Normative

[1] National Environmental Management Act 107 of 1998

[2] ISO 14001: 2015 Environmental Management Systems Requirements with Guidance for use

[3] ISO 9001 Quality Management System

[4] 32-727: Safety and Health, Environment and Quality (SHEQ) Policy

[5] 240-170000760: Maintenance Standard for Metal Structured Power Lines

[6] 240-Dx-09T: Standard for Environmental Impact Assessment of Distribution Activities

[7] 240-71380115 Task Manual Metal Structure powerline inspections and defect clearing-Lattice structures, insulators & Conductors

2.2.2 Informative

[1] 240-133087117: Environmental Incident Management Procedure

[2] 240-71555318: Generic Environmental Management Program for Operation and Maintenance

[3] 240-87293434: Job plan standard

[4] 34-1441: Routine inspection and maintenance of Sub transmission and distribution lines

[5] Mucina,L., Rutherford, M.C. and Powrie L.W. 2006. Inland Azonal vegetation. *Strelitzia 19*. p617- 657

2.3 DEFINITIONS

Definition	Description
Environmental Authority	Statutory body that governs and prescribes the processes that needs to be undertaken for certain construction activities. They are also the decision-making authority granting authorisation for specific projects.
Environmental impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services
Eskom Environmental Officer	An individual appointed by Eskom to implement and monitor compliance to the Environmental Maintenance Management Plan.
Contractor	A person or company appointed by Eskom to carry out stipulated activities.
Environment	Surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans and their interactions.
Environmental aspect	Elements of an organization's activities, products or services which can interact with the environment.
Mitigate	The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.
Monitoring	An activity which ensures that the requirements of the Environmental Management Program is met.

2.3.1 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
AHI	Asset Health Index
BIL	Basic Insulation Level
BGIS	Biodiversity Geographical Information System
CNC	Customer Network Centre
CPM	Control Plant Maintenance
DFFE	Department of Forestry, Fishery and Environment
DWS	Department of Water & Sanitation
Dx	Distribution Division
EIA	Environmental Impact Assessment
EM	Emergent Work KPIs in the MHD
EMP	Environmental Management Plan
EMMP	Environmental Maintenance Management Plan
EO	Environmental Officer
FSOU	Free State Operating Unit
MEW	Major Engineering Works
MHD	Maintenance Health Dashboard
HV OH	High Voltage Overhead
NEPS	Network and Equipment Performance System
OHSA	Occupational Health and Safety Act
PDE	Power Delivery Engineering
PM	Preventative Maintenance Task (Maximo)
PPE	Personal Protective Equipment
PPM	Power Plant Maintenance
SAHRA	South African Heritage Resource Agency
SDC	Structured Data Capture (Wood pole management)

2.5 ROLES AND RESPONSIBILITIES

a) Zone Manager

The *Zone Manager* is responsible for overall management of the maintenance and EMMP implementation during maintenance activities. The following tasks will fall within his / her responsibilities:

- Be familiar with the recommendations and mitigation measures of this EMMP and ensure implementation of these measures.
- Monitor site activities for compliance.
- Rectify transgressions through the implementation of corrective action.

b) Eskom Environmental Officer

The Environmental Officer (EO) is responsible for ensuring that the EMMP is properly implemented during major maintenance activities by acting as liaison between Eskom, Contractor, and Landowners. The following tasks will fall within his / her responsibilities:

- Be familiar with the recommendations and mitigation measures of this EMMP.
- Conduct construction audits and compile report as per Monitoring plan.
- Ensure contractors and entire project team are aware of the contents of EMMP.
- Liaise with the construction team and the CNC supervisor.
- Recommend corrective action for non-compliance incidents on the site.
- Carry out a general advisory role in terms of environmental management throughout the maintenance process.
- Identify and obtain any additional environmental authorisations required for the maintenance tasks.

c) Contractor/Specialised Maintenance and Support

The *Contractor* is responsible for the overall execution of the activities during the repair including the implementation and compliance at all times with recommendations and conditions of the EMMP as well as implementation of corrective actions from the EO. He/ She should maintain an environmental incident register which keeps a record of all incidents which occur on the site during construction. These incidents include:

- Public involvement / complaints
- Health and safety incidents
- Incidents involving Hazardous materials stored on site
- Non-compliance incidents
- Waste related incident
- Incidents involving biodiversity e.g. birds, livestock, etc.

2.6 ENVIRONMENTAL SCREENING

The study area is located within the town of Virginia, Free State province's Matjhabeng local municipality. The site is situated across from a residential area indicated as Ward 9. The backdrop of the site appears to be an old mining area belonging to Harmony mine. In terms of the vegetation group, the site falls within the Dry Highveld Grassland biome. The area has been predominantly transformed by human activities with evidence of indiscriminate littering, rubble dumping, trenching for man-made furrows, electricity power line development etc. being observed on site.

One of the major environmental features on site is a large Unchanneled Valley bottom wetland (see figure 1 and 1.1) and is categorised as being of artificial origin according to the South African National Biodiversity Institute (SANBI) Biodiversity Geographical Information System (BGIS) viewer.

The proposed maintenance activities on the existing powerline are planned to be undertaken within this wetland area. The wetland is predominantly degraded due to anthropogenic (human related) factors such as pollution through waste disposal activities. The proposed study area is located in the Middle Vaal Water management area as demarcated by the Department of Water and Sanitation and the vegetation classified as Highveld Alluvial Vegetation. The area is dominated by some short grasses and hydrophytic vegetation in the form of dense, long reeds attributed to long periods of time in wet conditions.

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Figure 1: Site layout area

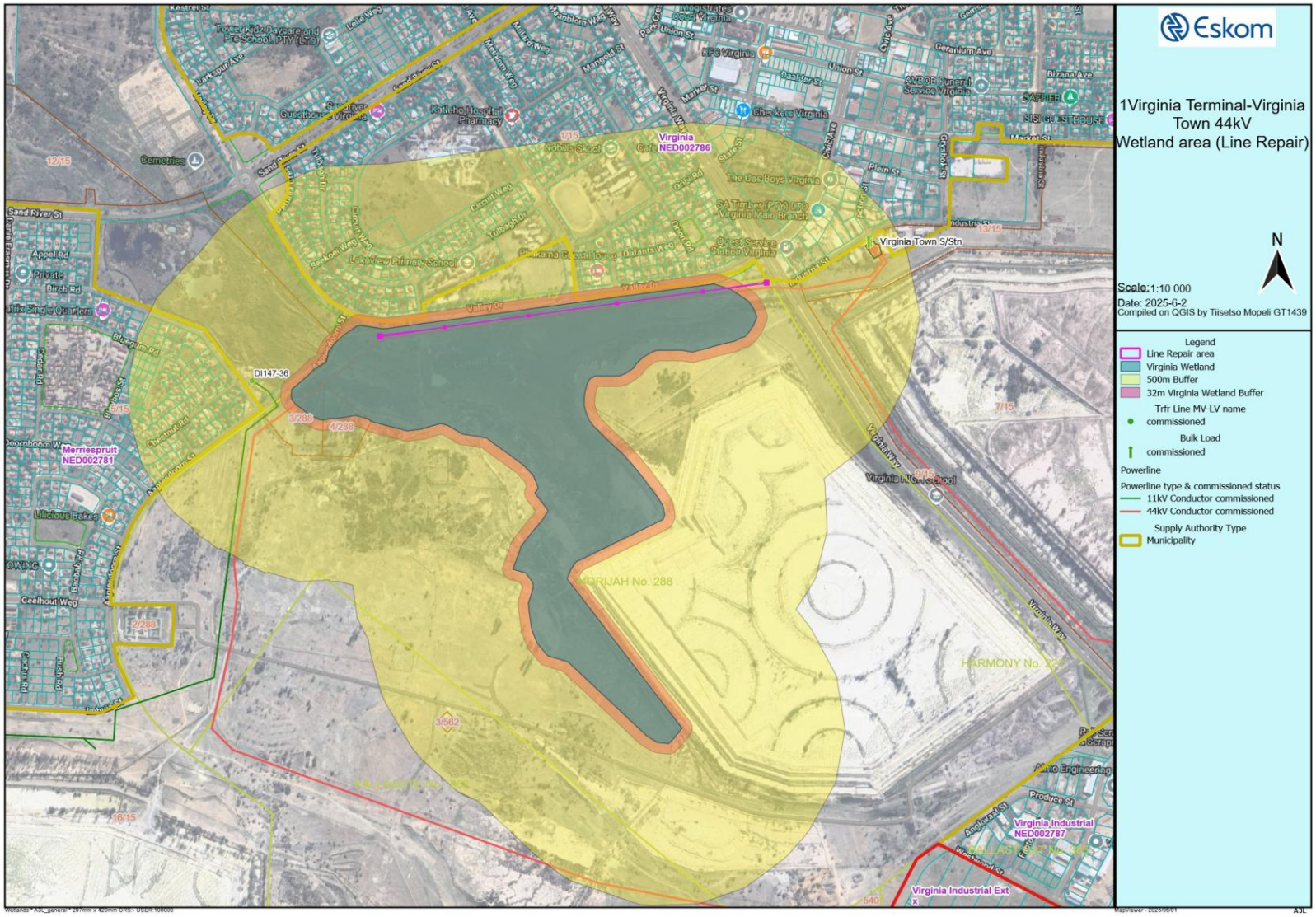


Figure1.1: Site layout area wetland

ENVIRONMENTAL ELEMENT (S)	DESCRIPTION(S)
2.6.1 Current Land-use surrounding the area:	• Project area is located in the town of Virginia across a residential area which is categorised as ward 9. The site where the existing line traverses and where the work in the unchanneled valley bottom wetland area is planned is on a property owned by Harmony Gold mine, farm name Morijah No. 288 • Towards the back of wetland area there is an old mine slimes dam at a distance from the area where the line runs (Figure 1). There are signs of littering and dumping of various material in the wetland area (see figure 2-4)

Figure 2: Evidence of dumping on site

Figure 3: Stone materials deposited on site

Figure 4: Various waste material dumped on site

2.6.2 Vegetation Type/ Biome (s) (plants, trees and grasses grow naturally in the area):	The Vegetation type in the project area according to SANBI is Alluvial Highveld vegetation within the Azonal Vegetation Biome. According to Mucina et al. (2006) this biome is characterised by vegetation that is more influenced by local soil conditions rather than the general climate in the region. Factors that influence this type of vegetation can include soil wetness, salinity and geomorphology. Such vegetation is more distinct in nature and often found in patches across the landscape. Hydrophytic wetland vegetation such as reeds (see figure 5) in the wetland at the study area is typical of azonal vegetation as it's influenced by prolonged periods of saturation.

Figure 5: Reeds growing in the wetland area

The areas that do not fall within the areas of permanent or prolonged saturation are characterised by short grasses and small trees as can be seen in figure 3.

2.6.3 Topography (Open veldt/ valley/ flowing landscape/ steep slopes):	The topography of the area is generally flat in nature with minor dips as one moves across the site. Being right across the residential area, there is a tarred road i.e Valley drive road running parallel to the site. The landscape is largely transformed by human activities with dumping of mounds of various types of debris also visible on site (see figures 2-4). There is also evidence of man-made furrows dug along the edge of the site (see figure 6)

Figure 6: Furrow on site

2.6.4 Soil type found in the area where the site occurs:	The broader soil class of the area according to SANBI is categorised as being part of structureless and clay-type in nature. The description goes on to further detail that the soil has a restricted depth and imperfect drainage. From observation on site, the soil appears to be a faded brown to grey in colour.

Figure 7: Soil on surface is greyish-brown in colour

2.6.5 Animals naturally occurring in the area (Fauna):	During the site visit there were no specific animals observed apart from a few small birds that were flying in and out of the reeds.
2.6.6 Protected areas (Game parks/nature reserves, monuments, etc.) close to the proposed site:	• There are no formally declared protected areas in the immediate vicinity of the project site. The closest is Tara Wildlife Safari which is a formerly declared nature reserve located approximately 17km away and Thabong game ranch 12km away.
2.6.7 Type of equipment/ material to be used on environment:	• Excavation equipment e.g. TLB; electrical conductors, isolators, construction vehicles, steel pole structures.
2.6.8 How far is the proposed operation from open water bodies?	The existing line is already located within an artificial unchanneled valley bottom wetland as depicted in figure 1 and 1.1..
2.6.9 Heritage resources present in and around the proposed site	• There were no heritage resources observed during site visit
2.6.10 Describe how spills of oil, grease, diesel, acid or hydraulic fluid will be dealt with.	• Any spills or contamination of environmental elements will be managed according to document number 240-133087117 which is Eskom's Environmental Incident Management Procedure. • The process entails the identification of the incident and thereafter initiating an emergency response to stabilise the situation. Notification and reporting to the relevant internal and external

	stakeholders must occur within 24 hours. Once the incident is in the internal reporting system then incident prioritisation, classification and recording will take place. An incident investigation will take place which will release findings subjected to corrective and preventative measures to be implemented. Incident communication must occur throughout the incident management process.

3. CATEGORIES OF MAINTENANCE ACTIVITIES

Maintenance activities can be separated into three categories namely routine maintenance, minor maintenance and major maintenance. The routine maintenance activities on the line consist of various line inspections and will be conducted on a routine basis. HV line inspections are conducted in order to identify any defects on the line that could affect the overall performance and all identified defects are then rectified by either minor or major maintenance work depending on the scope of work required. Performance reports and infrastructure failures as a result of incidents can also trigger specific maintenance activities.

3.1 ROUTINE MAINTENANCE ACTIVITIES

Routine maintenance activities consist of the following inspections done over the life span of the line. These inspections are scheduled and executed by the CNC. Inspection planning shall be carried out in accordance with the relevant Eskom procedures and standards.

3.1.1 Visual Inspections

Routine visual inspections shall be carried out at the minimum frequencies as set out in the Maintenance Management System works order.

These inspections shall be done to identify any defects such as, but not limited to:

a) Broken insulators and arresters

b) Pollution

The different types of pollution shall be recorded, e.g.:

- Industrial
- Marine
- Sand
- Bird

c) Dampers and spacers adrift or faulty

d) Erosion

e) Discolouration/corrosion of conductors and steel towers

f) Damaged conductors

g) Incorrect clearance from ground or trees

h) Incorrect clearance on shared structures

i) incorrect clearance from Telkom line crossings

j) Activities under power lines, e.g. buildings

k) Worn hardware and damaged structures

l) Correspondence of the single line diagrams (i.e. Electrical Network Schematics (ENS)) with the physical installation (check and ensure that they are the same)

3.1.2 Detailed line inspections

Detailed hands-on inspections shall be carried out at the frequency specified in Maintenance Management System generated checklist covering at least the following:

a) Inspection of all hardware.

b) A corrosion inspection (especially at the coast or in pollution areas).

c) Inspection of paintwork and foundation conditions.

d) A pole numbering inspection.

e) An inspection of all bolts, dampers, connectors, etc.

f) When the line has more than 100 structures, at least the following shall be performed:

- One suspension unit (hardware and clamps assemblies) every 100 structures shall be removed, dismantled and inspected for damage or non-conformance.
- One damper and spacer every 50 structures shall be removed and inspected for damages or non-conformance.
- The conductor shall be inspected for damage.

g) If the line has less than 100 structures, at least the following shall be performed:

- At least one suspension unit (hardware and clamps assemblies) shall be removed, dismantled and inspected for damage or non-conformance.
- One damper and one spacer shall be removed and inspected for damage or non-conformance.
- The conductor shall be inspected for damage.

h) Where any problems are found, further checks/analysis shall be carried out on those items.

A pole top inspection shall be conducted and shall cover at least the following :

- Inspection of hardware for defects.
- Inspection of dampers, insulators, preforms products, conductor, cross-arm, etc. for damage.

3.1.3 After Handover Inspection

a) An inspection shall be carried out within 10 months after handover to ensure that:

- all problems identified on the handing-over certificate have been addressed; and
- Any construction defects are identified.

b) The inspector can then submit these defects in writing to the contractor, within the guarantee period, for rectification within the period specified in the contract.

c) Only trained/competent/authorized personnel shall carry out these inspections.

3.2 MINOR MAINTENANCE ACTIVITIES

3.2.1 Preventative Maintenance

a) Measure tower footing resistance
b) Remove insulator for pollution conductivity testing
c) Remove sample, inspect and test conductor strength
d) Investigate conductor sag

3.2.2 Corrective Maintenance

a) Clean and treat corroded tower legs, members, foundation stubs and stay anchors
b) Replace corroded tower legs, members, foundation stubs and stay anchors and stays
c) Clean and repair and/or secure foundation concrete cap and sealing and repair soil erosion
d) Replace and tighten missing and or lose bolts and nuts
e) Tighten, repair or replace loose, corroded and missing earth straps
f) Install additional earthing and/or counterpoises
g) Install surge diverters
h) Install or repair terminal tower connections to substation earth mat
i) Repair or replace damaged and missing bird guards, warning signs and tower labels
j) Repair or replace corroded displaced or missing anti climb devices
k) Repair or replace damaged conductor
l) Spray wash insulators
m) Replace broken insulators in a string
n) Replace polluted and/or damaged insulators with composite insulators
o) Replace insulators with corroded pins and sockets
p) Remove / relocate birds nest where necessarily
q) Bush clearing

3.3 MAJOR MAINTENACE ACTIVITIES

Section 3.3.1 to 3.3.3 outlines the general major maintenance activities that can happen on the existing 1 Virginia Terminal-Virginia Town 44kV powerline

Section 3.3.4 outlines the specific scope to be followed to restore the line back to service after the line collapse incident on the specific section along to Valley Drive Road as per figure 1.

3.3.1 Structure replacement

a) Excavations around existing structure legs and stays for removal

b) Demolish existing concrete foundations where required

c) Removal of the existing structures and stays out from the excavations

d) Excavations will be backfilled with good soil and thoroughly compacted

e) Excavation for new structures to a maximum depth of 3m and maximum size of 4m x 4m or 48m^3

f) Excavation depths for all permanent stays will be to a maximum depth of 1,75m

g) A 200mm – 400mm thick reinforced concrete based will be cast at excavation beds of new structure excavations,

h) New structures will be assembled at peg positions and lifted into the excavation for planting purposes,

i) Backfilling of new structure excavations to be done with 8:1 soil/cement stabilized mixture, well compacted in the specified layers and using imported soil where clay soils are excavated

3.3.2 Conductor replacement

a) Phase conductor and shield wire drums will be transported to drum stations along the line route

b) Where site conditions allow, the pilot cables used for stringing purposes will be pulled along the line route

c) “Tension String” equipment (A winch-puller at one end of a sting section and a brake control machine at the drum station) will be used for the stringing of the phase conductors and shield wires.

d) This stringing equipment will be moved along the line route between drum stations.

3.3.3 Re-tension conductor

a) “Tension String” equipment (A winch-puller at one end of a sting section and a brake control machine at the drum station) will be used for the stringing of the phase conductors and shield wires.

b) This stringing equipment will be moved along the line route between drum stations

3.3.4 Activity details for the line repair following tower collapse along Valley drive road

a) High level scope

- The complete dismantling and removal of the 8 existing kite suspension structures 1 VGT-VTO 84 through to 1 VGT/VTO 91, including accompanying stays, hardware and vibration dampers.
- Establishment of vehicle access paths to new structure positions 2 and 3 to access new structure sites for construction purposes.
- Complete construction of 4 new 7611 structures with wind stays.
- Stringing existing phase conductor to the new structures and re-regulating tensions as needed.
- Replace cut section of 7/3.35 steel wire from 1VGT/VTO 82 up to 1 VGT-VTO 87.
- Stringing existing 7/3.35 steel earth wires to the new structures and re-regulating tensions as needed.
- The installation of new phase and shield wire vibration dampers.

See Figure 8 for layout of area to be worked on.

j) **Technical design details**

- Emergency mono-pole structures i.e. 4 x 20m structures will be utilised with 2 x wind stays to be installed for each structure. The line will support single ACSR Wolf phase conductor with 2 x 7/3.35 steel shield wires at a wind span of 270m over flat terrain. The structures were modelled in accordance with the manufacturing drawings for the emergency structures.

- The structures to be planted only 2m deep, backfilled with mass concrete and supported by wind stays to minimize excavation size while maintaining structural integrity.

- The proposed foundation dimensions to be 1.8m x 1.8m x2m deep in accordance with D-DT-7851 sheet 5 for inline structure planted in Type 4 soil.

- Pre-cast concrete slabs to be placed at the bottom of the excavation if available, alternatively the steel base plate for emergency structures to be used.

- The expected soil type is type 4 (submerged soft clay soil with seepage water). 10MPa mass concrete to be used for backfilling both structure and stay excavations. *In situe* material to be used for backfilling and rehabilitating existing structure sites after removal and the remainder to be spoiled at a suitable site. No additional earthing requirements is required based on the soil and structure foundation type.

- The existing conductor is single ACSR “Wolf” phase conductor and the shield wire is 2 x 7/3.35 steel wires. Vibration dampers will be installed for all phase and shield wire conductors.

- The existing strain sections to be regulated to sag and tension charts provided (assuming that the existing conductor is used). All tension and regulating to be done only after foundation have cured for at least 7 days.

- Re-regulating of existing conductors will require adjustment of attachment length, if the required adjustment is <+1.5m the strain assembly on 1 VGT-VTO92 to be adjusted. If the required

adjustment is however larger then a new 30m section of conductor with mid-span joint to the existing conductor to be added and new dead-ends crimped after regulating (with the original strain assemblies.

ii) **Construction access**

Due to water-logged areas and having to cross man-made furrow running parallel to existing tar road, construction access paths leading to the proposed structure locations for new towers 2 and 3 will need to be constructed as part of the Scope of work. Intention is to obtain suitable, uncontaminated rock material from a supplier to create 2 access paths, 1 to new tower 2 site and 1 to new tower 3 as depicted in **Figure 9.**

Each path will have the below approximate dimensions:

- 50m in length
- 4m wide
- Height of rock material planned to be +/- 250mm above ground

Approximate 200 cubic meters of rock material to be used to establish the construction access paths

In addition, to avoid impeding the water flowing through the man-made furrow flowing parallel to the tar road, four/six 300mm diameter concrete pipes to be placed inside the furrow per crossing creating two 300mm pipe sections greater than the required width of the road, prior to depositing the material to create the access path.

Figure 8: Layout of areas to be worked on

Figure 9: Proposed locations of construction access paths to be created

4. EMP REGISTER

This section outlines the aspects associated with the maintenance activities referred to above. The register addresses the potential impacts that could arise from the work by outlining the mitigation measures that should be implemented in order to minimise environmental degradation.

ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

Environmental awareness training

Impact management outcome: ***All onsite staff are aware and understand the individual responsibilities in terms of this EMP.***

Impact Assessment				Monitoring	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Untrained workers	Pollution Degradation Legal contravention	❖ All staff to receive environmental awareness training prior to commencement of the activities; ❖ The Contractor to allow for sufficient sessions to train all personnel ; ❖ Refresher environmental awareness training to be made available as and when required; ❖ All staff to be made aware of the conditions and controls linked to the EMMP and other applicable environmental documents and made aware of their individual roles and responsibilities in achieving conformance to said documents; ❖ Environmental awareness training must include as a minimum the following: a) Description of significant environmental impacts (actual or potential) related to their work activities	Environmental Officer	Once-off	Attendance registers

		b) Mitigation measures to be implemented when carrying out specific activities; c) Emergency preparedness and response procedures; d) Procedures to be followed when working near or within sensitive areas; e) Wastewater management procedures; f) Water usage and conservation; g) Solid waste management procedures; h) Sanitation procedures; i) Fire prevention; and j) Disease prevention ❖ A record of all environmental awareness training to be available including attendance registers			

Site establishment development

Impact management outcome: ***Minimisation of negative impacts during site establishment***

Impact Assessment				Monitoring	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Site layout, Planning, Loss of topsoil, Site camp positioning and location	Pollution Degradation Legal contravention, Erosion	❖ A plan of planned site camp establishment (if required) to be sent to the assigned environmental officer that includes the layout of the construction camp ❖ Location of camps must be within approved areas to ensure that the site does not impact on sensitive areas ❖ Sites must be located where possible on previously disturbed areas; ❖ The use of existing accommodation for contractor staff, where possible, is encouraged.	Contractor Project Manager	Once-off	Weekly registers; photographs

Access roads

Impact management outcome: ***Minimise impact to the environment due to access roads***

Impact Assessment				**Monitoring**	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Contractor workers, Construction activities, Equipment	Unauthorised access to site, Damages, general disturbance	❖ An access agreement must be formalised and signed by the Contractor and landowner before commencing with the activities; ❖ All private roads used for access to the servitude must be maintained and upon completion of the works, be left in at least the original condition ❖ All contractors must be made aware of all access routes to be used. ❖ Any access route deviation from that in the written agreement must be closed and re-vegetated immediately, at the contractor's expense; ❖ Maximum use of both existing servitudes and existing roads must be made to minimize further disturbance .	Contractor	Once-off	Existing Servitude agreements

Water Supply Management

Impact management outcome: ***Undertake responsible water usage.***

Impact Assessment				**Monitoring**	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Water	Water resource depletion	Ensure water conservation is being practiced by: ❖ Minimising water wastage by not undertaking unnecessary activities f ❖ Including a discussion on water usage and conservation during environmental awareness training.	Contractor	Once-off	

Storm and waste water management

Impact management outcome: ***Avoid Impacts to the environment caused by storm water and wastewater discharges during construction***

Impact Assessment				Monitoring	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Contaminated water	Surface and underground water pollution, Loss of biodiversity	❖ Runoff from any cement/ concrete mixing areas must be strictly controlled, and contaminated water must be collected, stored and either treated or disposed off-site, at a location approved by the project manager; ❖ All spillage of oil must be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility;	Contractor Project Manager and Environmental Officer	Daily	Photographs

		❖ Uncontaminated Natural storm water runoff can be discharged directly surrounding natural environment subject to the Project Manager's approval and support by the assigned environmental officer; ❖			

Solid and hazardous waste management

Impact management outcome: ***Wastes are appropriately stored, handled and safely disposed of at a recognised waste facility.***

Impact Assessment				Monitoring	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Waste	Pollution, Loss of biodiversity	❖ All measures regarding waste management must be undertaken using an integrated waste management approach; ❖ Sufficient, covered waste collection bins (scavenger and weatherproof) must be provided; ❖ A suitably positioned and clearly demarcated waste storage site must be identified and provided; ❖ The waste collection site must be maintained in a clean and orderly manner; ❖ Waste must be segregated into separate bins and clearly marked for each waste type for recycling and safe disposal; ❖ Staff must be trained in waste segregation; ❖ Bins must be emptied regularly; ❖ General waste produced onsite must be disposed of at registered waste disposal sites/ recycling company;	Contractor Project Manager	Daily/Weekly	Daily/Weekly registers and photographs; Training registers; Safe disposal certificates

		❖ Hazardous waste must be disposed of at a registered waste disposal site; ❖ Certificates of safe disposal for general, hazardous and recycled waste must be maintained.			

Protection of watercourses and natural channels

Impact management outcome: ***Pollution and contamination of the watercourse environment and or natural channel erosion is prevented.***

Impact Assessment				Monitoring	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Construction equipment	Surface and underground water pollution. Loss of biodiversity. Altering of banks and beds of watercourses	-All watercourses must be protected from direct or indirect spills of pollutants such as solid waste, sewage, cement, oils, fuels, chemicals, aggregate tailings, wash and contaminated water or organic material resulting from the Contractor's activities; -In the event of a pollution incident, prompt action must be taken to clear the polluted or affected areas; -Construction must include appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows -Do not locate any site toilet, sanitary convenience, septic tank within or near or in any watercourse -The surface water resource and the associated buffer zones are to be designated as "highly sensitive" and any impact must be limited to the minimum possible extent where construction is to take place -Construction workers are only allowed in the servitude area of the proposed power lines and not into the surrounding surface water resource system.	Contractor	Throughout construction	Incident registers, photographs

		-Access routes or “Right of Way” (RoW) is to be established to the desired construction area in the wetland or other surface water resources type. The width of the RoW must be limited as far as possible to the width of the vehicles required to enter the surface water resource -The number and type of permissible vehicles or machinery into or near to the sensitive areas must be limited to the bare minimum - All vehicles and machinery are to be checked for oil, fuel or any other fluid leaks before entering the construction areas. -All vehicles and machinery must be regularly serviced and maintained before being allowed to enter the construction RoW within the highly sensitive areas. -No fueling, re-fueling, vehicle and machinery servicing or maintenance is to take place in the sensitive areas -The construction site is to contain sufficient safety measures throughout the construction process. These include, but are not limited to, oil spill, fire extinguishers -Fuel, oil or hazardous substances storage areas must be bunded to prevent oil or fuel contamination of the ground and/or nearby surface water resource or associated buffer zone.			

		-No hazardous materials are to be stored or brought into the sensitive areas. Should a designated storage area be required, the storage area must be placed at the furthest location from the sensitive areas. Appropriate safety measures as stipulated above must be implemented - Access of all construction and material delivery vehicles should be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure.			

Protection of fauna

Impact management outcome: ***Disturbance to fauna, loss of biodiversity and habitat is minimised.***

Impact Assessment				Monitoring	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Construction equipment and workers	❖ Loss of fauna ❖ Disturbance of habitat ❖ Legal contravention	❖ Breeding sites (if any) must be kept intact and disturbance to breeding birds must be avoided. Special care must be taken where nestlings or fledglings are present; ❖ No snaring or hunting must be allowed under any circumstances.	Contractor Project Manager	Ongoing	No animals harmed ; incident registers

Safety of the public

Impact management outcome: ***Minimise the risk of injury, harm or complaints.***

Impact Assessment				Monitoring	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Construction equipment and workers	Injury and/or harm to public members. Damage to Eskom Image	❖ Identify fire hazards, demarcate and restrict public access to these areas as well as notify the local authority of any potential threats e.g. large brush stockpiles, fuels etc.; ❖ All unattended open excavations must be adequately fenced or demarcated; ❖ Adequate protective measures must be implemented to prevent unauthorised access to and climbing of partly constructed towers and protective scaffolding; ❖ Ensure structures vulnerable to high winds are secured; ❖ Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged	Contractor Project Manager and Health & Safety Officer	Daily/Weekly	Daily/Weekly registers and photographs. Complaints and Incident register

Sanitation

Impact management outcome: ***Minimise the risk of disease and impact to the environment as a result of sanitation services***

Impact Assessment				Monitoring	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Human waste	❖ Human health risk ❖ Ecological impact	❖ Mobile chemical toilets to installed onsite if no other ablution facilities are available; ❖ The use of ablution facilities and or mobile toilets must be used at all times and no indiscriminate use of the veld for the purposes of ablutions must be permitted under any circumstances; ❖ Where mobile chemical toilets are required, the following must be ensured: -Toilets are located no closer than 100 m to any watercourse or water body; - Toilets are secured to the ground to prevent them from toppling due to wind or any other cause; -No spillage occurs when the toilets are cleaned or emptied and the contents are managed in accordance with the EMP; - Toilets have an external closing mechanism and are	Contractor Project Manager	Daily/Weekly	Daily/Weekly registers; Copies of signed service certificates

		closed and secured from the outside when not in use - Toilets are emptied before long weekends and workers holidays, and must be locked after working hours; -Toilets are serviced regularly and the environmental officer and/or safety officer inspect toilets to ensure compliance to health standards; -A copy of the waste disposal certificates for disposed toilet waste must be maintained.			

Emergency procedures

Impact management outcome: ***Emergency procedures are in place to enable a rapid and effective response to all types of environmental emergencies.***

Impact Assessment				**Monitoring**	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Environmental Emergency situations	❖ Human health risk ❖ Ecological impact	❖ Compile an environmental Emergency Response Action Plan (ERAP) prior to the commencement of the proposed project; ❖ The Emergency Plan must deal with accidents, potential spillages and fires in line with relevant legislation; ❖ All staff must be made aware of emergency procedures as part of environmental awareness training; ❖ The relevant local authority must be made aware of a fire as soon as it starts; ❖ In the event of emergency necessary mitigation measures to contain the spill or leak must be implemented (see ***Hazardous Substances section***).	Contractor Project Manager Environmental Officer	Daily/Weekly	Daily/Weekly registers; photographs. Training registers

Hazardous substances

***Impact management outcome:* Safe storage, handling, use and disposal of hazardous substances.**

Impact Assessment				**Monitoring**	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Uncontrolled hazardous substances	❖ Human health risk ❖ Ecological impact ❖ Legal contravention	❖ The use and storage of hazardous substances to be minimised and non-hazardous and non-toxic alternatives substituted where possible; ❖ All hazardous substances must be stored in suitable containers ❖ Containers must be clearly marked to indicate contents, quantities and safety requirements; ❖ All storage areas must be bunded. The bunded area must be of sufficient capacity to contain a spill / leak from the stored containers in the case of liquid contents; ❖ Bunded areas to be suitably lined with a SABS approved liner; ❖ An Alphabetical Hazardous Chemical Substance (HCS) control sheet must be drawn up and kept up to date on a continuous basis; ❖ All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS's); ❖ All employees working with HCS must be trained in the safe use of the substance and according to the safety data sheet; ❖ Employees handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. Appropriate personal	Contractor Project Manager	Daily/Weekly	Daily/Weekly registers; photographs; Training registers

		protective equipment must be made available; ❖ The Contractor must ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers; ❖ The tanks/ bowsers must be situated on a smooth impermeable surface (concrete) with a permanent bund. The impermeable lining must extend to the crest of the bund and the volume inside the bund must be 130% of the total capacity of all the storage tanks/ bowsers (110% statutory requirement plus an allowance for rainfall); ❖ The floor of the bund must be sloped, draining to an oil separator; ❖ Provision must be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained; ❖ All empty externally dirty drums must be stored on a drip tray or within a bunded area; ❖ No unauthorised access into the hazardous substances storage areas must be permitted; ❖ No smoking must be allowed within the vicinity of the hazardous storage areas; ❖ Adequate fire-fighting equipment must be made available at all hazardous storage areas; ❖ Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit must be used. Appropriate ground protection such as drip trays must be used; ❖ An appropriately sized spill kit kept onsite relevant to the scale of the activity/s involving the use of hazardous substance			

Dust emissions

Impact management outcome: ***Minimise the generation of dust.***

Impact Assessment				**Monitoring**	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Dust particles	Human health risk Ecological impact	❖ Take all reasonable measures to minimise the generation of dust as a result of project development activities to the satisfaction of the Environmental activities ❖ Excavation, handling and transport of erodible materials must be avoided under high wind conditions or when a visible dust plume is present; ❖ During high wind conditions, the Environmental officer must evaluate the situation and make recommendations as to whether dust- damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level; ❖ Where possible, soil stockpiles must be located in sheltered areas where they are not exposed to the erosive effects of the wind; ❖ Where erosion of stockpiles becomes a problem, erosion	Contractor Project Manager	Ongoing	Daily/Weekly registers; photographs

		control measures must be implemented ❖ Vehicle speeds must not exceed 40 km/h along dust roads or 20 km/h when traversing unconsolidated and non-vegetated areas; ❖ For significant areas of excavation or exposed ground, dust suppression measures must be used to minimise it.			

Noise

Impact Management outcome: ***Minimise unnecessary noise to the environment***

Impact Assessment				**Monitoring**	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Construction noise	❖ Human health risk ❖ Ecological impact	❖ The Contractor must keep noise level within acceptable limits, Restrict the use of sound amplification equipment for communication and emergency only; ❖ All vehicles and machinery must be properly maintained; ❖ Any complaints received by the Contractor regarding excessive noise must be recorded and communicated.	Contractor Project Manager	Daily/Weekly	Daily/Weekly registers; Equipment maintenance records

		❖ communicate Code of Conduct for the construction phase in terms of behaviour of construction staff as part of environmental awareness ❖ Working hours must be kept to normal daylight working hours during the construction phase. Avoid after hours work ❖			

Fire prevention

Impact management outcome: ***Prevention of uncontrollable fires.***

Impact Assessment				**Monitoring**	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Environmental Emergency situations	❖ Human health risk ❖ Ecological impact	❖ Designate smoking areas to areas of low fire risk; ❖ Firefighting equipment must be available on all vehicles located on site; ❖ Contact numbers for the local fire fighting station and emergency services must be communicated in environmental awareness training and displayed at visible locations on site;	Contractor Project Manager	Daily/Weekly	Daily/Weekly registers; photographs.

Cabling and Stringing

Impact management outcome: ***No environmental degradation occurs as a result of stringing.***

Impact Assessment				**Monitoring**	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Cabling and stringing waste	❖ Human health risk ❖ Ecological impact	❖ Residual solid waste (off cuts etc.) shall be recycled or disposed of in accordance with the Section on Solid waste and hazardous Management;	Contractor Project Manager	Daily/Weekly	Waste registers

Socio-economic

***Impact management outcome*: Enhanced stakeholder relations**

Impact Assessment				Monitoring	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Stakeholder engagements	❖ Cordial stakeholder relations	❖ Develop and implement communication strategies to facilitate public participation; ❖ Develop and implement a collaborative and constructive approach to conflict resolution as part of the external stakeholder engagement process; ❖ Sustain continuous communication and liaison with community via ward councillor	Contractor Project Manager	Daily/Weekly	Daily/Weekly registers; photographs.

Heritage Management

***Impact management outcome*: Protection of heritage resources**

Impact Assessment				Monitoring	
Aspect	Impact	Impact Management Actions	Responsible person	Frequency	Evidence of compliance
Heritage management on site	Destruction of heritage resources	If any archaeological or paleontological materials are found during undertaking of work, construction must cease immediately at that location and the Eskom environmental officer be contacted immediately for further guidance.	Contractor Project Manager	Daily/Weekly	Incidence reports; photographs.

5. PROCESS FOR MONITORING

Since major maintenance activities have a much higher impact on the environment as compared to routine maintenance activities, the process for monitoring will be split into the following two categories.

The first category includes all routine/minor maintenance activities which will be monitored for compliance by the relevant Zone Manager. Any non-compliance of this EMMP during routine maintenance shall be reported to the EO as soon as is reasonably practicable.

The second category includes any major maintenance. Prior to any major maintenance activity, an EO must be on site to establish the existing condition of the area where the work is to take place. In the event of an overnight emergency or a weekend emergency, the site supervisor will take the required photos. The EO will visit the site as soon as is reasonably practicable to determine the relevant environmental measures required as per environmental legislation.

- Photographs before any work is done will be taken and be kept on record.
- Notification must be sent to all relevant authorities and to any affected land owners that work shall be undertaken.
- Bi-Monthly site visits will be conducted to determine the contractor's compliance to the EMMP.
- A report shall be compiled for every site visit and photographs will be taken. Any incidents captured on the incident register shall be followed by root cause determination and corrective action.
- Upon the completion of the work, EO will compile a completion report (with photographs) and notify the relevant authorities of the work completion within 30 days of completion.
- Environmental rehabilitation monitoring to be conducted as and when required.

5.1 RELATED/SUPPORTING DOCUMENTS

Not applicable.

6. GENERAL CONDITIONS TO COMPLY WITH DURING MAINTENANCE

6.1 SERVITUDES

6.1.1 Reference [9] DST_34-1454 sets out Eskom's rights with regard to servitudes, and the approach to the control and cutting of trees and bushes within these servitudes.

6.1.2 Where Eskom has Access Road rights for roads necessary for patrols and maintenance of lines, the road shall be maintained so that they are usable at all times (refer to [9] DST_34-1454).

6.1.3 All servitude gates shall be kept locked unless otherwise agreed with the landowner who shall indemnify Eskom. Gates shall only be installed with the permission of the landowner and Eskom shall maintain them in good order. This specifically includes any earth straps bonding the gate and posts.

6.1.4 The encroachment into Eskom's servitudes of new buildings, extensions, tennis courts, swimming pools and barns shall be reported immediately, especially if they are underneath the lines or inside the stipulated safety clearance.

6.2 BIRD NESTS

All bird nests to be handled in accordance with EPC 32-247.

6.2.1 Bird nests shall not be removed from structures unless the possibility exists that a flashover can occur.

6.2.2 All structures where bird nests are found shall be identified and reported.

6.2.3 A photograph of the nest shall be taken, if possible, to identify the type of bird.

6.2.4 The trees shall be trimmed back without damage to the nest if possible.

6.3 HOUSEKEEPING

6.3.1 After maintenance work is complete, the terrain shall be cleared of all debris and materials, and any required repairs or maintenance to roads, trees, etc. shall be carried out.

6.4 FORMS AND RECORDS

6.4.1 A work order with the applicable job plan and task manual will be issued for any work to be carried out. The feedback required for each specific task will be stipulated on the job plan/work order.

6.4.2 The inspection and maintenance reports shall form the record of work done.

6.5 WORK NEAR WETLAND AREAS

6.5.1 General conditions

a) No person will use the wetland area to relieve themselves. Well maintained toilet facilities will be provided.

b) Any cement mixing will be done on a suitable platform that prevents any spillage or contamination of the soil or water.

c) Any animal in the wetland area will be left undisturbed as much as possible

d) All compacted areas (i.e. cleared stockpile areas, areas where construction vehicle movement has compacted ground etc.) will need to be sufficiently ripped to allow the vegetation to establish.

7. GENERAL ENVIRONMENTAL CONDITIONS AND CONTROL MEASURES

7.1 The Eskom project manager or co-ordinator shall be responsible for ensuring that the land owners/ TSO/ Project co-ordinator have been informed before any work is carried out on site. Contractors shall find out if owners/ TSO/ Project co-ordinator have been informed before moving onto site.

7.2 No fences, gates or locks shall be damaged to obtain access onto a line route. Arrangements shall be made in advance to obtain permission for access.

7.3 Use of private roads shall be arranged in advance. Any damage to private roads shall be repaired at the contractor's expense and to the satisfaction of the landowner. This shall be the responsibility of the project manager or coordinator.

7.4 Gates shall be left as they are found, i.e. closed gates shall be kept closed and open gates shall be left open. Gates to adjacent properties or onto public roads shall be closed at all times. Any Eskom gates installed on the line route shall be kept closed and locked except while stringing is taking place. Open gates shall be guarded to prevent animals straying and unauthorized persons and vehicles entering into adjacent camps or properties.

7.5 Permission shall be obtained from landowners before any water is used.

7.6 No fires shall be lit on private property. If fires are lit on Eskom's property or in the construction camp, provision shall be made that no accidental fires are started. No firewood shall be collected in the veld.

7.7 If activities that can cause a fire are carried out, fire extinguishers shall be available on site and in the construction camp.

7.8 No property may be accessed after normal working hours except with the permission of the landowner /TSO/ Project co-ordinator. Privacy shall be respected at all times.

7.9 Eskom, Eskom's contractors and their employees shall at all times be courteous towards landowners, tenants and the local community.

7.10 Eskom, Eskom's contractors and their employees shall not cause damage to property, crops or animals. Activities that may cause conflict with landowners, tenants, the local work force or the local community shall be avoided. Should conflict arise it shall be immediately reported to the Eskom project manager or coordinator.

7.11 Vehicles shall be driven at a moderate speed on private roads and stay within the statutory speed limit on public roads.

7.12 All movement of vehicles shall take place on the established Eskom servitude road or on private roads as agreed in advance. Keep to existing tracks. No movement shall take place through the veld. Special care shall be taken to prevent excess damage during wet weather.

7.13 If any vehicle should get stuck, the damage shall be repaired immediately so that no deep ruts remain.

7.14 Any damage to private property shall immediately be reported to Eskom and the owner. The damage shall be rectified immediately if possible and/or appropriate compensation shall be paid to the owner at the discretion of the project manager/coordinator in consultation with the property owner. A written record of damages and rectifying action shall be kept. The landowner's satisfaction with the outcome of rectifying action shall be obtained in writing.

7.15 A proper system of waste management shall be instituted in the construction camp. This entails that sufficient waste bins are available on site and in the construction camp. The waste shall be dumped at an approved waste disposal site. No containers, scrap metal, conductor etc. shall be left on site.

7.16 All scrap shall be removed and taken to an appropriate disposal site. No oil, diesel or other chemicals shall be spilled or discarded anywhere. If an accidental spill occurs, it shall be reported immediately and cleaned to the satisfaction of Eskom and the landowner. No waste shall be left in the veld or on the line route.

7.17 Water and Toilet facilities shall be provided on site and in the construction camp. The facilities shall comply with Eskom standards and shall have the approval of the landowner.

7.18 No human excrement shall be left in the veld. If no toilet facilities are available such waste shall be buried immediately.

7.19 Herbicides (where needed) shall only be applied with Eskom's permission and in accordance with the Eskom's latest documents on herbicide management

7.20 Camp and office sites shall be dismantled and removed after completion of the construction phase of the project. The site shall be rehabilitated to as close as possible to its original condition to the satisfaction of the landowner that shall be in writing.

7.21 All excavations shall be enclosed to prevent animals or people from accidentally falling into excavations.

7.22 No trees shall be cut or removed without prior permission from the landowner. Permits shall be obtained for the cutting and removal protected trees

8. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
Margy Charlie	Welkom Sector Manager
Gerrie van Schalkwyk	Environmental Manager -Distribution Central East Cluster (Free State- Land Development &Environment)

9. REVISIONS

Date	Rev.	Compiler	Remarks
June 2025	0	Mahlatse Moeng	New document.

10. DEVELOPMENT TEAM

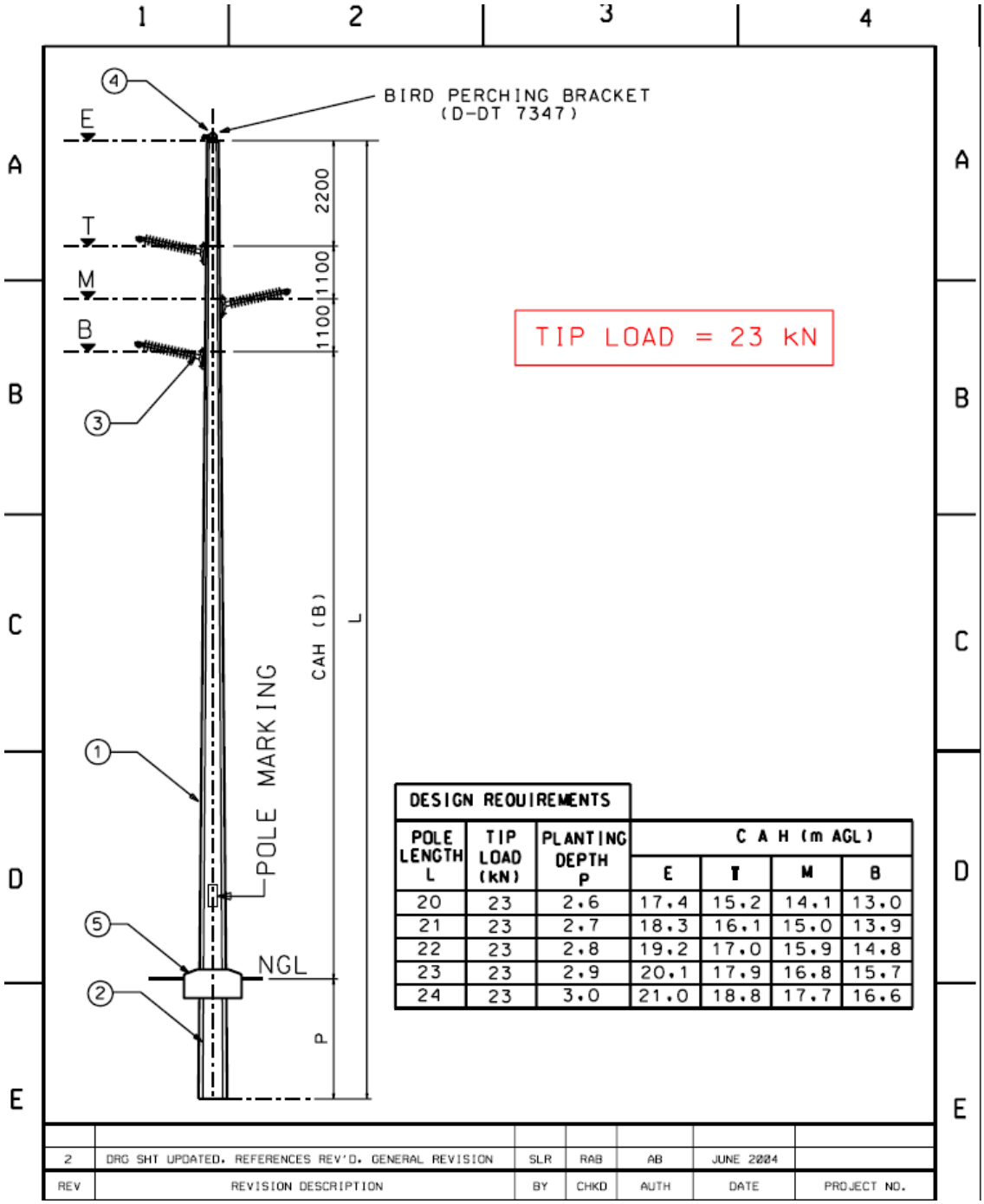
The following people were involved in the development of this document:

- Mahlatse Moeng
- Heini Mocke
- Vuyisile Maqibelo

11. ACKNOWLEDGEMENTS

- None.

APPENDIX A: STRUCTURE DETAILS

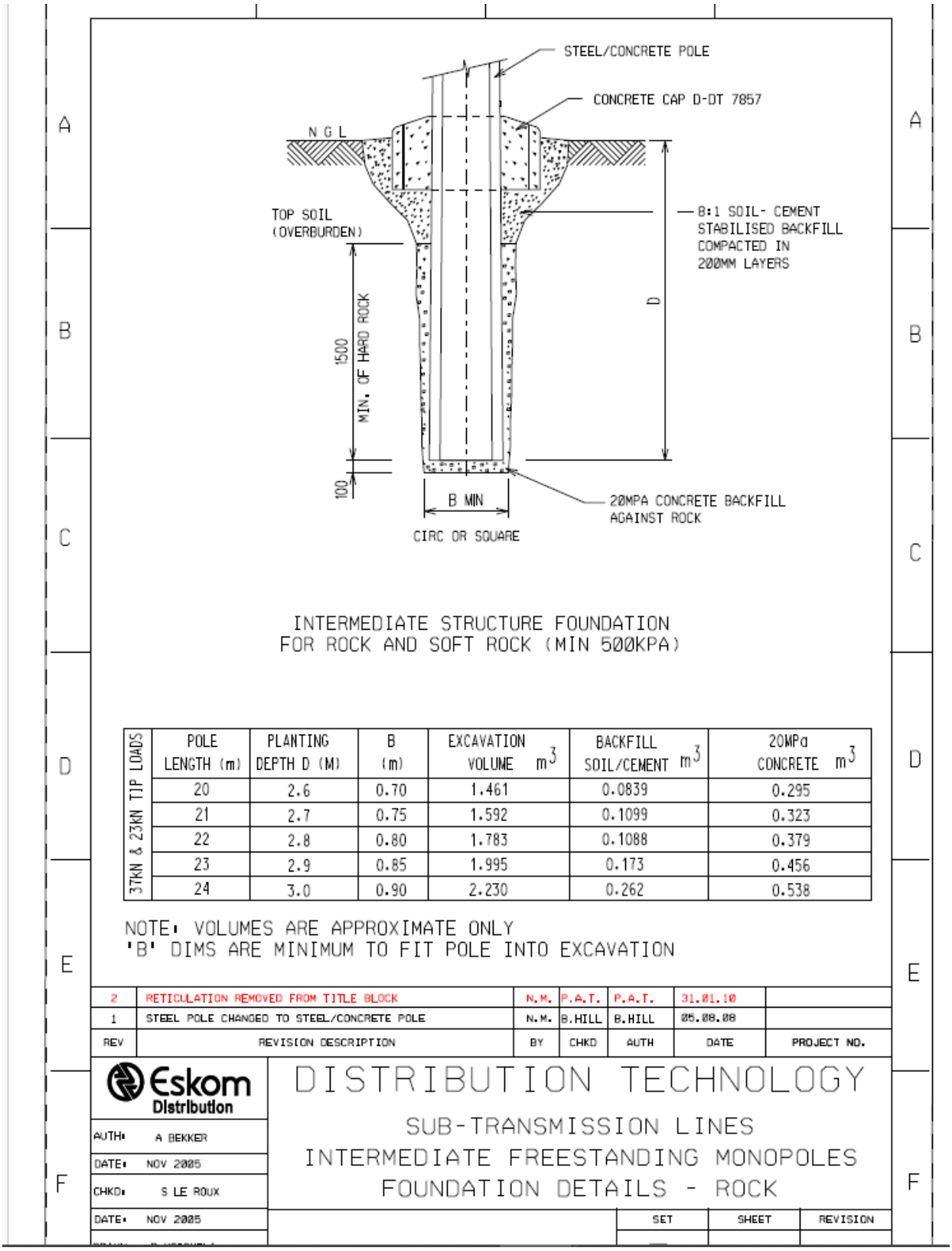


DESIGN REQUIREMENTS

POLE LENGTH L	TIP LOAD (kN)	PLANTING DEPTH P	C A H (m AGL)			
			E	T	M	B
20	23	2.6	17.4	15.2	14.1	13.0
21	23	2.7	18.3	16.1	15.0	13.9
22	23	2.8	19.2	17.0	15.9	14.8
23	23	2.9	20.1	17.9	16.8	15.7
24	23	3.0	21.0	18.8	17.7	16.6

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.
2	DRG SHT UPDATED. REFERENCES REV'D. GENERAL REVISION	SLR	RAB	AB	JUNE 2004	

APPENDIX B: FOUNDATION DETAILS



INTERMEDIATE STRUCTURE FOUNDATION
FOR ROCK AND SOFT ROCK (MIN 500KPA)

37KN & 23KN TIP LOADS	POLE LENGTH (m)	PLANTING DEPTH D (M)	B (m)	EXCAVATION VOLUME m^3	BACKFILL SOIL/CEMENT m^3	20MPa CONCRETE m^3
	20	2.6	0.70	1.461	0.0839	0.295
	21	2.7	0.75	1.592	0.1099	0.323
	22	2.8	0.80	1.783	0.1088	0.379
	23	2.9	0.85	1.995	0.173	0.456
	24	3.0	0.90	2.230	0.262	0.538

NOTE: VOLUMES ARE APPROXIMATE ONLY
'B' DIMS ARE MINIMUM TO FIT POLE INTO EXCAVATION

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.
2	RETICULATION REMOVED FROM TITLE BLOCK	N.M.	P.A.T.	P.A.T.	31.01.10	
1	STEEL POLE CHANGED TO STEEL/CONCRETE POLE	N.M.	B.HILL	B.HILL	05.08.08	

Eskom Distribution

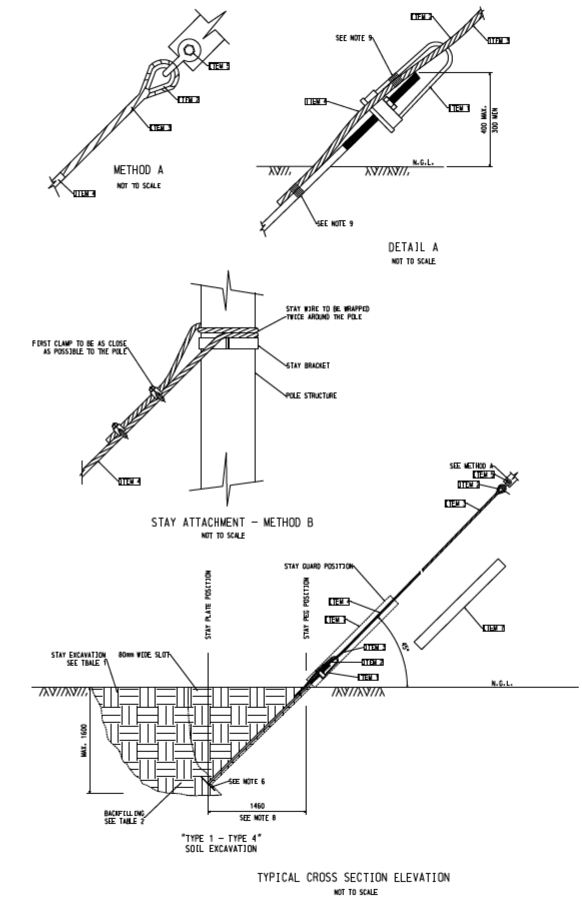
AUTH: A BEKKER
DATE: NOV 2005
CHKD: S LE ROUX
DATE: NOV 2005

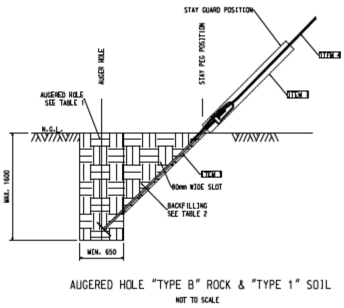
DISTRIBUTION TECHNOLOGY

SUB-TRANSMISSION LINES
INTERMEDIATE FREESTANDING MONOPOLES
FOUNDATION DETAILS - ROCK

SET	SHEET	REVISION

APPENDIX C: STAY DETAILS





MATERIAL SCHEDULE / STAY ASSEMBLY

ITEM NO	DESCRIPTION	DWG. NO	SAP REF. NO.	QTY
1	M24 x 2.4m ADJUSTABLE STAYROD ASSEMBLY, COMPLETE WITH 450 x 450 x 6mm THICK BASE PLATE, AND 150 x 150 x 6mm BACKING WASHER.	D-DT-7023	0163384	1
2	BARE WIRE ROPE THIMBLE TO SUIT 16mm STAY WIRE – SEE NOTE 5.	D-DT-3026	0163399	2-(METHOD A) 1-(METHOD B)
3	GUYGRIP DEAD END – GALVANISED STEEL TO SUIT DIA 13.21mm STAYWIRE – SEE NOTE 5.	D-DT-7035	0010883	2-(METHOD A) 1-(METHOD B)
4	19/2.65mm GALVANISD STEEL STSY WIRE 1100MPa	D-DT-7036	0000211	15m – 30m
5	16mm IEC STRAIGHT STANDARD SHACKLE BOLT TYPE 120kN – SEE NOTE 5.	D-DT-7017	0163406	1-(METHOD A)
*6	CROSBY CLAMP SUITABLE FOR DIA 16mm WIRE ROPE – SEE NOTE 5.	D-DT-7032	0039608	2-(METHOD B)
7	DIA 160mm UPVC VINYL SOIL PIP 1.75m LONG, ONLY IF REQUIRED.	NON STANDARD		1

TABLE 1

SOIL TYPE AND DESCRIPTION	MINIMUM EXCAVATION / HOLE SITES
"TYPE 1" SOIL:– COMPETENT SOIL STIFF COHESIVE – MEDIUM DENSE COHESIONLESS SOILS – 300kPa BEARING PRESSURE.	650 x 650 x 1.6m DEEP EXCAVAION or DIA 650mm x 1.6m DEEP AUGERED HOLE.
"TYPE 2" SOIL:– LESS COMPETENT SOIL-STIFF SWELLING COHESIVE MEDIUM DENSE COHESIONLESS SOILS– 150kPa BEARING PRESSURE.	750 x 750 x 1.6m DEEP EXCAVAION OR DIA 750mm x 1.6m DEEP AUGERED HOLE.
"TYPE 3" SOIL:– DRY LOOSE COHESIONLESS – VERY SOFT COHESIVE SOILS– 100 kPa BEARING PRESSURE.	1200 x 1200mm x 1.6m DEEP EXCAVATIONS.
"TYPE 4" SOIL:– SUBMERGED COHESIONLESS AND COHESIVE SOILS 50kPa BEARING PRESSURE.	1500 x 1500mm x 1.6m DEEP EXCAVATIONS.
"TYPE A" ROCK:– HARD TO VERY HARD MODERATELY FRACTURED CONTINUOUS ROCK 2000kPa BEARING PRESSURE.	DIA 60mm x 1.5m DEEP ROCK DRILLED HOLE.
"TYPE B" ROCK:– WEATHERED OR DECOMPOSED SOFT CONTINUOUS ROCK 800kPa BEARING PRESSURE.	DIA 650mm x 1.5m DEEP AUGURED HOLE.

TABLE 2

SOIL TYPE (TABLE 1)	BACKFILLING & COMPACTION DETAIL
"TYPE 1" SOIL	BACKFILL EXCAVATED SOIL AT ITS OPTIMUM MOISTURE CONTENT. IN LAYERS NOT EXCEEDING 300mm IN THICKNESS. COMPACT EACH LAYER WITH A MECHANICAL COMPACTOR TO A 1600kg/m DENSITY.
"TYPE 2" SOIL	MIX EXCAVATED SOIL TO A 1:10 CEMENT/SOIL MIXTURE. BACKFILL AND COMPACT AS SPECIFIED FOR "TYPE 1" SOIL TO A 1600kg/m DENSITY.
"TYPE 3" SOIL	SIMILAR TO PROCESS SPECIFIED FOR "TYPE 1" AND "TYPE 2" SOILS. FOR VERY SOFT CLAY CONDITIONS, REMOVE EXCAVATED MATERIAL, IMPORT SELECTED "TYPE 1" SOIL ANS MIX, BACKFILL AND COMPACT AS SPECIFIED FOR "TYPE 2" SOIL, TO A 1400kg/m DENSITY.
"TYPE 4" SOIL	ALL WATER MUST BE REMOVED BEFORE THE BACKFILL AND COMPACTION IS DONE AS SPECIFIED FOR "TYPE 3" VERY SOFT CLAY SOIL. COMPACTION TO A 1400kg/m DENSITY.
"TYPE A" ROCK	ROCK ANCHORS: OMIT STAY PLATE AND BACKING WASHER AND BEND ROD AS SPECIFIED. PROVIDE A DOUBLE LAYER OF "DENSO TAPE" OR BITUMIN COATING AROUND ROD TO MIN.200mm BELOW GROUND LEVEL. GROUT ROD IN HOLE. USING: a) "FOSROC – CONBETRA GP" GENERAL PURPOSE NON-SHRINK CEMENTITIOUS FLOWABLE GROUT. OR b) "FOSROC – LOCKSET S40" POLYESTER RESIN GROUTS. NB: ALL GROUTING SHALL BE DONE IN STRICT ACCORDANCE WITH THE MANUFACTURER'S SPECIFICAIONS.
"TYPE B" ROCK	BACKFILL AND COMPACT AS SPECIFIED FOR "TYPE 2" SOIL TO A 1600kg/m DENSITY. IMPORT SELECTED "TYPE 1" SOIL. IF REQUIRED.

NOTES:

1. MACHINE TO BE THE MINIMUM DIMENSIONS SPECIFIED IN TABLE 1.
2. THE MINIMUM SIZE OF THE AUGERED HOLE TO BE THE DIAGONAL DIMENSION OF THE STAY PLATE, SEE TABLE 1.
3. AFTER COMPLETION OF THE STAY EXCAVATION/HOLE A MINIMUM 80mm WIDE x 45°SLOT TO BE CUT TOWARDS THE STRUCTURE/POLE.
4. FOR BACKFILLING METHODS REFER TO TABLE 2.
5. STAY ATTACHMENT DETAIL TO THE STRUCTURE/POLE CAN BE TO "METOD A" OR "METHOD B".
6. THE STAY PLATE MUST BE POSITIONED AS CLOSE AS POSSIBLE AGAINST THE IN-SITU SOIL. PRIOR TO BACKFILLING.
7. HORIZONTAL AND VERTICAL DIMENSIONS VARIES DEPENDING ON:
   a) ATTACHMENT HEIGHT OF THE STAY ASSEMBLY.
   b) SLOPE OF THE NATURAL GROUND.
8. CUT STAY WIRE LONG ENOUGH TO BE PUSHED MIN.50mm INTO THE GROUND AND TIE IT ONTO STAY ROD AT TWO POSITIONS.
9. STAY ROD TO BE HEATED PRIOR TO BENDING AND DOUBLE PROTECTIVE COATING TO BE APPLIED OVER THE HEATED AREA AFTER BENDING.

Eskom Distribution

FREE STATE OPERATING UNIT

STANDARD M24 x 2.4m ADJUSTABLE STAY ASSEMBLY AND INSTALLATION DETAIL

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