Eskom	Standard	Technology

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1. Introduction

Vegetation is of the utmost importance to Eskom Holdings SOC LTD (Eskom) and presents a significant risk to public safety and safe network operations and sustainability. Veld fires and trees encroaching into safety clearance zones may cause power outages. These line faults cause electrical stresses to primary plant equipment such as power transformers, circuit breakers, supply quality and security. In order to ensure continuity of supply, quality of supply and to improve the life cycle of the equipment these potential faults must be curtailed and appropriately managed. Further, Eskom requires better tools to effectively and efficiently manage contractors working on burning, bush clearing and other vegetation management interventions for Eskom.

The maintenance of vegetation in the proximity of electrical networks ensures sustainable and safe operations in pursuit of Eskom's social, economic and environmental obligations and liabilities. The uncontrolled interaction between electrical networks of various types and configuration and vegetation of different growth forms and density can be disastrous. The following illustrate:

a) Vegetation physical clearance to power lines (plant performance and safety),

b) Bio fuel: dielectric failure) as a result of fire (plant performance and network sustainability, this include simple grass and reed fires.

c) Bio Fuel: heat transferred to FON by fire (FON cable sustainability)

d) Access restrictions (to maintain assets – inspections/preventative and reactive maintenance),

e) Mitigate run away fires caused by Eskom networks by removing unnecessary bio fuel in the network proximity.

f) Creeper plants can invade control boxes and marshalling kiosks or over grow physical asset types that can cause dielectric or mechanical failure to such plant.

g) Limiting habitat to insects, rodents and other animal that can be harmful to any part of the assets (tunnelling, nesting, pollution etc.),

Previous incidents of vegetation causing outage have highlighted a number of vulnerabilities to electrical power utilities worldwide in the maintenance of their electricity infrastructure. An ESKOM vegetation management Project was initiated in April 2014, with an aim to ensure that all vegetation within Eskom's Main Transmission System (MTS) and medium voltage (MV) servitudes are appropriately controlled and managed in order to ensure continuity of supply, protect the reputation of Eskom and to comply with the relevant environmental regulations. The scope of the project includes the development of an appropriate vegetation management strategy/methodology and to determine the required information technology systems that would be required for managing vegetation within the servitudes. This includes the need for detailed remote sensing and survey technologies such as LiDAR and large scale aerial photography, etc.

2. Supporting clauses

2.1 Scope

This Maintenance Strategy is applicable to work in Eskom and by external contractors to enable Eskom to prepare, plan, react-to and manage vegetation within Transmission (Tx) and Distribution (Dx), Eskom Real Estates (ERE) and Eskom Telecommunications proactively, through the use of remote sensing technology. The consultant will be required to develop the analysis technique for processing the relevant data; and develop the Information Technology (IT) systems and provide the IT hardware infrastructure to implement the technique or framework.

All minimum maintenance activities are described along with the triggers for said maintenance activities and the associated logistics requirements.

The test and inspection, preventative and corrective maintenance activities are included, based on the outcome of vegetation growth rates, Effects and Criticality Analyses (FMECAs) of such vegetation to the network. Triggers for this maintenance are developed based on the growth rate and form of 'Indicator Vegetation Species' prevalent in the respective bio-regions.

The scope of this strategy includes:

- Maintenance requirements (Predictive vegetation growth, Inspection requirements, Preventative Maintenance based on vegetation growth factors and plant inspection, Preventative Maintenance based on time (indicator species growth rate) and Corrective maintenance within the various statutory and regulatory frameworks that applies.
- Maintenance logistic requirements (Contractor Service Capacity, Special tools and facilities)
- Asset Health requirements
- Asset performance requirements
- Manage Asset Excursion

2.1.1 Purpose

All plant species have a constant growth rate and given that the growth factors and the prevalent plant growth forms are known: control of vegetation can be 100% time based with minimal adjustment for changing environmental factors. The growth form (trees, brush and grass), demographics and density of the various biomes define the growth factors and bio-mass. Thus knowing what biome, bio-region and vegetation type (grouping of specific plant species) occur in any given locality and the growth rate of the species that occur there is known, the cycles between vegetation harvesting excursions can be scheduled with absolute surety.

The purpose of this document is to stipulate the Engineering requirements for maintenance of Vegetation that grow in Distribution and Transmission networks, Land in control of Eskom Real Estate and Eskom Telecommunication infrastructure and access routes and to indicate how the health of the network in proximity of this vegetation is to be monitored such that the appropriate capital and operational investments can be made, at the appropriate times, to sustain the operational capability of the asset..

2.1.2 Applicability

This document is applicable to Eskom Transmission, Distribution, Eskom Real Estate and Eskom Telecommunication Groups.

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] ISO 9001 Quality Management Systems

[2] Guide to Integrated Risk Management, ©Eskom Ltd, 2009

[3] Act No. 85 Occupational Health and Safety Act, 1993

[4] 474-190 Design Base Standard

[5] MN 240-44509543 Process Control Manual (PCM) for Design System

[6] MN 240-45920887 Process Control Manual (PCM) for Maintenance of Design Base

[7] MN 240-45921037 Process Control Manual (PCM) for Optimized Operational Asset Performance

[8] MN 240-45920941 Process Control Manual (PCM) for Manage Asset Excursion

[9] 41-334 Vegetation management guideline

[10] 240-70172585 Vegetation management and maintenance within Eskom land, servitude and right of a way

[11] 240-52456757 CONTRACT SPECIFICATION FOR VEGETATION MANAGEMENT SERVICES ON ESKOM NETWORKS

[12] 32-736 Land and Biodiversity Policy

[13] Act 101 of 1998 National Veld & Forest Fire, 1998

[14] 240-125477962 Herbicide use in Eskom prohibited and restricted areas, live chambers and Telecommunication infrastructure yards and security fences

[15] Act No 10 of 2004: Alien and Invasive Species Regulation

2.2.2 Informative

[16] 240-49230046 Failure Mode and Effects Analysis Guideline

[17] 240-49230148 Maintenance and Logistics Support Design Guideline

[18] 24-49230067 Life Data Analysis Guideline

[19] Electrical Machinery Regulations, 2011 under Section 43 of the Occupational Health and Safety

[20] Land and Biodiversity Standard 32-815

[21] National Spatial Biodiversity Assessment (NSBA) 2011

2.3 Definitions

2.3.1 General

Definition	Description
Alien species	A Vegetation species that is not an indigenous species; or An indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention (National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
Asset	Any infrastructure that has been established to enable the generation, transmission, distribution and sale of electricity.
Corrective Maintenance	The maintenance carried out after a failure has occurred and intended to restore an item to a state in which it can perform its required function.
Critically endangered	Ecosystems that have undergone severe degradation of their ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation (National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
Eskom land	Any land and/or servitude and/or any real right registered in the Deeds Office in Eskom's name or favour. It also includes rights of way granted to Eskom.

Definition	Description
Functional Importance – Critical	Applicable to an asset that must operate, as designed, in order: • to meet to meet legal requirements; or • to meet regulatory requirements; or • to ensure safety of people; or • to prevent irreversible environmental harm; or • to prevent economic loss (net profit) of > R99 million; or • To ensure continuity of supply, where not doing so would imply failure to meet one of the above points in the Eskom or public domain.
Functional Importance – Economic	Applicable to an asset which must operate, as designed, in order to ensure continued income through the provision of services and accurate billing; or to prevent damage to, or accelerated ageing of asset resulting in economic loss, such that any economic losses (net profit) are limited to between R100 000 and R1 million.
Functional Importance – Run to Failure	Applicable to an asset where the consequences of failure are acceptable, without preventative maintenance being performed, for a period of time until normal inspection and test activities will determine the failure and correction actions can be carried out. Economic losses are limited to < R100 000.
Functional Importance – Significant	Applicable to an asset which must operate, as designed, in order • to prevent impact on personnel and public; or • to prevent measureable impact on environment; or • to prevent damage to, or accelerated ageing of asset resulting in economic loss; to ensure continued income through the provision of services and accurate billing; or to protect the Eskom brand and reputation, such that any economic losses (net profit) are limited to between R1 million – R99 million.
Geospatial	Relating to or denoting the data that is associated with a particular location on land.
Maintenance Engineering Strategy	Maintenance Engineering Strategy refers to the engineering performed during the design process (logistic support analysis) to define the maintenance requirements of the System, Structure or Component (SSC) (which typically include the following: minimum critical spares requirements; maintenance tasks definition; in-service inspection and test requirements; maintenance periodicities and triggers; training requirements; facilities; expected SSC life, etc.) that serves as primary input to the maintenance execution strategy.
Preventative Maintenance	The maintenance carried out at predetermined intervals or corresponding to prescribed criteria (such as measured condition or number of operations), and intended to reduce the probability of failure or the performance degradation of an item.
Remote Sensing	The scanning of the earth by satellite or high-flying aircraft in order to obtain information about it.
Servitude	A servitude is a real right (i.e. registered in the Deeds Office against the title deed of an erf), the content of which is to allow limited access to an erf for a specific purpose. It does not entail ownership and must be exercised in a seasonable way, within the boundaries of the specific purpose. In this standard, the reference is specifically to servitudes which allow Eskom only to build, operate and maintain infrastructure for the generation and conveyance of electricity, and ancillary purposes.

2.3.2 Disclosure classification

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

2.4 Abbreviations

Abbreviation	Description
ADSS	All Dielectric Self Supporting
CM	Corrective Maintenance
CMMS	Computerized Maintenance Management System
CoE	Centre of Excellence
DX	Eskom's Distribution division
FMEA	Failure Modes and Effects Analysis
FMECA	Failure Modes, Effects and Criticality Analysis
GIS	Geographical information system
GPS	Global Positioning Satellite
HV	High voltage. Nominal voltage levels equal or greater than 44 kV up to and including132 kV
IT infrastructure	Information Technology infrastructure
LiDAR	Light detection and ranging
MTS	Main Transmission System
MV	Medium voltage. Nominal voltage levels greater than 1 kV and less than 44kV
MVCD	Minimum Vegetation Clearance Distance
TX	Eskom's Transmission division

2.5 Roles and responsibilities

The Manager - Design Base Asset Maintenance is responsible for the consistency and process of compiling this maintenance strategy. The targeted Divisions and Departments are responsible for the selection of asset specific maintenance execution strategies per individual asset.

The targeted Divisions and Departments are also accountable for developing Maintenance Plans in line with this maintenance standard and the subsequent scheduling, work execution and capturing of the relevant information as specified by this standard and job plans and / or task list in the CMMS's.

Compliance with the requirements of this standard is MANDATORY, and where the affected OUs and Grids cannot comply with any of the specified requirements, such deviations shall be managed as per the Manage Asset Excursion process.

Any other maintenance documents developed must comply with the requirements of this maintenance strategy.

In the absence of an Asset Performance Management (APM) tool, the Manager – Design Base Asset Maintenance is accountable to provide templates which allows for manual implementation of the requirements of this standards.

2.6 Process for monitoring

The Manager - Design Base Asset Maintenance will monitor the effectiveness and consistency of adoption of this standard through established report formats which will be sent to the Identified User Group to provide the required information.

2.7 Related/supporting documents

Not applicable.

3. Requirements

3.1 Asset identification

3.1.1 Vegetation Classification and demographics

All Vegetation that grows in all land that Eskom has a controlling or beneficial interest in. The vegetation types of interest are: trees, shrubs, grasses with the potential to adversely affect the asset classes as directed in this standard. All other growth forms are not provided for in this standard as it does not have a significant bearing on the asset or organisational activities.

A Biome is a large geographical area that forms ecologies of vegetation, animal and insects, adapted to the local conditions which include: min/max temperature, precipitation levels, soil types, geology, topology and other factors. Species not indigenous to a Biome will not propagate or survives unassisted in a Biome where the conditions listed are not suitable. Some alien and invasive species thrive in conditions created during vegetation management that suits its seed germination and growth. Biomes define unique combinations of Trees, Scrubs, Grass, Lichens, Moss and Fungi. One biome is visually distinguishable from the other.

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There are sub ecological systems that occur within Biomes called Bio- regions and vegetation types that become ever-more discriminatory of the species type that will flourish in a given area.

The acknowledge Biomes that occur in South Africa are:

3.1.1.1 Forests (Natural and Commercial Plantations

a) Description and Distribution

Forests are units of multi-layered vegetation dominated by large trees whose canopies overlap. These forests are generally evergreen and can reach a height of 30 meters.

Forests are scattered along the eastern and South Eastern escarpment (mountain ranges) through Limpopo, Mpumalanga, Maputuland and KZN and as far along the coast as Western Cape.

b) Impact on Eskom Operations

The trees in forest present a mechanical risk to assets as it can fall on line conductors and structures causing such to break and pose fire risks and electric shock hazardous to man and beast. These tall trees can also grow into power lines causing transient faults (power quality problems) or sustained power outages (Security of supply).

c) Impact on Eskom Contractors

Cutting these large trees especially in the proximity of other trees and services (power lines, fences, building etc.) pose a significant risk to felling operations. These trees are only cut by contractors licensed by Eskom to the appropriate competence level and organisational capacity. The cost of ownership for vegetation management in this biome is high.

3.1.1.2 Albany Thicket

a) Description and Demographics:

Thicket is a tangle of dense woody and thorny growth of shrubs or trees of an average height of 2 to 3 meters. The growth form is generally impenetrable.

Thicket almost exclusively occurs in the Western parts of Eastern Cape with small pockets occurring in the Eastern part of Western Cape.

b) Impact on Eskom Operations

Restrict access to power line corridors for Construction and Maintenance crews. Thicket provides considerable bio-mass and is a fire hazard during dry seasons and following extended periods of drought. Such dense bush may host fauna and insects that could harm Eskom and Contractor staff and organic assets.

c) Impact on Contractors

Dense bush is very difficult to cut as access is restricted and tall trees grow in the proximity of other services, assets and close to one another. The hard plants test the blades and operating mechanisms of the specialized cutting machines. Thicket is difficult to cut up and stack or remove due to the volume of the uneven growth.

Note: Invader species like Lantana Rosa in certain Savana's present the same high density growth as Albany thicket but is less woody. They also grow faster.

3.1.1.3 Human Modified Vegetation

a) Description and demographics

Human modified domains can generally be easily distinguished from the natural vegetation. Of significance are trees with single or multiple stems that end in a defined canopy. Plantations of Black Wattle and Port Jackson are all introduced by humans for a variety of reason and are regarded as intruder species and undesirable. Man planted trees across the length and width of South Africa in all Biomes described.

Some agricultural activity required the introduction of wind breaks, and fast growing tall trees were introduced into a variety of biomes for that purpose. Trees are also planted for aesthetic purposes and provide shadowy areas for recreation. Some of these trees are indigenous and protected while a group of intruder species have been declared pests and are to be removed at every occasion.

b) Impact on Eskom Operations

Human modified domains pose a fire, mechanical and electrical risk to the network and need to be cleared. Due to the function of some plantations, they have to be continually trimmed instead of cut down, by land owner preference. Cutting it down is preferred vegetation control activity and in some cases call for extensive and difficult discussion with land owners.

c) Impact on Contractors

Without fail single trees planted can be classified as dangerous trees (see Contract Specification). Wattle and similar plantations of high density does not constitute danger trees. However, all these plants are either difficult to fell or cut or to dispose of. It required specifically licensed contractors to fell and cut the tall trees. The modifier prices will be paid over and above the biome within which it occurs.

Strong negotiations skills will allow contractors to be effective in the long term management of a corridor.

3.1.1.4 Savanna

a) Description and distribution

Savanna is dominated by woody plants, both shrubs and trees of medium to high canopy. The medium density of growth allows grass and other plants to grow below the trees. The bio-mass of these regions is high thus testing the capability and competence of the contractor.

Savanna covers a large part of South Africa and stretches from North East regions of the Northern Cape, covers much of North West Province, most all of Limpopo, the eastern part of Mpumalanga, central parts of KZN and coast of the Eastern Cape

b) Impact on Eskom Operations

The diverse growth form and dimensions pose all the hazards associated with vegetation for Eskom. Fire risk, access restriction, mechanical risk and dielectric problems are significant. For this reason the corridor clearing is mostly seen as an aesthetic nightmare to nature lovers but is a necessity for stable electricity supply operations.

c) Impact on contractors

The high density, high bio-mass and bulky trees make vegetation harvesting and waste management quite challenging. Contractor capacity in terms of knowledge, variety and cost of production equipment and negotiation skill will be tested to the limit. In most cases contractors working in this area need to be licensed for "danger trees". The tourism industry is big in the savanna biome and facilitates hunting and game watching, all revenue generating interests. Therefor the land owners are quite protective of the bush and they will make it difficult for contractors removing the vegetation. Due to the wide distribution of Nature Reserves and National Parks all Wild Life pressure groups keep a critical eye on industry that intends to remove the vegetation. Contractors should be aware that they share space with dangerous animals in these reserves, ranches and parks.

3.1.1.5 Namma-Karoo

a) Descriptions and distribution

Namma-Karoo is a composite vegetation zone reflecting elements of Savanna, Grasslands, Albany thicket and contains small trees, shrubs and grasses. This region is dominated by grasslands and succulent plants.

Namma-Karoo spans the North Western parts of South Africa covering Northern Cape, the Western Parts of Free state, North Eastern Part of Western Cape and the north Western part of Eastern Cape.

b) Impact on Eskom operations

Vegetation can restrict access, can fuel fires in the dry season or during droughts and can grow into power lines. It is also the most complex region to price due to the high growth form diversity from no treatment required to intensive treatment in specific areas.

c) Impact on Contractors

The vegetation growth form is diverse and ranges from small and large/dangerous trees and is extremely difficult to price the service due to diversity. It challenges the organization capabilities in the broad spectrum of human competence and uncertain use of specialized production equipment required.

3.1.1.6 Indian Ocean Costal Belt

a) Description and distribution

In areas the Indian Ocean Coastal Belt resembles Savanna with predominantly shrubs but occasionally dispersed small trees.

The Indian Ocean Coastal Belt covers a narrow strip all along the Indian Ocean Costal area.

b) Impact on Eskom operations

Vegetation has the potential to grow into the power line but pose a minimal mechanical threat. Vegetation can obstruct access to plant for construction and maintenance work and pose a limited fire risk.

c) Impact on Eskom contractors

Contain some large and dangerous trees but is mostly shrub lands with dense vegetation. The branches are not as intertwined as Albany Thicket and it is therefore easier to cut and separate than the latter.

3.1.1.7 Succulent Karoo

a) Description and distribution

Low growing, succulent vegetation with flowery plants dominates this landscape. The dominant growth form is shrubs with some low trees growing in pockets. Larger growth forms introduced by humans do exist in extreme low density. Soft fruit orchards and vineyards is an economic reality.

The Succulent Karoo defines a narrow belt of vegetation in the Northern and Western Cape. It is flanked by Fynbos and Namma-Karoo. These three Biomes share common species of plants. It covers three provinces namely the Western Coastal areas of the Northern Cape, central Western Cape and a small area into the Eastern Cape

b) Impact on Eskom operations

Access is restricted in vineyards and soft fruit orchards. Trees grow into Eskom power lines and the vegetation that replicates to Fynbos can cause severe fire damage to power lines and overhead cables, especially ADSS FON strung below primary conductors on some power lines.

c) Impact on Contractors

The fire management protocol is reasonably undefined, so minimal vegetation is designated to be removed. Under specific lines containing FON, shrubs that can grow in excess of 500 mm will be removed from the corridor. The cut and removal challenges to the contractor are similar to Fynbos. In remote locations, dangerous trees will need felling and removal.

3.1.1.8 Fynbos

a) Description and distribution

The Fynbos biome gets its name from the Fynbos that dominates this winter rainfall region. Small leaved ever green shrubs prone to fires almost completely covers the landscape. Trees in most cases are planted by humans and are therefore defined as human modified domain. Soft fruit orchards and vineyards are an economic reality

Fynbos occurs mostly in the Winter Rainfall Areas of the Western Cape.

b) Impact on Eskom operations

Fynbos hardly have the potential to grow into the power lines but constitute a high density growth that may restrict vehicle and even movement on foot. Where they grow high and dense enough it presents a fire risk to Eskom assets like wood poles, overhead cable networks including All Dielectric Self Supporting (ADSS) Fibre Optic Cables and need to be curtailed in the corridor. Clearing of this vegetation (by cutting just above ground level_ is recommended in a radius of 400 mm around poles and structures.

c) Impact on contractors

It is not particularly challenging to cut the shrubs that can grow to in excess of 5 meter but difficult to remove due to the irregular growth a volume of the plants. Fire is a serious risk in the dry season (summertime) and contractors should take the preventative and reactive measures to deal with small fires in their early stages.

3.1.1.9 Grassland

a) Description and distribution

Comprise mostly of relatively of short simple and herbaceous grass structures. Woody plants are rare or confined to specific habitats.

Grassland covers most of the Eastern-Central Part of South Africa and mostly found on the Mpumalanga, Free State, KZN and Eastern Cape Highveld's.

b) Impact on Eskom operations

Grass neither presents a flash over nor does it restrict access by vehicle of by foot. In the case of Transmission: certain grass types are rich in energy and can burn vigorously. High energy veld fires cause ionization of the air around the power line that can result in Ultra high voltage flash over. Distribution is not as dependent on the dielectric properties of air. Transmission identified zones of grass that is cut annually in the dry season. This work is extremely seasonal and places a high demand on grass cutting contractors later in its growth cycle to the early dry season. Wood poles are protected against fires but older poles which dried out are at risk. Eskom discourage the clearing of grass at wood pole bases by hoeing around the base as in the long run the standing water causes early ageing of the poles.

Trees occurring in this Biome were mostly introduced by humans and need to be cut where they present a mechanical as well as a dielectric threat to Eskom operations.

c) Impact on contractors

This area devoid of woody trees and the shrubs require little attention. Where trees were introduced by Humans it will be cut as human modified domain or single tree events. Trees introduced by humans can grow high and will be defined as "danger trees" requiring it to be cut by contractors specifically licensed for it.

3.1.1.10 Desert

a) Description and distribution

Deserts contain low growing flowery plant with almost no tree or grass growing.

Deserts occur in a small strip mostly in the Northern Cape along the South African/Namibian border

b) Impact on Eskom operations

Deserts have minimal impact on the Eskom business as it does not restrict access neither can it grow into the power line. Even fires when they occur have minimal impact.

Low priority work and in general vegetation maintenance will not be scheduled for these biomes. Human modified domain will receive treatment on request only.

c) Impact on contractors

No impact

3.1.1.11 Azonal

This Biome will not be discussed in detail. It defines vegetation in peculiar growth conditions like salt pans, some waterways that have no impact on Eskom Business. The cutting of reeds and other grasses in these biomes have been ring-fenced under the cutting of reed and bamboo

3.1.2 Growth form description

a) Tree: A tree is a plant that lives for more than two years with an elongated stem, or trunk (the main wooden axis of a tree), supporting leaves or branches. A tree is a woody plant, only plants that are usable as lumber or only plants above a specified height. At its broadest, trees include the taller palms, the tree ferns, bananas and bamboo.

b) Shrubs: A shrub is distinguished from a tree by its multiple stems and shorter height, usually less than 6 m (20 ft.) tall. Plants of many species may grow either into shrubs or trees, depending on their growing conditions. Small, low shrubs, generally less than 2 m (6.6 ft.) tall, such as lavender, periwinkle and most small garden varieties of roses, are often termed subshrubs or bushes

c) Grasses: Are plants with a single flower pod, usually herbaceous plants with narrow leaves growing from the base. They include the "true grasses", of the family Poaceae (also called Gramineae), as well as the sedges (Cyperaceae) and the rushes (Juncaceae). The true grasses include cereals, bamboo and the grasses of lawns (turf) and grassland

d) Creepers: Creepers are non-woody and elongated plants that can grow multiple branches and covered with complex or single leaves and flowers. They grow up on structures to gain a growth advantage in photo-synthesis. Good examples are Poison Ivey, tomato's and granadillas

3.1.3 Design intent

Maintenance requirements contribute to achieving the design intent, i.e. what the maintenance should sustain. In order to accurately specify the maintenance requirements, it is necessary to understand the design intent in terms of the intended:

3.1.3.1 Purpose of this asset care

Vegetation is a national resource and will be managed within the confines of Statutory, Regulatory and Ethical consideration to the multitude of benefactors of vegetation. The various biomes contain vegetation that have the following core benefits to man and animal:

a) Commercial value: I.e. agriculture and eco-tourism

b) Socio-political: Some specific trees (varied species) have esthetical, emotional, religious and political value

c) Environmental Sustainability: Vegetation is the predominant soil erosion prevention method on earth. Vegetation stabilise top soil, are effective carbon traps, generate oxygen; provide secondary habitat for mammals, avian species, insects and other vegetation types.

d) Human uses for trees: provide: wood for furniture, relaxation areas, fire wood and sustenance

e) Beneficial Sustenance: Vegetation provides sustenance in the form of food (fruit and roots). Some of its growth provides parts with medical properties that can heal man and beast.

In pursuit of providing for the sometime competing value of vegetation, various species are categorised as: endangered, protected, invasive and alien, each with particular statutory and regulatory preservation, control and in some cases extermination requirement.

3.1.3.2 Vegetation growth forms

Vegetation grows in many forms. Only the three growth forms discussed below is listed as it have a significant impact on Eskom operations.

Trees

- A tree is a plant that lives for more than two years with an elongated stem, or trunk (the main wooden axis of a tree), supporting leaves or branches. A tree is a woody plant, only plants that are usable as lumber or only plants above a specified height. At its broadest, trees include the taller palms, the tree ferns, bananas and bamboo. Eskom classify trees for payment in three categories:

a) Trees with a stem diameter smaller than 100 mm not qualify as a tree for the purpose of this standard. This includes new growth of even the tallest tree.

b) Trees with a stem diameter between 100 and 399 will be deemed a small tree

c) Trees with a stem diameter of more than 400 mm will qualify as a dangerous trees

Shrubs

A shrub is distinguished from a tree by its multiple stems and shorter height, usually less than 6 m (20 ft.) tall. Plants of many species may grow either into shrubs or trees, depending on their growing conditions. Small, low shrubs, generally less than 2 m (6.6 ft.) tall, such as lavender, periwinkle and most small garden varieties of roses, are often termed subshrubs or bushes

3.1.3.3 Grass

Are plants with a single flower pod, usually herbaceous plants with narrow leaves growing from its base. They include the "true grasses", of the family Poaceae (also called Gramineae), as well as the sedges (Cyperaceae) and the rushes (Juncaceae). The true grasses include cereals, bamboo and the grasses of lawns (turf) and grassland.

3.1.4 Vegetation growth inhibitors

a) The performance and sustainability metrics of the asset is its ability to grow and sustain its structural integrity and reach of influence on the network in its natural habitat. The principal performance criteria, in so far as this strategy is concerned, is the growth rate of plants. The vegetation ability to grow and maintain its structural integrity is impaired in the following ways:

- Impact or abrasive interaction between external bodies and the major structural components
- Fire damage to major structures (especially trees)
- Fungal attack to major structures
- Termite attack to major structures
- Shell and heart rot
- Any exposure to chemical substances that affect the ability of the tree to grow or sustain itself (poisons)
- Critical loss of bark of the major structures

Note: A large plant (i.e. trees) that experienced structural damage or has dried out for whatever reason present a major risk to life and asset when it fails and fall to the ground and should be approached with great care.

3.1.5 The Operating (physical and electrical) environments the asset cannot tolerate are as follows

3.1.5.1 Power Lines in the Wires Business

- Trees can obstruct access to the power line components and when it grows in contact with the line is a safety risk and reduces the power line performance. Therefore: the power line corridor will be cleared of all small, medium and large trees.
- Shrubs can obstruct access to the power line components and when there is a high density growth directly adjacent to a wood pole a sustained fire can damage the wood pole to the point of failure. The power line corridor will be cleared of shrubs capable of growing to a height exceeding 1000 mm. This includes cutting all shrubs around structure bases so that it is clear for a distance of 500 mm
- The impacts of grasses on Distribution networks are insignificant. In certain locations and situation clearing it may be required. The respective Operating Units will identify locations where it is a specific problem arise and issue instruction for it to be removed.
- Opportunistic growth of weed in substations is both aesthetically displeasing and holds a dielectric risk for staff operating and working in substation. It is therefore important to inhibit growth as much as possible. Two containment methods are effective:
  - General application of long acting chemical that will inhibit germination and growth while contact chemical will deal with the current growth in such a substation.
  - Gravel stone maintenance must prevent soil build-up in the gravel stone and the correct stone layer depth denies sunlight that inhibits growth and weed beds from forming.

- Grass growing in the restricted and controlled areas around substation provides biomass that can sustain grass fires that may cause air ionisation or damage to assets, is a security risk and provide a safe habitat for dangerous snakes, insects and vermin. Such areas need to be cleared of grass to satisfactory levels at the start of the dry out season.

3.1.5.2 ADSS: Optic Fibre Networks

- Trees provide bio-fuel that when it burns rapidly heat the Optic Fibre, causing it to melt which will result in permanent damage. Trees can also obstruct access to the communication system components. Lastly trees may experience structural failure and fall onto the communication network. Therefore: the power line corridor will be cleared of all small, medium and large trees.
- Shrubs provide bio-fuel that when it burns rapidly heat the Optic Fibre, causing it to melt resulting in permanent damage. It can also obstruct access to the communication system components. The power line corridor will be cleared of shrubs capable of growing to a height exceeding 1000 mm
- Certain high density or oily germinates provide bio-fuel that can cause structural failure to the Optic Fibre when it burns. The following germinates in the corridor will be cleared for this reason: Protoasparagus laricinus (Katbos), Cosmos bipinnatus (Cosmos), Tagetes minuta (Khakibos): and Common reeds

Note: Mega germinates (Grass species that grow beyond 2 meter and includes reeds) does not pose a significant risk. Waterborne environments in the power line corridor will be cleared of reeds.

3.1.5.3 Vegetation Management in Substations

Various distribution mechanisms deposits seed (weeds, grasses) in substations. The occurrence of such weeds reduce the insulation capacity of the substation ground line (compromise the insulation capacity of gravel stone) and create micro-habitats that can introduce insects, small rodents, reptiles, birds and carnivorous animals (cats) along the food chain, inside the substation fence. Such habitation should be discouraged by denying weed and grass to grow.

Crusher stone placed in the substation is a primary mechanism to prevent the growth of small plants and weed in substations. Chip stones are placed at a thickness of 100mm and will deprive any seeds lying on the soil surface sun light which is needed for germination. Soil introduced to the substation floor by wind or erosion compromise this function of the gravel stone, allowing vegetation to establish itself in pockets of the substation.

The vegetation that occurs in a substation is reflective of the plants in the biome or bio-region that the substation is placed in. In desert areas for instance the vegetation will be sparse or even absent. In these areas vegetation control in substation is not required. However in tropical regions of high rainfall, with a variety of plants species, vegetation control is an all year round challenge.

Substations within the Distribution and Transmission network vary greatly in size and are often situated in close proximity to water courses, plots of agricultural production, sensitive environments and urban areas. Consequently the nature of risks involved in the use of herbicides varies for each site and the selection of the type of herbicide should be approached with care.

3.1.6 Vegetation Impact on networks

a) Growth and the existence of vegetation in the proximity of the electrical network must be manage when the mutual influence is negative or threaten the sustainability of either asset type. The following mutual influence should be noted and managed:

- **Biomass in contact with power line conductors** can cause phase to phase and phase to earth faults negatively impacting plant performance and safety of assets or life,
- **Bio fuel**: plant material especially when it is dry and/or rich in oils can ignite and sustain fires. Such fires below the power line conductors can ionise the air resulting in flash overs between phases on Ultra-High Voltage power lines. (Network performance and sustainability) Growth forms that provide bio-fuel are Trees, shrubs and grasses which include reeds.

- **Bio fuel**: plant material especially when it is dry and/or rich in oils can ignite and sustain fires. These fires can increase the direct or ambient temperature of electrical components causing permanent damage to it (i.e. ADSS - FON networks, overhead cables, wood poles and cross-arms)
- **Bio fuel**: plant material especially when it is dry and/or rich in oils can ignite and sustain fires. These fires could emanate from the electrical network and migrate to neighbouring vegetation or vice versa. Minimising the bio-mass reduce this transfer risk.
- **Access to plant:** Certain bio-regions provide a high density growth that restricts access to the plant. It can deny operating, maintenance and inspection of the network parts and components.
- Creeper plants can invade control boxes and marshalling kiosks or over grow physical asset types that can cause dielectric or mechanical failure to such plant.
- **Undesirable habitat creation**: Vegetation provides a habitat to insects, rodents and other animal that can be harmful to any part of the assets (tunnelling, nesting, pollution etc.),
- **Undesirable working environment**: Low density vegetation on a power line allows a 360° view for staff in their working environment for a reasonable distance (specifically provided for National Parks). This allows the identification of dangerous animals thus providing rapid egress.

b) The following vegetation growth form impact the electrical network in the following way:

- **Trees** provide bio-fuel that can cause ionisation of hydrocarbons that could cause line flash over when it burns close up to the conductors when it burn. Trees can also obstruct access to the power line components and when it grows to a point of contact with the power line conductors it is a safety risk and reduce the power line supply stability. Lastly trees may experience structural failure and fall onto the power line. Therefore: the power line corridor will be cleared of all small, medium and large trees.
- **Shrubs** provide bio-fuel that can cause ionisation of hydrocarbons that could cause line flash over when it burns. It can also obstruct access to the power line components. The power line corridor will be cleared of shrubs (retain the root system) capable of growing to a height exceeding 1000 mm
- **Gramenites (Grass along the power line corridor)** some germinates provide bio-fuel that can cause ionisation of hydrocarbons that could cause line flash over and line flash over when it burns. Networks are more susceptible to fires where the conductor ground clearance is at the minimum and/or where the topology direct heat and ionised air into the line. The full length of the power line will not be cleared of grass. The decision to cut germinates will be informed by a study or the inspection to identify the following factors:
    - **Bio-mass risk (Grass Density)**: The risk increase with the density of the patch of indicated species is sufficient to sustain the fire
    - **Grass Species** dictate the energy available to fuel the fire. The presence of the following species shall be used as risk indicator: Protoasparagus laricinus (Katbos), Cosmos bipinnatus (Cosmos) Tagetes minuta (Khakibos) and Common reeds

Note: Acacia mearnsii (Black wattle is also a great contributor of bio-fuel capable of significant air ionisation.

Note: Mega germinates (Grass species that grow beyond 2 meter and includes reeds) does not pose a significant risk.

- **Topography** Risk is defined by the ground clearance of line conductors is predetermined by the topology that the line traverses. The following risk factors must be considered:
    - **Low Risk:** Where the ground clearance is more than the design clearance for that voltage

- **Medium Risk:** Over level terrain where the ground clearance is less than 2 meters higher than the standard design clearance for the voltage
- **High Risk**: Lines constructed along the side of a cliff or where the line clearance is below or just meet the design clearance for that voltage

- **An Ignition Risk** is presented by veld fires are started by natural phenomena like lightning strikes to the ground or trees. In most cases however, grass fires is a result of human activity. For this aspect the risks are defined as follows:
  - **High:** Informal settlements near the line corridor or a road where cigarette butts is indiscriminately discarded or picnic areas where braai fires are left uncontrolled.
  - **Low:** Where human activity is reduced.
- **Germinates (Grass) growing in substation** in the restricted and controlled areas around substation provides biomass that can sustain grass fires that may cause air ionisation or damage to assets, is a security risk and provide a safe habitat for dangerous snakes, insects and vermin. Such areas need to be cleared of grass to satisfactory levels
- **Weeds growth in substations** are both aesthetically displeasing and holds a dielectric risk for staff operating and working in substation. It is therefore important to inhibit growth as much as possible. Two containment methods are effective:
  - General application of long acting chemical that will inhibit germination and growth while contact chemical will deal with the current growth in such a substation.
  - Gravel stone maintenance to prevent soil build-up in the gravel stone at the correct depth denies sunlight that inhibits growth

3.1.7 Power Line Corridor widths to be managed as directed in this standard

Nominal voltage	Servitude/Way leave width	Maximum Vegetation Clearance
11 - 66kV	8 m	4 m on either side of the centre line will be cleared. Any tree outside the corridor capable of growing (canopy radius ≥ 4 m) into or fall onto (height ≥ 6 m) the trees will be cut.
88 kV	10 m	5 m on either side of the centre line will be cleared. Any tree outside the corridor capable of growing (canopy radius ≥ 5 m) into or fall onto (height ≥ 7 m) the power line will be cut. Eradication of declared invaders in the corridor and the full servitude width where there is continuous growth from the corridor to the boundaries of the servitude.
132 kV	16 m	8 m on either side of the centre line will be cleared. Any tree outside the corridor capable of growing (canopy radius ≥ 8 m) into or fall onto (height ≥ 10 m) the power line will be cut. Eradication of declared invaders in the corridor and the full servitude width where there is continuous growth from the corridor to the boundaries of the servitude.
220 - 275 kV	36 m	18 m on either side of the centre line will be cleared. Any tree outside the corridor capable of growing (canopy radius ≥ 18 m) into or fall onto (height ≥ 19 m) the power line will be cut. Eradication of declared invaders in the corridor and the full servitude width where there is continuous growth from the corridor to the boundaries of the servitude.

Nominal voltage	Servitude/Way leave width	Maximum Vegetation Clearance
400 kV	42 m	21 m on either side of the centre line will be cleared. Any tree outside the corridor capable of growing (canopy radius ≥ 21 m) into or fall onto (height ≥ 22 m) the power line will be cut. Eradication of declared invaders in the corridor and the full servitude width where there is continuous growth from the corridor to the boundaries of the servitude.
533 kV DC	16 m	8 m on either side of the centre line will be cleared. Any tree outside the corridor capable of growing (canopy radius ≥ 8 m) into or fall onto (height ≥ 17 m) the power line will be cut. Eradication of declared invaders in the corridor and the full servitude width where there is continuous growth from the corridor to the boundaries of the servitude.
765 kV	60 m	30 m on either side of the centre line will be cleared. Any tree outside the corridor capable of growing (canopy radius ≥ 30 m) into or fall onto (height ≥ 31 m) the power line will be cut. Eradication of declared invaders in the corridor and the full servitude width where there is continuous growth from the corridor to the boundaries of the servitude.

3.2 Maintenance Engineering Strategy

The Maintenance Engineering Strategy refers to the engineering performed during the design process (logistic support analysis) or retrospectively, taking cognizance of the original design intent, to identify e the asset care requirements of the asset classes/systems, which includes:

a) Maintenance task determination (3.3.1)

b) Asset and maintenance data required (3.3.2)

c) Identify the required Task manuals (3.3.3)

d) Maintenance spares (3.3.4)

e) Facilities and training requirements (3.3.5)

Remote Sensing (RS) technologies capture information at different wavelength in the electromagnetic spectrum. The information captured can be used to differentiate different vegetation types occurring at a site area and its surroundings. Having knowledge about the different vegetation species can influence the type of interventions required to manage the servitude. Remote sensing technology has been used by different environmental companies and agricultural companies to map the species and to measure the growth of vegetation species over time; it is an excellent tool to use for production time series data.

Remote sensing allow frequent review of the asset sub class (Bio Region) demographics that is provided and integrated in small world data that assist the maintenance task assignment based on the asset sub class.

Small world data provide a geographical view of the various asset location and specification.

3.2.1 Maintenance Task Determination

The generic maintenance activities and triggers are derived from the impact of vegetation on the network (see paragraph 3.1.5)

The Maintenance tasks are created based on the following:

- Grouped by network: lines, substations unoccupied land designated for supply networks, or part thereof.
- The maintenance specification is informed by the vegetation 'growth forms', each that result in network and operating risk for the respective biome and network types.
- The maintenance frequencies are determined by the predictable growth rate of the indicators species (fastest growers) in a specific biome.
- The maintenance task is also informed by the risk presented by vegetation growth forms and plant characteristics (thorny parts, size, dangerous felling environment, other assets in the proximity, dead and unhealthy trees)

3.2.1.1 Maintenance determinant based on growth rate

The driver discussed below inform the maintenance frequencies as directed in Table 1 below

Various species that grow in their natural habitat have a predictable growth that depends on the climatic conditions, rainfall rates, solid health and quality of sunlight.

a) The following growth rates and growth factors in trended from one season to the next:

- High growth rate ($m.annum^{-1}$) due to higher rainfall than normal
- Normal growth rate ($m.annum^{-1}$) due to normal rainfall
- Low growth rate ($m.annum^{-1}$) due to one or more seasons of drought

b) The maintenance intervals prescribed follows the identification of all species that exists in a specific biome and the identification of the species that grow the fastest amongst those that is natural to the biome. (Invader species needs to be eradicated from the defined corridor)

Table 1: Maintenance Activities

Biome	Vegetation Group	Indicator species	Grow Rate (m per year)	Maintenance Frequency (Months)
Albany Thicket	Albany Coastal Belt	Ficus sur	1	24
Albany Thicket	Buffels Thicket	Apodytes dimidiata or Vepris lanceolata	0.3	80
Albany Thicket	Camdebo Escarpment Thicket	Cussonia paniculata	1	24
Albany Thicket	Coega Bontveld	Maerua cafra	0.6	40
Albany Thicket	Eastern Cape Escarpment Thicket	Cussonia spicata	1	24
Albany Thicket	Gamka Thicket	Pappea capensis	0.3	80
Albany Thicket	Gamtoos Thicket	Ptaeroxylon obliquum	0.6	40
Albany Thicket	Great Fish Noorsveld	Cussonia spicata	1	24
Albany Thicket	Great Fish Thicket	Ptaeroxylon obliquum	0.6	40
Albany Thicket	Groot Thicket	Cussonia spicata	1	24
Albany Thicket	Kowie Thicket	Ptaeroxylon obliquum	0.6	40
Albany Thicket	Southern Cape Valley Thicket	Olea europaea subsp. africana	0.3	80
Albany Thicket	Sundays Noorsveld	Pappea capensis	0.3	80
Albany Thicket	Sundays Thicket	Cussonia spicata	1	24
Azonal	Alluvial Vegetation	Combretum erythrophyllum	1	24
Desert	Gariep Desert Bioregion	Pappea capensis	0.3	80
Desert	Southern Namib Desert Bioregion	Boscia albitrunca	0.3	80
Forest	Azonal Forests	Dais cotinifolia	1.5	16
Fynbos	Alluvium Fynbos	Olea europaea subsp. africana	0.3	80
Fynbos	Dolerite Renosterveld	Olea europaea subsp. africana	0.3	80
Fynbos	Granite Fynbos	Cunonia capensis	1	24

Biome	Vegetation Group	Indicator species	Grow Rate (m per year)	Maintenance Frequency (Months)
Fynbos	Granite Renosterveld	Olea europaea subsp. africana	0.3	80
Fynbos	Limestone Renosterveld	Acacia karroo or Olea europaea subsp. Africana	0.3	80
Fynbos	Quartzite Fynbos	Grewia occidentalis or Polygala myrtifolia	0.6	40
Fynbos	Sandstone Fynbos	Cunonia capensis or Podocarpus elongatus		24
Fynbos	Shale Band Vegetation	Curtisia dentata	0.6	40
Fynbos	Shale Fynbos	Kiggelaria africana or Leucadendron argenteum	0.6	40
Fynbos	Shale Renosterveld	Halleria lucida or Acacia karroo or Maytenus acuminata	0.3	80
Fynbos	Western Strandveld	Ptaeroxylon obliquum or Sideroxylon inerme	0.6	40
Grassland	Sub-Escarpment Grassland Bioregion	Syzygium cordatum var. cordatum or Faurea saligna	0.6	40
Indian Ocean Coastal Belt	Indian Ocean Coastal Belt	Albizia adianthifolia or Bridelia micrantha		24
Nama-Karoo	Lower Karoo Bioregion	Ficus cordata or Ziziphus mucronata subsp. Mucronata	0.6	40
Nama-Karoo	Upper Karoo Bioregion	Boscia albitrunca	0.3	80
Savanna	Central Bushveld Bioregion	Sclerocarya birrea subsp. caffra	0.6	40
Savanna	Kalahari Duneveld Bioregion	Acacia erioloba	0.3	80
Savanna	Lowveld Bioregion	Sclerocarya birrea subsp. Caffra or Acacia nigrescens	0.6	40
Savanna	Mopane Bioregion	Adansonia digitata or Sclerocarya birrea subsp. Caffra.6		24
Succulent Karoo	Namaqualand Hardeveld Bioregion	Pappea capensis	0.3	80
Succulent Karoo	Richtersveld Bioregion	Boscia albitrunca or Schotia afra	0.3	80

3.2.2 Maintenance Task Activities

The maintenance activity result from the variables listed in the paragraphs above as follows:

Table 2: Maintenance Activities

No	Maintenance Activities / Job operational steps	Risk	Trigger	Licence category	Outage Y/N	Manual Y/N	Limits	Maintenance Tasks (Job plan / Task list)	Task No
Condition Monitoring									**1**
1.1.1	Vegetation impact identified during routine inspection		Time	CNC / CNL	N	N	NA	Vegetation Variance Inspections	1.1
Preventive Maintenance based on Time									**2**
	Cutting, stacking and/or removal (land owner preference) of trees, shrubs and bio waste indigenous to the biome Cutting of shrubs 1 m around single structure/pole bases and the whole area below a lattice structure and 2.5 m beyond the structure footprint The cutting or a 1 m wide path in the shrubs (not the grass) from the nearest access point (normal or informal road/track) to every switching point on any Distribution line. Stumps remaining after the felling shall be treated with a suitable chemical to prevent regrowth (within 20 minutes)	Note 3.3.2	Time	A 2	N	N		Bush Clearing	2.1

No	Maintenance Activities / Job operational steps	Risk	Trigger	Licence category	Outage Y/N	Manual Y/N	Limits	Maintenance Tasks (Job plan / Task list)	Task No
	This activity entails the follow-up chemical treatment of the power line e corridor soon (depending on the plant types) after the line has been cut, to inhibit germination of seed and/or regrowth.	Note 3.3.2	Time	B1	N	N		Follow up chemical Application	
	Selective grass cutting (specific areas and species) in the power line corridor and some cases to the servitude perimeter. Grass cutting with either a tractor and cutter or with hand held grass cutters depending on contractor capacity	Note 3.3.2	Time	A1	N	N		Grass cutting	
	Mechanical harvesting of weeds in the substation that is disposed of at an waste disposal site For the wires business this included the extended area beyond the substation fence demarcated by the fence curbing/anti tunnelling protection	Note 3.3.2	Time	A1				Substation weeding	
	Application of chemicals as directed in this standard to prevent and remove the establishment of weed beds in the substation. For the wires business this included the extended area beyond the substation fence demarcated by the fence curbing/anti tunnelling protection These contractors are accountable for access authorisation and keys in accordance with the Operating Regulation for High Voltage Systems	Note 3.3.2	Time	B1				Substation herbicide application	

No	Maintenance Activities / Job operational steps	Risk	Trigger	Licence category	Outage Y/N	Manual Y/N	Limits	Maintenance Tasks (Job plan / Task list)	Task No
	Grass cutting in Eskom land, in substation perimeter, CNC areas as and when required. Grass cutting is performed either with a tractor and cutter or with hand held grass cutters depending on contractor capacity	Note 3.3.2	Time	A1				Eskom land grass cutting	
	Selective and controlled burning of vegetation in the power line corridor as an alternative to grass cutting. The specific areas targeted for burn will be in accordance with the maintenance activity specification discussed in this report.	Note 3.3.2	Time	B2				Burning of grass	
Preventive Maintenance based on Condition									**3**
	The cutting and removal of the reeds from the water way. It will be stacked at a predetermined location (land owner preference) or disposed of in an ethical way.	Note 3.3.2	Condition	A1				Reeds/bamboo cutting	3.1

No	Maintenance Activities / Job operational steps	Risk	Trigger	Licence category	Outage Y/N	Manual Y/N	Limits	Maintenance Tasks (Job plan / Task list)	Task No
	Invaders listed Table 4 (declared indicators of bush encroachment) in GN1048 of 25 May 1984, promulgated under Section 29 of the Conservation of Agricultural Resources Act (Act 43 of 1983) (E.g. Black wattle, Blue gum, Port Jackson) Cutting, stacking along the corridor and/or removal and disposal of bio waste in a legal and responsible manner (landowner preference). Stump treatment of invader species inside the corridor and selectively (at the discretion of the Operating Unit) outside the corridor of trees and shrubs capable of growing into or fall onto a line is included. Eskom prefer all trees in and outside the power line corridor that risk Eskom operations to be totally removed. There are however cases where a tree, lane or cluster of trees inside or out the corridor for which the land owner will not give Eskom permission to cut. In some cases trees will be trimmed if it does not present the following risks for which the negotiation to cut becomes a safety imperative: where the root system of the tree is collapsing or extracting (foundation cracking): or the tree is damaged by fire, fungal or insect attack and can break: or major members can fail and potentially to the point where contact can be made with the line: or The tree or a major member can fall onto the line. The bio waste shall be removed and disposed of in a legal and responsible manner or shall be stacked at land owner discretion.	Note 3.3.2	Condition	A 2/3				Alien and invasive species control/eradication	

No	Maintenance Activities / Job operational steps	Risk	Trigger	Licence category	Outage Y/N	Manual Y/N	Limits	Maintenance Tasks (Job plan / Task list)	Task No
	Should an orchard of fruit trees that has not been appropriately pruned by the land owner present operational problems to the network, it will be trimmed to prevent it from growing into or falling onto the power line (it includes branches breaking and falling).	Note 3.3.2	Condition	A3				Trimming trees in orchards	
	Hedges are ever green plants and can be, but are not generally a fire hazard. Shoots and branches can grow into the power line and can cause power supply problems. It entails the trimming of hedges (either invader species or species indigenous to the biome) capable of growing into the power line. The bio waste will be disposed of in a responsible and legal manner	Note 3.3.2	Condition					Trimming hedges	
Corrective Maintenance:									**4**
	This activity entails the travelling, labour, cutting, chemical stump treatment and stacking or removing (at the preference of the land owner). The bio waste shall be disposed of in a legal and responsible manner.	Note 3.3.2	Condition	A2/3				Single tree felling	

Note 3.3.2: The risk assessment for the specific asset (Substation or line) on which the biomass occur will inform the asset risk rating applicable to the table above

3.2.3 Estimated Activity Duration per specified team

Biome	Team Progress km/day
Thicket	0.7
Desert	7
Forest	0.8
Fynbos	3
Grasslands	7
Indian ocean coastal belt	1.7
Namma Karoo	2.7
Savanna	1.3
Succulent Karoo	2.7

3.3 Asset and Maintenance data required

Where Eskom land or asset co-inhabit or co-exist in space with vegetation growth, the basic description of both these data sets and identification of the organisation that is responsible for those areas inform the specification and scheduling of maintenance activities.

3.3.1.1 Asset Data

The following minimum asset data must be captured in the Computerized Maintenance Management System (CMMS) to suitably describe the asset.

- Biome name
- Bio Region name
- Biome/bio-region occurrence polygon (GIS view)
- Excluded areas (Agricultural activity, commercial forests or other sterilised areas) and GIS polygon
- Protected environments (I.e. Nature reserves) and GIS polygon

3.3.1.2 Eskom owned land data required

- Name of substation
- Size of substation yard
- Size of servitude Eskom owned land around substation where grass need to be managed
- Address or location of Eskom (even vacant) land that require grass cutting

3.3.1.3 Eskom servitude or way leave description

- Name of power line
- Nominal voltage of power line
- Structure and span information (GIS view of the radial asset)
- Auxiliary equipment and point of supply identification
- Other services crossing the powerline

3.3.1.4 Eskom organisational data: Distribution

- Operating Unit Name
- Zone name
- Sector name
- Customer Network Centre name

3.3.1.5 Eskom organisational data: Transmission

- Grid Name
- Customer Network Link Name

3.3.1.6 Vegetation Contractor Data

- Contractor Name
- Contractor Team Identification name
- Team licence level

3.3.1.7 Maintenance data

The capture of maintenance data is of critical importance to enable the determination of the next / follow up maintenance cycle, the determination of asset health and the determination of asset performance.

No work orders without the required feedback should be closed.

The maintenance data must be captured in accordance with condition monitoring (Inspections and Tests (IT)), Preventative Maintenance (PM), Corrective Maintenance (CM) and Investigation (I) results as listed in specific job plans / task lists.

The following minimum asset data shall be captured in the CMMS.

Table 3: Maintenance data fields

Maintenance task/data	Data type	Source	Source activity
Asset Identification			
1.1 Sector name		Task Order	
1.2 CNC Name			
1.3 Line/Substation Area Name			
1.4 Task order number			
2 Primary Task order elements			
2.1 Indigenous Trees removed from corridor	Number	Production sheet	
2.2 Indigenous trees not removed from corridor	Number	Production sheet	
2.3 Name of Biome treated		Production sheet	
2.4 Bush clearing completed per biome	(m^2)	Production sheet	
2.5 Chemical Control		Production sheet	
2.5.1 Area Treated	(m^2)	Production sheet	
2.5.2 Number of stumps treated		Production sheet	
2.5.3 Chemical Description		Production sheet	

2.5.4 Chemical Volume used		Production sheet	
2.5.5 Water Volume used		Production sheet	
2.6 Grass cut	(m^2)	Production sheet	
2.7 Controlled burning of grass (m^2)		Production sheet	
2.8 Substation weeding conducted	(m^2)	Production sheet	
2.9 Herbicide application in substation		Production sheet	
2.9.1 Area treated	(m^2)	Production sheet	
2.9.2 Chemical description		Production sheet	
2.9.3 Chemical volume applied		Production sheet	
2.9.4 Water volume used		Production sheet	
2.10 Single tree event	Number	Production sheet	
Task Order Modifiers			
2.11 Number of alien trees/shrubs removed	(m^2)	Production sheet	
2.12 Area of invaders removed (80m2 incidents)	Number	Production sheet	
Exclusions			
2.13 Access denial (Structure number at start)		Production sheet	
2.14 Access denial (Structure number at end)		Production sheet	
2.15 Danger trees untreated (Number)	Number	Production sheet	
2.16 Sterilised area	(m^2)		
2.17 Agricultural activity (type)	(m^2)		
2.18 Reeds cut	(m^2)	Production sheet	
2.19 Grass removal from corridor	(m^2)	Production sheet	
2.20 Trimming of trees and shrubs	(m^2)	Production sheet	
2.21 Trimming of trees in orchards	(m^2)	Production sheet	
2.22 Trimming of hedges	(m^2)	Production sheet	
2.23 Reeds and bamboo cut and removed	(m^2)	Production sheet	
2.24Compensation event	(R)	Production sheet	
2.25 Standing time	Hours	Production sheet	
Team Utilisation			
2.26 Team size (heads)	Number	Production sheet	
2.27 Team days for task order	Number	Production sheet	
2.28 Team Identity (Name of team)			

3.3.2 Required task manuals

None

3.3.3 Maintenance spares

See 240-52456757: Contract specification for Vegetation Management Services on Eskom Networks

OU's / Grids must determine the stock levels required.

3.3.4 Facilities and training material

See 240-52456757: Contract specification for Vegetation Management Services on Eskom Networks.

3.4 Maintenance Execution Strategy

The Maintenance Execution Strategy refers to the asset specific maintenance tasks and triggers which the Grids and OUs use for the creation of Maintenance Plans.

An asset risk framework (Asset classification) is adopted, which is based on defined Asset Conditions (health), Environment, Usage / Duty Cycle and Functional importance (Criticality based on consequence of failure and Operational factors) within the parameters of the Maintenance Engineering Strategy.

To select the optimal maintenance triggers for the creation of PMs, the following components of the maintenance execution strategy are to be carried out:

a) Asset classification (3.4.1)

b) Maintenance task selection (3.4.2)

c) Functional equipment grouping (3.4.3)

3.4.1 Primary Maintenance Cycles on Powerlines

a) Cycle 1: Mechanical harvesting and removal of trees and brushes

This method of vegetation control is currently the preferred and only vegetation elimination technique applied by most Distribution Operating Units and Transmission Grids, and the first stage of a longer term strategy practiced in pockets of the business. It entails the mechanical felling or cutting of various vegetation types using chain saws, brush cutters or lawn mowers. This phase is immediately followed with stump treatment, either chemically or mechanically to prevent the cut tree or brush to sprout and grow again.

In this phase the biomass harvested will be removed as waste or stacked next to the corridor dependant on the land owner's instructions.

b) Cycle 2: Mechanical harvesting and removal of trees and brushes

Removal of any tree or brush provides resources for seed germination and new growth of the same or undesired specie in the cleared corridor. Germination control is the process of preventing specific species to germinate and grow in the line corridor while allowing preferred vegetation to prosper. The cost and effort of vegetation control is significantly reduced in cases where this cycle is effectively concluded within 4 to 9 months after cycle 1 depending on the Bio-Regional needs and specification. In this phase the biomass harvested will be removed as waste or stacked next to the corridor dependant on the land owner's instructions or: chemicals will be applied where possible to prevent germination of seeds and to arrest regrowth.

3.4.2 Vegetation maintenance cycles in substations

3.4.2.1 Manual harvesting and removal of vegetation in substation

Every incident of chemical control of vegetation in a substation will be preceded by manual removal of all weeds, grasses and other vegetation that has been established in a substation.

3.4.2.2 Herbicide application in substations

a) Herbicides used in substation are categorized by its residential properties as follows:

- Non-residual herbicides which only controls existing weed growth and do not prevent subsequent weed growth: and
- Residual or soil acting herbicides which not only controls existing growth, but provide extended control of subsequent growth for a period up to 24 months. These products are available in both soluble and granular forms.

b) Due to the residential capability, herbicide selection and application requires the consideration of a variety of factors that aims at limiting collateral damage to adjacent vegetation while providing optimal coverage. The following factors need critical consideration:

- Drainage of the substation: Substations designed with a storm water drainage system increases the risk of herbicides being transported with water drainage from the substation to adjacent properties. The use of soluble products with a short term residual activity is recommended for use on these substations.
- Rainfall of the area: Substations in areas with an annual rainfall of above 600mm increases the risk of herbicides leaching or being transported from the substation to adjacent properties. The use of soluble products with a short to medium term residual activity is recommended for use on these substations whereas granules are recommended for substation in areas of annual rainfall below 600mm. It should be noted that granules will also dissolve in water and can be transported of the site during heavy storms.
- Receiving environment surrounding the substation: Substations located in close proximity to agricultural lands, crops or water sources increases the risk of potential contamination. The risk is furthermore increased if the substation is located on undulating terrain with a steep slope towards these features. The use of soluble products with a short to medium term residual activity is recommended for use on these substations

3.4.2.3 Selecting the most appropriate category of herbicide to apply

a) Selection questionnaire

Physical Attributes	Leading Question	Response	
		Yes	No
Substation floor design	Does the substation have a drainable system		
Substation topology	Is the substation situated on a sloping terrain		
Soil type (geology)	Is the substation established in a sandy terrain?		
Neighboring land use	Is there any agricultural activity, environmental sensitive area, and grazing or forestry activity neighboring the substation?		

b) Sites with a high risk potential for collateral damage

For a ‘yes’ answer to any question above, the risk requires the application of herbicides containing the following active agents:

Exterminating existing weeds	To prevent weed infestation
Glyphosate – Non-residential	Thiazine’s – 6 to 12 month residency Bromacil – 6 to 13 months residency Tebuthiuron – 12 to 18 months residency

c) Should all answers to the above questions (3.9.2 a)) be ‘No’, the substation is deemed low risk: herbicides with the active ingredients Triazines Bromacil and Tebuthiuron may be used:

3.4.2.4 Types of Herbicides

All herbicides are manufactured either as a soluble solution or in granular form. Selecting the appropriate type of herbicide to be applied in substations will depend on the type of weeds that need to be controlled as well as the potential risk posed to the receiving environment around the substation. The following factors need to be evaluated in the selection of the appropriate herbicide.

a) Drainage of the substation: Substations designed with a storm water drainage system increases the risk of herbicides being transported with stromata from the substation to adjacent properties. Over-application of granules on such substations furthermore increases the risk. The use of soluble products with a short to medium term residual activity is recommended for use on these substations.

b) Rainfall of the area: Substations in areas with an annual rainfall of above 600mm increases the risk of herbicides leaching or being transported from the substation to adjacent properties. The use of soluble products with a short to medium term residual activity is recommended for use on these substations whereas granules are recommended for substation in areas of annual rainfall below 600mm. It should be noted that granules will also become soluble during rains and can be transported of the site during heavy storms.

c) Receiving environment surrounding the substation: Substations located in close proximity to agricultural lands, crops or water sources increases the risk of potential contamination. The risk is furthermore increased if the substation is located on undulating terrain with a steep slope towards these features. The use of soluble products with a short to medium term residual activity is recommended for use on these substations.

3.4.3 Asset classification

In order to ensure that the Operating Units and / or Grids classify individual assets in a consistently similar manner, the table in Annex A is provided for vegetation maintenance execution.

Classification as per the lines and substation maintenance standards

3.4.4 Maintenance task selection

3.4.4.1 Herbicide Application matrix

a) Selection questionnaire: This questionnaire allows selection of the most relevant chemical that will not leach and cause damage to the environment and agricultural activity.

Physical Attributes	Leading Question	Response	
		Yes	No
Substation floor design	Does the substation have a drainable system		
Substation topology	Is the substation situated on a sloping terrain		
Soil type (geology)	Is the substation established in a sandy terrain?		
Neighboring land use	Is there any agricultural activity, environmental sensitive area, and grazing or forestry activity neighboring the substation?		

b) Sites with a high risk potential for collateral damage

Exterminating existing weeds	To prevent weed infestation
Glyphosate – Non-residential	Thiazine's – 6 to 12 month residency Bromacil – 6 to 13 months residency Tebuthiuron – 12 to 18 months residency

c) Herbicide application guideline

Substation risk quantification	Annual rainfall (mm)	Application type	Active ingredient	Application frequency
High Risk: The substation have a high drainage potential, built on sloping terrain which is sandy and the neighboring land use is sensitive to leaching of the chemical.	< 600	Granular application	Thiazine's	6-12 months
			Bromacil	6-12 months
High Risk: The substation have a high drainage potential, built on sloping terrain which is sandy and the potential receiving environment is sensitive to leaching of the chemical.	>600	Water soluble drip application	Glyphosate	As required
			Thiazine's	6-12 months
			Bromacil	6-12 months
Low risk: The substation have a low water drainage potential, built on flat terrain with not sandy soil and the potential receiving environment is not sensitive leaching chemicals	<600	Granular application	Thiazine's	6-12 months
			Bromacil	6-12 months
Low risk: The substation have a low water drainage potential, built on flat terrain with not sandy soil and the potential receiving environment is not sensitive leaching chemicals	>600	Water soluble drip application	Thiazine's	6-12 months
			Bromacil	6-12 months
			Tebuthiuron	12-18 months

Move the above table into appendix.

3.4.5 Functional vegetation grouping

Maintenance is scheduled for the whole or parts of a powerline (starting at structure n and ending with structure xn) and no piecemeal work will be scheduled (targeted spans in a line)

In most cases, vegetation can be cut in these power line corridors. However when the cutting or felling of a tree will result in it falling on the power line structures or conductors an outage will be arranged for a suitable number of such trees to deserve an outage. The need for such outage will be notified by the Contractors and scheduled by Eskom to ensure that the contractor is still working on the line.

The adopted maintenance strategy adopted is "Predictive Maintenance – based on the predictable time that vegetation grow and present a problem on the network. There are cases where this strategy can fail. As a backup preventative measure line and substation inspections are performed. During these inspections vegetation is an element of the inspection. Where there is cause for concern, vegetation that may be problematic will be reported and attended to base on 'condition'.

Some grasses have a short life expectancy and the full life cycle is completed in one season. Where grasses present a risk to Eskom operations, they are cut annually with scheduled (in season) task orders. Manage Asset Excursions

3.5 Asset health

3.5.1 Design life expectancy and failure issues

Notwithstanding the prediction and time based maintenance intent, business constraints may cause the prescribed vegetation maintenance scheduling and execution to slip placing the electrical network at risk. Based on the growth rate and growth form, this may cause operational problems on the power line. Should the maintenance be deferred, the vegetation regrowth will result in the natural biome to claw back where the biomass to be removed is typical of virgin density and volume requiring extensive and costly maintenance to restore.

Vegetation that did not at the time of the scheduled maintenance present a risk to operations may as a result of natural stimuli become problematic. This exception can result from catastrophic veld fires, tropical storms or other atmospheric condition or plant disease and demand extra ordinary response.

The additional vegetation maintenance requirements are reflected in table3.5.2 indicates the risk assessment and response criteria.

3.5.2 Condition assessment techniques

The health of Electrical Asset is inversely proportional to the health of any vegetation that can impact its performance as discussed in 3.1. Annex A define the maintenance frequencies applicable to the various voltages in years. The negative effect of the critical growth forms on the network is quantified by two variables:

3.5.2.1 Natural factors that accelerate the growth of vegetation (Growth index)

- Allocation of a growth index of 1.5 is allocated when the biomass in the corridor has been subject to a growth poor growth season (generally drought conditions) where the maintenance cycle can be extended with the number of years that the drought lasted in a particular area; and

- Allocation of a growth index of 1 is allocated when the biomass in the corridor has been subject to a normal growth season where the prescribed maintenance cycle should be observed; and

- Allocation of a growth index of 0.75 is allocated when the biomass in the corridor has been subject to abnormally good growth season where the prescribed maintenance cycle should be shortened by 50% of the maintenance frequency in years.

3.5.2.2 Maintenance slip period

This is a ratio of the prescribed maintenance cycle for the bio-region and the network type and the years since the vegetation in the asset was last attended to.

Table 4: Asset health criteria

	Asset/asset health index criteria	Weight (1-4)	Condition rating	Factors	Score
1	Growth Index	NA	0.75 1 1.5	Excellent growth season in year -1 Regular growth season in year -1 Drought in year -1	
2	Maintenance slip period	NA	k	$\frac{maintenance\ cycle\ (years)}{years\ sincle\ last\ maintenance}$	
Total Score					

Note 1: The total score is a product of the Growth index and the maintenance slip period.

Note 2: A score above 1 signify healthy assets in the network

Note 3: Where a power line traverse multiple bio-regions, the bio region with the lowest maintenance frequency will be used for the calculation as a problem in one section of the line will negatively impact the performance of the total line.

3.5.3 End of life criteria

Not applicable to vegetation maintenance

3.6 Asset Performance

Not applicable to vegetation maintenance.

3.6.1 Failure causes to be recorded in performance management systems

Not applicable to vegetation maintenance.

4. Authorization

This document has been seen and accepted by:

Name and surname	Designation
A Mtshali	Senior Manager Power Delivery
R Kruger	Conviener – Vegetation Management Care Group
A Jaykaran	SCOT/SC Chairperson

5. Revisions

Date	Rev	Compiler	Remarks
July 2019	1	AJ Kraftt	New standard developed.

6. Development Team

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

- Koos Kraftt

7. Acknowledgements

Not applicable.

Annex A – Maintenance analysis

Prescribed Vegetation Maintenance for Transmission Lines

Biome	Bio Region	Description	220 to 765 kV	132 and 533 kV
Albany Thicket	Albany Thicket	Indigenous trees smaller than 10 meters high occurs amongst the Thicket while succulent trees of less than 6 meters also occurs	Maintenance frequency = 2 years. No clearing beyond above specification Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear high risk trees outside of corridor Chemical stump treatment and germination control
Desert	Gariep Desert	Indigenous trees smaller than 10 meters high and succulent trees of less than 6 meters also occurs sparsely populated	Maintenance frequency =6, 7 years. No clearing beyond above specification Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency =6, 7 years. Corridor width = 8 m both sides of line centre Selective clearing outside of corridor Chemical stump treatment and germination control
Desert	Southern Namib Desert	A single succulent tree of less than 6 meters also occurs sparsely populated. No other trees naturally occurs in this bioregion	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Forest	Azonal Forest	Indigenous trees taller than 15 meters dominate with smaller trees about. Population density medium in most vegetation types	Maintenance frequency = 2 years. No clearing beyond above specification Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Selective clearing outside of corridor Chemical stump treatment and germination control

Biome	Bio Region	Description	220 to 765 kV	132 and 533 kV
Forest	Zonal and Intrazonal Forests	Indigenous trees taller than 15 meters dominate with smaller trees about. Population density medium in most vegetation types	Maintenance frequency = 2 years. No clearing beyond above specification Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Selective clearing outside of corridor Chemical stump treatment and germination control
Fynbos	Alluvium Fynbos	Low and tall shrubs are dominant with only small indigenous trees growing in this bio region. Tree density is low except for the Breede Alluvium Fynbos Vegetation Group	Maintenance frequency = 6.7 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. No clearing beyond above specification Corridor width = 8 m both sides of line centre Chemical stump treatment and germination control
Fynbos	Alluvium Renosterveld	No indigenous trees occur in this bio region.	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Conglomerate Fynbos	Two species of small trees less than 10 m high occurs at low density amongst the shrubs	Maintenance frequency = 2 years. No clearing beyond above specification Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Selective clearing outside of corridor Chemical stump treatment and germination control

Biome	Bio Region	Description	220 to 765 kV	132 and 533 kV
Fynbos	Dolerite Renosterveld	Indigenous: Two species of small trees less than 10 m and Succulent trees exceeding 6 m high occurs at low density amongst the shrubs Alien and Invaders:	Maintenance frequency = 6.7 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. No clearing beyond above specification Corridor width = 8 m both sides of line centre Chemical stump treatment and germination control
Fynbos	Ferricrete Fynbos	No indigenous trees occur in this bio region which is mostly scrubland	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Granite Fynbos	Five species of small trees less than 10 m high occurs at low to medium density amongst the shrubs	Maintenance frequency = 2 years. No clearing beyond above specification Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Selective clearing outside of corridor Chemical stump treatment and germination control
Fynbos	Granite Renosterveld	No indigenous trees occur in this bio region which is mostly scrubland	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Limestone Fynbos	No indigenous trees occur in this bio region which is mostly scrubland	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff

Biome	Bio Region	Description	220 to 765 kV	132 and 533 kV
Fynbos	Limestone Renosterveld	One species of small trees less than 10 m and one Succulent trees exceeding 6 m high occurs at low density amongst the dominant shrubs	Maintenance frequency = 6.7 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. No clearing beyond above corridor Corridor width = 8 m either side of centre line Chemical stump treatment and germination control
Fynbos	Quartzite Fynbos	Three species of small trees less than 10 m and one Succulent trees exceeding 6 m high occurs at low density amongst the dominant shrubs	Maintenance frequency = 3.3 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. No clearing beyond above corridor Corridor width = 8 m either side of centre line Chemical stump treatment and germination control
Fynbos	Sand Fynbos	One species of small trees less than 10 m occurs at low density amongst the dominant shrubs of low to high density	Maintenance frequency = 2 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 2 years. No clearing beyond above corridor Corridor width = 8 m either side of centre line Chemical stump treatment and germination control
Fynbos	Sandstone Fynbos	Seventy nine species of small trees less than 10 m and four species of succulent trees of less than 6 meters occurs at medium to high density amongst the dominant shrubs of high density	Maintenance frequency = 2 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 2 years. No clearing beyond above corridor Corridor width = 8 m either side of centre line Chemical stump treatment and germination control
Fynbos	Shale Band Vegetation	Five nine species of small trees less than 10 m occurs at low density amongst the dominant shrubs of evenly low density	Maintenance frequency = 3.3 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. No clearing beyond above corridor Corridor width = 8 m either side of centre line Chemical stump treatment and germination control

Biome	Bio Region	Description	220 to 765 kV	132 and 533 kV
Fynbos	Shale Fynbos	Nine species of small trees less than 10 m and one species of succulent trees of less than 6 meters occurs at low density amongst the dominant shrubs of low density	Maintenance frequency = 3.3 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. No clearing beyond above corridor Corridor width = 8 m either side of centre line Chemical stump treatment and germination control
Fynbos	Shale renosterveld	Twenty six species of small trees less than 10 m and ten species of succulent trees of less than 6 meters occurs at medium to high density amongst the dominant	Maintenance frequency = 6.7 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. No clearing beyond above corridor Corridor width = 8 m either side of centre line Chemical stump treatment and germination control
Fynbos	Silcrete Fynbos	No indigenous trees occur in this bio region which is mostly scrubland	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Silicrete Renosterveld	No indigenous trees occur in this bio region which is mostly scrubland	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Western Strandveld	Fifty nine species of small trees less than 10 m occurs at low density amongst the dominant shrubs of evenly low density	Maintenance frequency = 3.3 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. No clearing beyond above corridor Corridor width = 8 m either side of centre line

Biome	Bio Region	Description	220 to 765 kV	132 and 533 kV
Grassland	Drakensberg Grassland	Three species of small trees less than 10 m occurs at low density amongst the dominant shrubs of evenly low density	Maintenance frequency = 2 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase	Maintenance frequency = 2 years. No clearing beyond above corridor Corridor width = 8 m either side of centre line Chemical stump treatment and germination control
Grassland	Dry Highveld Grassland	Twenty species of small (<10m) and two species of large trees (>10 m) grow in this bioregion. The density of trees varies between sparse and high density.	Maintenance frequency = 2 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control Chemical stump treatment and germination control	Maintenance frequency = 2 years. No clearing beyond above corridor Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control Chemical stump treatment and germination control
Grassland	Mesic Highveld Grassland	One hundred and thirteen species of small (<10m) and two succulent species of large trees (>6 m) grow in this bioregion. The density of trees varies between sparse and high density.	Maintenance frequency = 2 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 2 years. No clearing beyond above corridor Corridor width = 8 m either side of centre line Chemical stump treatment and germination control
Grassland	Sub-Escarpment Grassland	Sixty one species of small and large trees (<10m) and three succulent species of large trees (>6 m) grow in this bioregion. The density of trees varies between low and medium density.	Maintenance frequency = 3.3 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control

Biome	Bio Region	Description	220 to 765 kV	132 and 533 kV
Indian Ocean Coastal Belt	Indian Ocean Coastal Belt	Only indigenous succulent trees growing larger than 6 meters occur at medium to high density in this bio region. Extensive timber plantations occur in this bioregion classified as human modified domain.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control
Nama-Karoo	Lower Karoo	Twelve species of small and large trees (<10m) and two succulent species of large trees (>6 m) grow in this bioregion along drainage lines. Here the density of trees is high	Maintenance frequency = 3.3 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control
Nama-Karoo	Bushmanland	Sixteen species of small and large trees (<10m) and one succulent species of large trees (>6 m) grow in this bioregion along drainage lines. Here the density of trees varies between medium to high density.	Maintenance frequency = 2 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control
Nama-Karoo	Upper Karoo	Only two species of small and large trees (<10m) naturally occur in this bioregion along drainage lines. Here the density of trees is medium	Maintenance frequency = 6.7 years. No clearing beyond above corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control

Biome	Bio Region	Description	220 to 765 kV	132 and 533 kV
Savanna	Central Bushveld	The Central Bushveld is rich in tree diversity with trees rang in between small and large trees growing in excess of 10 meters	Maintenance frequency = 3.3 years. Corridor width = under line + 10 m either side of outer phase Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control
Savanna	Eastern Kalahari Bushveld	The Eastern Kalahari is rich in tree diversity with trees ranging between small and large trees growing less than 10 meters high. Some succulent trees occur but grow just higher than 6 m on average.	Maintenance frequency = 3.3 years. Corridor width = under line + 10 m either side of outer phase Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control
Savanna	Kalahari Duneveld	Five species of small trees (<10m) and two species of succulent trees >6m) occurs naturally in medium to high density.	Maintenance frequency = 6.7 years. Corridor width = under line + 10 m either side of outer phase Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control
Savanna	Lowveld	A variety of small and tall trees (<10m) and some succulent species of tree occur in this bio region. The density across the vegetation types are evenly distributed between low, medium and high density.	Maintenance frequency = 3.3 years. Corridor width = under line + 10 m either side of outer phase Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control

Biome	Bio Region	Description	220 to 765 kV	132 and 533 kV
Savanna	Mopane	A variety of small and tall trees (<10m) and some succulent species of tree occur in this bio region. The density across the vegetation types is all high.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control
Savanna	Sub-Escarpment Savanna	A variety of small and tall trees (<10m) and some succulent species of tree occur in this bio region. The density across the vegetation types is all high.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control
Succulent Karoo	Knersvlakte	No indigenous trees occur in this bio region which is mostly scrubland	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Succulent Karoo	Namaqualand Hardeveld	Five species of small trees (<10m) and one succulent species of large trees (>6 m) grow in this bioregion. The density of trees is low	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control

Biome	Bio Region	Description	220 to 765 kV	132 and 533 kV
Succulent Karoo	Namaqualand Sandveld	Only seven species of small trees growing no higher than 10 m occur and no other trees. Shrubs dominate this bioregion. Densities of trees are low to medium.	Maintenance frequency = 2 years. No clearing beyond the corridor Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control
Succulent Karoo	Rainshadow Valley Karoo	Seven species of small trees (<10m) and two succulent species of large trees (>6 m) grow in this bioregion. The density of trees is low	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control
Succulent Karoo	Richtersveld	Three species of small trees (<10m) and four succulent species of large trees (>6 m) grow in this bioregion. The density of trees is low to medium	Maintenance frequency = 6.7 years. Corridor width = under line + 10 m either side of outer phase Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control
Succulent Karoo	Trans-Escarpment Succulent Karoo	No indigenous trees occur in this bio region which is mostly scrubland	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff

Biome	Bio Region	Description	220 to 765 kV	132 and 533 kV
Human Modified Domain	Trees	Large trees planted in lanes or micro-forests	On condition maintenance will follow line inspections in biomes where trees do not naturally occur. Single tree events will be planned following individual identification by operations staff. In other bio-regions, such trees will be cleared as part of the natural vegetation but separately invoiced.	On condition maintenance will follow line inspections in biomes where trees do not naturally occur. Single tree events will be planned following individual identification by operations staff. In other bio-regions, such trees will be cleared as part of the natural vegetation but separately invoiced.
Trees of significance	Trees	Clusters or ranges of trees of various dimension that has economic, esthetical, religious, cultural or other significance	Trees shall be trimmed by order of the land owner or statutory authority in accordance with national, regional and local regulation	Trees shall be trimmed by order of the land owner or statutory authority in accordance with national, regional and local regulation

Prescribed Vegetation Maintenance for Distribution Lines

Biome	Bio Region	Description	132 kV	66 and 88 kV	11 to 44 kV
Albany Thicket	Albany Thicket	Indigenous trees smaller than 10 meters high occurs amongst the Thicket while succulent trees of less than 6 meters also occurs	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear trees in corridor Clear high risk trees outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear Trees in Corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Desert	Gariep Desert	Indigenous trees smaller than 10 meters high and succulent trees of less than 6 meters also occurs sparsely populated	Maintenance frequency = 6.7 years. Corridor width = 8 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Desert	Southern Namib Desert	A single succulent tree of less than 6 meters also occurs sparsely populated. No other trees naturally occurs in this bioregion	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff

Biome	Bio Region	Description	132 kV	66 and 88 kV	11 to 44 kV
Forest	Azonal Forest	Indigenous trees taller than 15 meters dominate with smaller trees about. Population density medium in most vegetation types	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Forest	Zonal and Intrazonal Forests	Indigenous trees taller than 15 meters dominate with smaller trees about. Population density medium in most vegetation types	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Selective clearing outside of corridor Clear trees in corridor Chemical stump treatment and germination control
Fynbos	Alluvium Fynbos	Low and tall shrubs are dominant with only small indigenous trees growing in this bio region. Tree density is low except for the Breede Alluvium Fynbos Vegetation Group	Maintenance frequency = 6.7 years. Corridor width = 8 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control

Biome	Bio Region	Description	132 kV	66 and 88 kV	11 to 44 kV
Fynbos	Alluvium Fynbos	Low and tall shrubs are dominant with only small indigenous trees growing in this bio region. Tree density is low except for the Breede Alluvium Fynbos Vegetation Group	Maintenance frequency = 6.7 years. Corridor width = 8 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Fynbos	Alluvium Renosterveld	No indigenous trees occur in this bio region.	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Conglomerate Fynbos	Two species of small trees less than 10 m high occurs at low density amongst the shrubs	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control

Biome	Bio Region	Description	132 kV	66 and 88 kV	11 to 44 kV
Fynbos	Dolerite Renosterveld	Two species of small trees less than 10 m and Succulent trees exceeding 6 m high occurs at low density amongst the shrubs	Maintenance frequency = 6.7 years. Corridor width = 8 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Fynbos	Ferricrete Fynbos	No indigenous trees occur in this bio region which is mostly scrubland	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Granite Fynbos	Five species of small trees less than 10 m high occurs at low to medium density amongst the shrubs	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Granite Renosterveld	No indigenous trees occur in this bio region which is mostly scrubland	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff

Biome	Bio Region	Description	132 kV	66 and 88 kV	11 to 44 kV
Fynbos	Limestone Fynbos	No indigenous trees occur in this bio region which is mostly scrubland	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Limestone Renosterveld	One species of small trees less than 10 m and one Succulent trees exceeding 6 m high occurs at low density amongst the dominant shrubs	Maintenance frequency = 6.7 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Fynbos	Quartzite Fynbos	Three species of small trees less than 10 m and one Succulent trees exceeding 6 m high occurs at low density amongst the dominant shrubs	Maintenance frequency = 3.3 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Fynbos	Sand Fynbos	One species of small trees less than 10 m occurs at low density amongst the dominant shrubs of low to high density	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control

Biome	Bio Region	Description	132 kV	66 and 88 kV	11 to 44 kV
Fynbos	Sandstone Fynbos	Seventy nine species of small trees less than 10 m and four species of succulent trees of less than 6 meters occurs at medium to high density amongst the dominant shrubs of high density	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Fynbos	Shale Band Vegetation	Five nine species of small trees less than 10 m occurs at low density amongst the dominant shrubs of evenly low density	Maintenance frequency = 3.3 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Fynbos	Shale Fynbos	Nine species of small trees less than 10 m and one species of succulent trees of less than 6 meters occurs at low density amongst the dominant shrubs of low density	Maintenance frequency = 3.3 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Fynbos	Shale renosterveld	Twenty six species of small trees less than 10 m and ten species of succulent trees of less than 6 meters occurs at medium to high density amongst the dominant	Maintenance frequency = 6.7 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control

Biome	Bio Region	Description	132 kV	66 and 88 kV	11 to 44 kV
Fynbos	Silicrete Renosterveld	No indigenous trees occur in this bio region which is mostly scrubland	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Western Strandveld	Fifty nine species of small trees less than 10 m occurs at low density amongst the dominant shrubs of evenly low density	Maintenance frequency = 3.3 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Grassland	Drakensberg Grassland	Three species of small trees less than 10 m occurs at low density amongst the dominant shrubs of evenly low density	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Grassland	Dry Highveld Grassland	Twenty species of small (<10m) and two species of large trees (>10 m) grow in this bioregion. The density of trees varies between sparse and high density.	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control

Biome	Bio Region	Description	132 kV	66 and 88 kV	11 to 44 kV
Grassland	Mesic Highveld Grassland	One hundred and thirteen species of small (<10m) and two succulent species of large trees (>6 m) grow in this bioregion. The density of trees varies between sparse and high density.	Maintenance frequency = 2 years. No clearing beyond above corridor Corridor width = 8 m either side of centre line Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Grassland	Sub-Escarpment Grassland	Sixty one species of small and large trees (<10m) and three succulent species of large trees (>6 m) grow in this bioregion. The density of trees varies between low and medium density.	Maintenance frequency = 3.3 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Indian Ocean Coastal Belt	Indian Ocean Coastal Belt	Only indigenous succulent trees growing larger than 6 meters occur at medium to high density in this bio region. Extensive timber plantations occur in this bioregion classified as human modified domain.	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control

Biome	Bio Region	Description	132 kV	66 and 88 kV	11 to 44 kV
Nama-Karoo	Bushmanland	Sixteen species of small and large trees (<10m) and one succulent species of large trees (>6 m) grow in this bioregion along drainage lines. Here the density of trees varies between medium to high density.	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Nama-Karoo	Lower Karoo	Twelve species of small and large trees (<10m) and two succulent species of large trees (>6 m) grow in this bioregion along drainage lines. Here the density of trees is high	Maintenance frequency = 3.3 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Nama-Karoo	Upper Karoo	Only two species of small and large trees (<10m) naturally occur in this bioregion along drainage lines. Here the density of trees is medium	Maintenance frequency = 6.7 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control

Biome	Bio Region	Description	132 kV	66 and 88 kV	11 to 44 kV
Savanna	Central Bushveld	The Central Bushveld is rich in tree diversity with trees rang in between small and large trees growing in excess of 10 meters	Maintenance frequency = 3.3 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Savanna	Eastern Kalahari Bushveld	The Eastern Kalahari is rich in tree diversity with trees ranging between small and large trees growing less than 10 meters high. Some succulent trees occur but grow just higher than 6 m on average.	Maintenance frequency = 3.3 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Savanna	Kalahari Duneveld	Five species of small trees (<10m) and two species of succulent trees >6m) occurs naturally in medium to high density.	Maintenance frequency = 6.7 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control

Biome	Bio Region	Description	132 kV	66 and 88 kV	11 to 44 kV
Savanna	Lowveld	A variety of small and tall trees (<10m) and some succulent species of tree occur in this bio region. The density across the vegetation types are evenly distributed between low, medium and high density.	Maintenance frequency = 3.3 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Savanna	Mopane	A variety of small and tall trees (<10m) and some succulent species of tree occur in this bio region. The density across the vegetation types is all high.	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Savanna	Sub-Escarpment Savanna	A variety of small and tall trees (<10m) and some succulent species of tree occur in this bio region. The density across the vegetation types is all high.	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control

Biome	Bio Region	Description	132 kV	66 and 88 kV	11 to 44 kV
Succulent Karoo	Knersvlakte	No indigenous trees occur in this bio region which is mostly scrubland	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Succulent Karoo	Namaqualand Hardeveld	Five species of small trees (<10m) and one succulent species of large trees (>6 m) grow in this bioregion. The density of trees is low	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control
Succulent Karoo	Namaqualand Sandveld	Only seven species of small trees growing no higher than 10 m occur and no other trees. Shrubs dominate this bioregion. Density of trees is low to medium.	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Selective clearing of tall trees is required outside the corridor. Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Succulent Karoo	Rainshadow Valley Karoo	Seven species of small trees (<10m) and two succulent species of large trees (>6 m) grow in this bioregion. The density of trees is low	Maintenance frequency = 2 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control

Biome	Bio Region	Description	132 kV	66 and 88 kV	11 to 44 kV
Succulent Karoo	Richtersveld	Three species of small trees (<10m) and four succulent species of large trees (>6 m) grow in this bioregion. The density of trees is low to medium	Maintenance frequency = 6.7 years. Corridor width = 8 m either side of centre line Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 5 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 4 m both sides of line centre Clear trees in corridor Selective clearing outside of corridor Chemical stump treatment and germination control
Succulent Karoo	Trans-Escarpment Succulent Karoo	No indigenous trees occur in this bio region which is mostly scrubland	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Trees of significance	Trees	Clusters or ranges of trees of various dimension that has economic, esthetical, religious, cultural or other significance	Trees shall be trimmed by order of the land owner or statutory authority in accordance with national, regional and local regulation	Trees shall be trimmed by order of the land owner or statutory authority in accordance with national, regional and local regulation	Trees shall be trimmed by order of the land owner or statutory authority in accordance with national, regional and local regulation

Shrub Management in all Divisions

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Albany Thicket	Albany Thicket	A mixture of shrub species range between very low to in excess of 2 meters. The densities vary greatly between the different vegetation types.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control
Desert	Gariep Desert	Sparse low vegetation.	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Forests	Azonal Forests	High density tall shrub layer that need attention once trees are cut.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control
Forests	Zonal & Intrazonal Forests	Dense sublayer of medium to high shrub under trees.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Fynbos Biome	Alluvium Fynbos	Short grassy shrub land usually dominated by renosterbos.	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Alluvium Renosterveld	Short grassy shrub land usually dominated by renosterbos.	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Conglomerate Fynbos	Dense and high shrub lands especially on the high ground.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Fynbos	Dolerite Renosterveld	Non succulent shrubs while the plains are almost devoid of shrubs or even grasses.	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Ferricrete Fynbos	Medium to tall evergreen shrubs	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Fynbos	Granite Fynbos	The dominant shrubs are medium to tall plants distributed in medium density.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control
Fynbos	Granite Renosterveld	Low mountains and broken veld covered with dense 1 to 1, 5 m tall shrubs.	Maintenance frequency = 6.7 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Fynbos	Limestone Fynbos	Moderately dense, low shrub land of the Protea species.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control
Fynbos	Limestone Renosterveld	Low to moderately high shrub land dominated by renosterbos.	Maintenance frequency = 6.7 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Fynbos	Quartzite Fynbos	Medium dense, moderately tall shrub land with open, emergent tall species.	Maintenance frequency = 3.3 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control
Fynbos	Sand Fynbos	Scattered 1 to 1.5 meter tall shrub with a canopy spanning 1 to 3 meter result in dense shrub canopy over the area.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Fynbos	Sandstone Fynbos	Low shrub land with scattered tall shrubs, Cape thicket and shrub fynbos communities are dominant.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control
Fynbos	Shale Fynbos	Low shrub land amongst grasses and herbs. Protea type shrubs will grow generally to a maximum 1 meter. Waboom veld is a general occurrence.	Maintenance frequency = 3.3 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Fynbos	Shale Renosterveld	Flat valley supporting short grassy shrub land dominated by renosterbos.	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Silcrete Fynbos	Medium tall, evergreen shrub land or grass land with mixed protea and astris types funbos. Renosterveld occurs in pockets of this bioregion	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Fynbos	Silcrete Renosterveld	Flat valley supporting short grassy shrub land dominated by renosterbos growing in high density.	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Fynbos	Western Strandveld	Sting and dense features of Albany and fynbos ticket in fire protective enclaves interchanged with other fynbos species at medium height and density.	Maintenance frequency = 3.3 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Grassland	Drakensberg Grassland	Woody species occur mostly on the slopes of hills and valleys where the population is dense and grow to a significant height to require treatment.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control
Grassland	Dry Highveld Grassland	Low density of shrubs. Woody species, where they occur are limited to specialised niche habitat. Taller shrubs are invariably invader species planted by man for commercial and other reasons.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Grassland	Mesic Highveld Grassland	Low density of shrubs. Woody species, where they occur are limited to specialised niche habitat. Taller shrubs are invariably invader species planted by man for commercial and other reasons.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control
Grassland	Sub-Escarpment Grassland	Woody species occur mostly on the slopes of hills and valleys where the population is dense and grow to a significant height to require treatment.	Maintenance frequency = 3.3 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 8 m both sides of line centre No clearing beyond servitude Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Indian Ocean Coastal Belt	Indian Ocean Coastal Belt	Pockets of low shrubs in typical thicket fashion and extensive cane fields.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor
Namma Karoo	Bushman land	Dominated by low (dwarf <1 m) shrubs intermixed by grasses and succulent geophytes.	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Namma Karoo	Lower Karoo	Dominated by low (dwarf <1 m) shrubs intermixed by grasses and succulent geophytes, generally low density but increases in drainage lines to high.	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Nama-Karoo	Upper Karoo	Dominated by low (dwarf <1 m) shrubs intermixed by grasses and succulent geophytes generally low density but increases in drainage lines to high.	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Savanna	Central Bushveld	Plains with scattered, low to medium high trees and shrubs (mostly no distinguishable).	Maintenance frequency = 3.3 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 3.3 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor
Savanna	Eastern Kalahari Bushveld	Well-developed tree and shrub layer in dense stands of plants in certain areas.	Maintenance frequency = 3.3 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 3.3 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Savanna	Kalahari Duneveld	Open shrub land	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Savanna	Lowveld	Scrubs in places amongst the trees	Maintenance frequency = 3.3 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 3.3 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 3.3 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 3.3 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Savanna	Mopane	pen woodland with moderately low shrub veld	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control No clearance of sugarcane in corridor
Succulent Karoo	Knersvlakte	Mostly vygie veld and low (0, 3 meters high) floral and Gonnabos growth is dominant of this bio-region with a short plant life expectancy.	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Succulent Karoo	Knersvlakte	Mostly vygie veld and low (0, 3 meters high) floral and Gonnabos growth is dominant of this bio-region with a short plant life expectancy.	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Succulent Karoo	Namaqualand Sandveld	A mixture of shrub species range between very low to in excess of 2 meters in isolated pockets of growth.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Succulent Karoo	Rainshadow Valley Karoo	Tall shrubs and low succulent shrubs occur in this bio region. The density and height of shrubs in the Gwarrieveld differ from the other vegetation types in this bioregion.	Maintenance frequency = 2 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 2 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Succulent Karoo	Richtersveld	There is a gradient of increasing density and plant height correlating with increasing altitude and increasing density on the south western slopes rather than the north eastern slopes of mountains. Shrublands vary from sparse dwarf-shrubs in the low laying and arid higher ridges of mountains have shrubs exceeding 2 meters high.	Maintenance frequency = 6.7 years. Corridor width = under line + 10 m either side of outer phase Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 8 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 5 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control	Maintenance frequency = 6.7 years. Corridor width = 4 m both sides of line centre Clear shrubs around structure bases for 1 m Cut shrubs with a mature growth of 2 meter, 500 mm from ground No clearing beyond servitude Chemical stump treatment and germination control

Biome	Bio region	Shrub Description	220 to 765 kV	132 and 533 kV	66 and 88 kV	11 to 44 kV
Succulent Karoo	Trans-Escarpment Succulent Karoo	Plains very sparsely populated by dwarf shrubs	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff	On condition maintenance will follow line inspections only. Single tree events will be planned following individual identification by operations staff
Human Modified Domain	Shrub Bushes	Typically shrubs introduced into the biome in pockets of dense and high growing plants.	Clear at frequency and corridor width as specified for the various bio-regions detailed above	Clear at frequency and corridor width as specified for the various bio-regions detailed above	Clear at frequency and corridor width as specified for the various bio-regions detailed above	Clear at frequency and corridor width as specified for the various bio-regions detailed above