# **Tree Management Plan**

Safety and Environment Services January 2023







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# **1.0 INTRODUCTION**

### 1.1 COMPANY PROFILE

Endeavour Energy is responsible for building, maintaining, and operating an electricity network that connects 2.6 million people to traditional and renewable energy sources in homes and businesses across Sydney's Greater West, the Blue Mountains, Southern Highlands, the Illawarra and the South Coast. With an estimated value of \$6.7 billion, the network supplies 1,034,215 customers spanning over 25,000 square kilometres. Our vast traditional network is made up of more than 430,000 power poles and streetlight columns, 202 major substations and 32,600 distribution substations connected by nearly 60,600 kilometres (more than the distance from Sydney to London and back) of underground and overhead cables. It integrates with renewable energy sources including 200,000 residential solar connections, industrial solar and embedded large scale batteries.



Figure 1 Endeavour Energy network area



# 1.2 OVERVIEW OF THIS PLAN

This Tree Management Plan defines our approach to managing vegetation near our network assets and associated infrastructure in accordance with the *Electricity Supply (Safety and Network Management) Regulation 2014.* 

This plan provides an overview of our responsibilities, tree pruning techniques, defines our policy on tree removal, and provides guidance on planting near network assets

## 1.3 FEEDBACK AND REVIEW

Feedback on this plan can be provided at any time and will be considered during periodic reviews. Written submissions should be addressed to:

(Attention: Vegetation Manager, Endeavor Energy website

https://www.endeavourenergy.com.au/contact-us/general-enquiry)

# 2.0 FACTORS INFLUENCING VEGETATION MANAGEMENT

Endeavour Energy has a statutory obligation to maintain our electrical assets in a safe and reliable manner. Balancing this obligation with our commitment to sustainability remains an ongoing challenge that we are working to achieve. Our approach to managing vegetation reflects the Industry Safety Steering Committee Guidelines<sup>i</sup> and works toward meeting community expectations and respecting the environmental values of the streetscape and rural environment.

Many factors influence the development of our vegetation management standards. Appropriate consideration of such factors, as defined below, is conducted prior to identifying the preferred vegetation management option.

# 2.1 SAFETY

Due to the inherent risks of live electricity, safety must always be the first priority when considering the clearance between trees and overhead powerlines. To keep the community safe, a safety clearance around powerlines needs to be established and maintained. If branches are within the required safety clearance, they are pruned back to the nearest growth point or branch collar to protect the health of the tree and prevent poorly attached regrowth that would create future safety hazards.

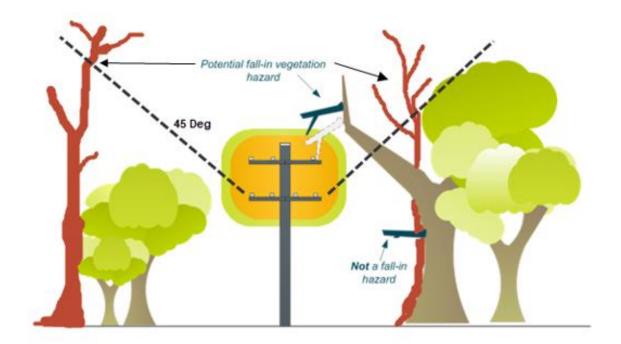
The principles of vegetation management near Endeavour Energy Network Assets, is based on the Industry Safety Steering Committee Guidelines<sup>1</sup>. Our standards have incorporated the requirements of the guidelines as defined in Table 1: Minimum vegetation clearances from the conductor. The minimum trimming clearance is strongly influenced by the voltage of the overhead cables with higher voltages requiring increased clearances. Other considerations include the type of overhead cable construction and the distance between poles or towers (span length) (Refer Table 1).

Table 1: Minimum vegetation clearances from the conductor are indicative clearances. Once these clearances between the overhead cables (powerlines) and the vegetation have been achieved, branches are then pruned back to the nearest growth point and/or branch collar in accordance with the Australian Standards of Pruning (AS4373-2007). In such cases this may increase the minimum vegetation clearances (Refer Table 1).



#### Fall-in Vegetation Hazard/Hazard Tree

Visually defective vegetation (which is vegetation that is dead, dying and appears structurally unsound as identified from the perspective of the Network Asset as far as it is reasonably practicable to do so), that is outside the minimum Clearing Requirement distances from Network Assets and which may require pruning, cutting, or removal to obviate the risk of it falling, dropping, and contacting the assets.





In designated bushfire prone areas, add 0.5 metres to the clearances for bare conductors.									
	Conductor Type	Span length - X (m)							
Voltage		X ≦ 50	50 < X ≤ 100	100 < X ≤ 200	200 < X ≤ 300	300 < X ≤ 400	400 < X ≤ 500	500 < X ≤ 600	
Up to and	Bare conductors	1.0	1.0	2.5	4.0				
including 1 kV	Covered and EE comm cables	0.5		1.0					
	Bare conductors (not including steel)	1.5	2.5	3.5			5.0		
Greater than 1kV, up to	HVABC	l.	0.5	1	.0				
and including 22kV	сст			1.0					
	Steel conductors (including SWER)	1.5	1.5	2.5	4.0				
Greater than 22kV, up to	Steel conductors	1.5	1.5	2.5	4.0				
and including 66kV	Bare conductors (not including steel)	2.0	3.0	4.0	6.0				
132kV	Bare conductors	3.0	4.0	5.0	6.5				

#### Table 1: Minimum vegetation clearances above and below the conductor

#### Table 2: Minimum blowout vegetation clearances (spans ≤ 300m)

In designated bushfire prone areas, add 0.5 metres to the clearances for bare conductors.									
	Conductor Type	Span length - X (m)							
Voltage		X ≤ 50		50 < X ≤ 100		100 < X ≤ 200		200 < X ≤ 300	
		First and Last 1/6 <sup>th</sup>	Middle 2/3rds	First and Last 1/6 <sup>th</sup>	Middle 2/3rds	First and Last 1/6 <sup>th</sup>	Middle 2/3rds	First and Last 1/6 <sup>th</sup>	Middle 2/3rds
Up to and	Bare conductors	1.0		1.0		1.5	2.5	3.5	4.0
including 1 kV	Covered and EE comm. cables	0.5		0.5		0.5	1.0	1.0	
	Bare conductors (not including steel)	1.5		1.5	2.5	2.0	3.5	4.0	5.0
Greater than 1kV, up to	HVABC	0.5		0.5		0.5	1.0	1.0	
and including 22kV	ССТ	1.0		1.0		1.0	1.0	1.0	
	Steel conductors (including SWER)	1.5		1.5		1.5	2.5	2.0	4.0
Greater than 22kV, up to	Steel conductors	1.5		1.5		1.5	2.5	2.0	4.0
and including 66kV	Bare conductors (not including steel)	2.0		2.0	3.0	3.0	4.0	4.5	6.0
132kV	Bare conductors		.0	3.0	4.0	3.5	5.0	5.5	6.5

• 1/6th clearances are measured from the crossarm, up until the 1/6th of the span length. Refer to Annexure 1 for further explanation.



In designated bushfire prone areas, add 0.5 metres to the clearances for bare conductors.										
	Conductor Type	Span length - X (m)								
Voltage		300 < 2	K ≤ 400	400 < X ≤	£ 500	500 < X ≤ 600				
		First and Last 1/6 <sup>th</sup>	Middle 2/3rds	First and Last 1/6 <sup>th</sup>	Middle 2/3rds	First and Last 1/6 <sup>th</sup>	Middle 2/3rds			
Up to and	Bare conductors									
including 1 kV	Insulated and EE comm. cables									
	Bare conductors (not including steel)	4.0	7.0	5.5	9.5	8.0	12.5			
Greater than 1kV, up to and	HVABC									
including 22kV	ССТ									
	Steel conductors (including SWER)	3.5	6.0	5.0	8.5	7.0	11.0			
Greater than 22kV, up to	Steel conductors	3.5	6.0	5.0	8.5	7.0	11.0			
and including 66kV	ACSR	4.5	7.5	6.0	10.0	8.5	13.0			
132kV	ACSR	5.0	8.5	7.0	11.0	9.5	14.0			

#### Table 3: Minimum blowout vegetation clearances (spans >300m to 600m)

1/6th clearances are measured from the crossarm, up until the 1/6th of the span length. Refer to Annexure 1 for further explanation.

#### Notes:

EE refers to Endeavour Energy HVABC – high voltage aerial bundled cable (Covered) CCT – Covered Conductor Thick SWER – Single Wire Earth Return

# 2.2 NETWORK RELIABILITY

Enhancing the reliability of our network and meeting customer expectations by keeping the lights on remains a priority. A significant proportion of electricity blackouts during storms are caused by trees that have damaged power lines. Further, foliage and dislodged branches can cause wires to fall down, resulting in a safety hazard.

# 2.3 BUSHFIRE PREVENTION

Bushfires are one of the potential hazards affecting large areas of the Endeavour Energy network. In areas prone to bushfire, maintaining safe clearances to prevent the ignition of bushfires from electricity lines remains a priority. Recognising the hazard of bushfires, Endeavour Energy aims to ensure that vegetation is kept at a safe distance from electrical infrastructure in declared bushfire prone areas. In accordance with the Industry Safety Steering Committee Guidelines, the clearance distances provided in Table 1: Minimum vegetation clearances from the conductor, are increased by 0.5 metres in bushfire prone areas for all bare conductors. In non-urban bushfire prone areas, this requirement may be increased, subject to appropriate risk assessment relative environmental impacts, to include the trimming of all vegetation above conductors.

Endeavour Energy does not routinely manage fuel loads in the vicinity of electrical assets, this may be considered for strategic assets located in declared bushfire prone areas.



# 2.4 STREETSCAPE AMENITY

The contribution of trees to the visual amenity of the streetscape is recognised and considered in our approach to vegetation management. A number of options are available for managing vegetation in proximity to electrical assets, particularly in urban areas. Where the maintenance of safety clearance distances is considered to have a significant impact on visual amenity, the feasibility of alternatives will be evaluated.

## 2.5 MAINTENANCE COST

Endeavour Energy spends circa \$40m annually on the maintenance of vegetation to keep a safe and reliable network. An increase in maintenance costs could lead to substantial increase in the consumer bills and hence Endeavour Energy manages the program in the most efficient and effective way that focus on reducing risks and the overall costs.

To assist in reducing these costs Endeavour Energy employ various cutting cycles across the network based on urban/rural bushfire and non-bushfire areas. These cycles are split into 12, 15, & 24 month cutting cycles. Landowners are reminded that planting vegetation in and around the network does have an impact in future maintenance costs.

# 2.6 ACCESS TO NETWORK ASSETS AND WATERCROSSING SIGNS

Vegetation can hinder access to network assets. Maintaining access to network assets is vital to ensuring a reliable electricity supply. Endeavour Energy actively maintains access tracks to enable vehicles and crews to inspect and maintain the electricity network.

Endeavour Energy has installed water crossing signs to denote the presence of overhead conductor on navigable waters. To maintain visibility of water crossing signs, all vegetation must be cleared between nominated projected lines. These works follow appropriate consultation with the relevant determining authority and the provision of approval for works in sensitive environments (i.e. those containing mangroves).

# 3.0 VEGETATION MANGEMENT OPTIONS

Following consideration of the factors addressed in Section 2, a number of options are considered by Endeavour Energy for managing vegetation in proximity to electrical assets. These options are discussed in detail below.

### 3.1 PRUNING

In respect to electrical assets, tree pruning may be defined as the selective removal of branches to enable safety clearance distances to be maintained.

Pruning techniques, as defined in Endeavour Energy's standards, reflect the *Australian Standard AS 4373-2007 Pruning of Amenity Trees*. Sometimes this is not possible as trees may have outgrown their aesthetic value, so removal may be the best option. Where trees are removed Endeavor Energy will plant in consultation with vegetation owners a vegetation offset in suitable locations away from the any future interaction with the network.



Prior to selecting an appropriate pruning technique, the tree growth habit is assessed together with the impact of previous pruning works. Typically, the selected pruning method is influenced by the extent of previous pruning practices and tree species. When pruning is undertaken in young trees, pruning techniques will result in a modified growth habit, thereby avoiding overhead powerlines.

In the past, many trees situated under overhead powerlines have been pruned by removing branches to the desired clearance rather than pruning to the growth point. Depending on the species, this practice can result in the growth of large quantities of weakly attached branches, affecting both tree health and public safety. In such cases, these trees may have to be revisited and further vegetation control techniques employed on a more regular basis to mitigate the risk that these branches pose to the network.

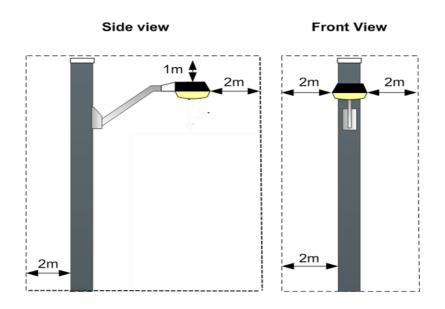
It should be noted that each branch is pruned to achieve the minimum safety clearance together with an allowance for regrowth.

Trees are generally pruned on a cycle of 12, 15 or 24 months, depending on the rate of regrowth, Urban/ Rural bushfire risk and local conditions and characteristics. Pruning trees can also occur on a more frequent basis allowing for reduced trimming to accommodate regrowth. Such a cycle is typically only applied for heritage or locally significant listed trees where standard clearances are likely to impact on the aesthetic values of the tree.

# 3.2 PRUNING AROUND STREETLIGHTS

Streetlight lanterns must have a minimum of two (2) metres clearance in all directions, except above the lantern, where a minimum of one (1) metre is required.

Maintaining clearances around streetlight lanterns in areas where electricity is supplied by underground mains is the responsibility of the local council. However, where the supply is by overhead mains, this is the responsibility of Endeavour Energy.





# 3.3 GROUNDLINE CLEARING, SLASHING OR TRITTERING, POISIONING

This method has been historically used on a number of rural lines and road verges to prevent vegetation from growing into safety clearances. It should be noted that for groundline clearing, slashing and trittering works in areas not recently subject to this management option, an environmental assessment process defined in the *Environmental Planning and Assessment Act 1979* is followed. Stakeholder engagement occurs during this process in order to achieve balanced outcomes.

# 3.4 TREE REMOVAL

The removal of trees growing in proximity to power lines will only be considered where alternative methods, as defined in this section of the plan, are not feasible or a tree has been assessed as a Fall-in Vegetation Hazard/Hazard Tree. In these cases, tree removal works are subject to the environmental assessment process (with the exception of emergency works and hazardous trees) and will only be undertaken following appropriate stakeholder consultation. May also be removed in consultation with the tree owner if the tree/s have outgrown aesthetic value to surrounding environment.

# 3.5 TECHNICAL OPTIONS

In managing our assets sustainably, there is recognition that safety clearance distances between trees and overhead cables may be achieved through a number of measures of which tree pruning is just one. Where tree pruning activities will have a detrimental impact on tree health or is considered inappropriate for a particular location, technical alternatives may be considered.

For existing assets, the primary technical option used to reduce tree trimming is the installation of aerial bundled cable (ABC). The replacement of bare low voltage conductors with this insulated cable allows safety clearance distances to be reduced from 1.0 metre to 0.5 metre. Although the cable is significantly thicker than open wires, many tree species will grow around the cable and provide an effective screen. As such, ABC is typically installed in areas where dense stands of trees will screen the cable.

Where existing low voltage overhead cables must be replaced or augmented, our policy is to replace the cable with ABC. High voltage cables in areas with large established trees are replaced with ABC or Covered Conductor Thick (CCT). Both types of insulted cable provide better reliability outcomes for customers as they are less susceptible to interruptions from wind-blown branches when compared to bare conductors. In addition, as described above, tree trimming safety clearances are reduced where insulated cables are used.

# 4.0 OUR ENVIRONMENT AND COMMUNITY

Irrespective of the vegetation management option used, Endeavour Energy has a number of responsibilities to our environment and the wider community. This section details the key issues that are reflected in our approach.

# 4.1 ENVIRONMENTAL DUE DILIGENCE

Endeavour Energy's commitment to environmental performance is communicated through our Environment Policy and implemented through an Environmental Management System.

Developed in accordance with the international standard ISO14001, the Environmental Management System consists of formal, documented processes for identifying and responding to environmental aspects.



In respect to vegetation management, the environmental aspects have been considered and reflected in relevant standards and procedures. Employees and contractors conducting tree pruning works undertake training to ensure ongoing compliance with the requirements of our procedures.

This section provides a summary of the key environmental issues associated with vegetation management together with our approach to managing these issues.

#### **Heritage Sites**

Tree pruning or tree removal works have the potential to impact on natural and cultural heritage features including aboriginal sites, non-aboriginal historic structures and relics, memorial gardens, parks, and protected or heritage listed trees.

The environmental assessment process, as defined through the *Environmental Planning and Assessment Act 1979*, forms the basis for identifying and evaluating environment aspects prior to tree removal or excavation works. In the event that aboriginal or non-aboriginal objects or places are identified, works will immediately cease. The event will be reported to the Office of Environment and Heritage or the Heritage Council for appropriate action.

Potential impacts to significant, memorial or heritage trees are evaluated prior to undertaking pruning works. In some cases, alternative pruning cycles or technical options may be considered where practicable. Endeavour Energy collaborates with local councils to facilitate the identification and management of significant trees.

#### **Threatened Species**

Vegetation classified as threatened or endangered under relevant legislation may grow within easements or near powerlines. In some cases, previous clearing undertaken within powerline corridors has created ideal growing conditions for threatened or endangered floral species. Additionally, certain vegetation may comprise habitat for threatened or endangered fauna.

Where such species or communities are known to exist, vegetation management activities will be modified to minimise potential damage on threatened species. This may include alternative pruning cycles, the provision of specialist assistance, stakeholder engagement or variations in the vegetation management options.

#### **Erosion and Sediment Control**

Where trees must be removed or replaced in accordance with the requirements of this plan, works will be undertaken to minimise erosion and sedimentation. Primary measures will focus on preventing erosion through the retention of root structures and minimising disturbance to low growing species and ground covers. Where soil is exposed and there is the potential for erosion, appropriate controls will be established and maintained including brush-matting with locally available seed bearing vegetation.

#### Waste Management

Green waste generated as part of tree pruning works in urban areas is recycled. Within rural areas, it may be appropriate to allow debris to naturally decompose where safety is not compromised, and the property owner has approved the practice. Where debris contains noxious weeds, off-site disposal to an appropriately licensed facility is undertaken to prevent the spread of weeds. The management of vegetative waste from Endeavour Energy's operations is undertaken in accordance with relevant legislation.



#### Pesticides

As part of Endeavour Energy's maintenance programs, various pesticides are applied to protect assets and maintain public safety. Pesticides used for vegetation control are restricted to cut and paint stump and spot spray methods following the specimen label and Safety Data Sheet.

The application of pesticides in public open spaces is governed by our Pesticide Use

Notification Plan. This plan was developed in accordance with the requirements of the *Pesticides Regulation* 2017 and defines how we will inform the community of the use of pesticides in public open spaces. Copies of the Plan are available from the Endeavour Energy website at <u>www.endeavourenergy.com.au</u>.

Our pest management program reflects best practice to minimise adverse impacts to the surrounding community and environment. All personnel who are engaged in using pesticides receive appropriate competency-based training.

## 4.2 OUR COMMUNITY

The inherent safety risks associated with vegetation near powerlines are such that Endeavour Energy must ensure that appropriate clearance distances are maintained. Recognising this risk, we are committed to developing appropriate public education initiatives to encourage the selection of appropriate species of trees for planting under or near powerlines.

Where Endeavour Energy undertakes pruning works, employees or contractors shall possess appropriate qualifications and authorisations. Given the hazards associated with pruning vegetation in proximity to powerlines, qualifications are clearly defined and monitored.

Prior to undertaking pruning works, we will notify landowners and occupiers of the type of works to be undertaken and the proposed timing. It should be noted that pruning works are subject to weather conditions and may be delayed to ensure the safety of employees and contractors.

Vegetation growing near private lines or service lines is the responsibility of the respective landowner or occupier. In these cases, Endeavour Energy will monitor vegetation growth and advise property owners or occupiers when safety clearances have been compromised. Alternatively, where safety clearances have not been maintained by the property owner or occupier, the *Electricity Supply Act 1995* enables Endeavour Energy to undertake the pruning works at the cost of the property owner.

Pruning vegetation in proximity to power lines or network assets is extremely hazardous and should never be undertaken by an unqualified landowner or occupier. Vegetation growing within three metres of the electricity network must be pruned by qualified and authorised vegetation management contractors. Care must be taken to ensure both tree trimming equipment and vegetation remains outside the three metre safety clearance distance.

Alternatively, if tree trimming is not a desirable option, landowners may opt to engage the services of an accredited service provider to relocate the point of attachment of the service line away from vegetation. The name of an accredited service provider (ASP) who works in your area may be obtained by contacting the Department of Trade and Investment.

Further information on trimming safely is available on our website.

www.endeavourenergy.com.au

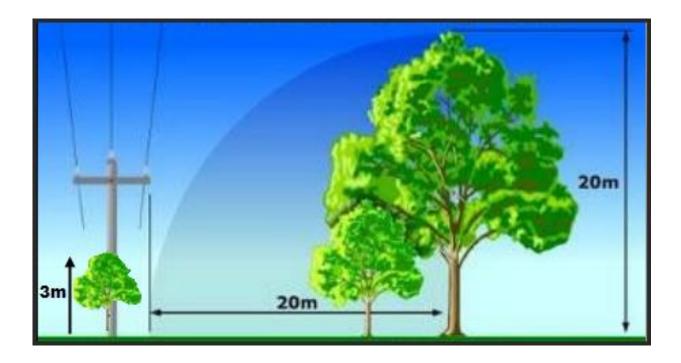


# 5.0 PLANTING GUIDELINES

Large trees planted underneath powerlines pose significant challenges for Endeavour Energy, particularly when the trees are not amendable to pruning. Whilst pruning avoids the need to remove trees, Endeavour Energy's residual challenge from continued maintenance of large, planted trees is to balance the social, environmental, and economic costs with our stakeholders. As such, consideration must be given to the suitability of trees before planting in close proximity to powerlines. Trees should be planted at the same distance from the powerline as their potential height. In rural and bushfire prone areas, the ground immediately beneath powerlines should be free of any combustible materials.

## 5.1 WHAT TO CONSIDER BEFORE PLANTING NEAR POWER LINES

- Consider how tall, wide and deep a plant will grow and how it will impact on overhead or underground services such as power lines, service pillars or other electricity infrastructure. Ensure the mature plant will not damage buildings, fences or foundations, or interfere with motorists' vision.
- Throughout its life, vegetation should never overhang, touch or be able to fall on electrical infrastructure including substations, power lines, or service lines to private property.
- Whilst it is not advisable to plant trees directly under overhead powerlines, if you do, remember that the safety clearance distances detailed in Table 1 must be maintained between the lowest wire and the top of the mature plant. Only trees that have a growth potential less than 3 metres in height will reduce the impact of pruning in future years. Taller species such as eucalyptus, palms, or camphor laurels, should therefore, never be planted in close proximity to power lines.
- Aim to plant trees at a greater distance from power lines than their potential height. As an example, a tree with a mature height of 10 metres should be planted 10 metres from the nearest powerline.
- Where safety clearances have not been maintained in regard to new plantings by the property owner or occupier, the *Electricity Supply Act 1995* enables Endeavour Energy to undertake the pruning works at the cost of the property owner.
- Gain council approval prior to planting any trees, shrubs or plants on the nature strip.





# 5.2 WHAT TO PLANT

Due to the varied climatic and growing conditions that are experienced across Endeavour Energy's network area, it is very difficult to recommend species that would be suitable for planting near powerlines in all situations. Species should be selected on the basis of their low mature height, aesthetic qualities, drought tolerance, frost resistance, amenability to pruning and general suitability to the growing conditions experienced across Endeavour Energy's network area. It is strongly recommended that you contact your local nursery and/or council for advice on species that might be appropriate in your area.

# 6.0 **DEFINITIONS**

#### Aerial Bundled Cable (ABC)

Two or more cores twisted together into a single bundled cable assembly. ABC may be low voltage or high voltage.

#### **Bushfire prone areas**

Areas of land defined by bushfire prone by local councils in accordance with the requirements of the Rural Fires Act 1997.

#### **Covered Conductor Thick (CCT)**

A conductor around which is applied a specified thickness of insulating material. The nominal covering thickness is dependent on the working voltage.

#### Fall-in Vegetation Hazard/Hazard Tree

Visually defective vegetation (which is vegetation that is dead, dying and appears structurally unsound as identified from the perspective of the Network Asset as far as it is reasonably practicable to do so), that is outside the minimum Clearing Requirement distances from Network Assets and which may require pruning, cutting, or removal to obviate the risk of it falling, dropping, and contacting the assets.

#### Fault and Emergency Works

Refers to the following:

Works that are required to restore/ensure the supply of electricity due to component failure (actual or anticipated) or adverse environmental influence; or

Works where Endeavour Energy has reasonable cause to believe that particular vegetation could destroy, damage or interfere with its electricity works, or could cause its electricity works to become a potential cause of bush fire or a potential risk to public safety, and that urgent corrective action is required to manage the vegetation in accordance with the standards referred to in this agreement.

#### High voltage

Any voltage above 1,000 volts



#### Kilovolts (kV)

1 kilovolt = 1,000 volts

#### Low voltage

Any voltage below 1,000 volts

#### **Network assets**

All elements of Endeavour Energy's electrical infrastructure associated with the transmission, distribution and supply of electricity. This includes, but is not limited to, powerlines, pilot cables, streetlights, poles, stay wires, substations, and transformers.

#### Overhead

In relation to a powerline, refers to a powerline that is above ground level.

#### Powerline

Any electrical cable, structure or equipment used for or in connection with the supply of electricity.

#### Vegetation

Refers to all plant life, including, but not limited to, trees, palms, vines, shrubs and grasses which could destroy, damage, or interfere with the network assets and maintenance access, or could make the network assets become a potential cause of bushfire or a potential risk to public safety.



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