



Appendix C

TransGrid Policies

- C-1 Easements and Access Track Maintenance Policy
- C-2 Principals for the Clearing of Transmission Line Easements



Appendix C-1

Easements and Access Track Maintenance Policy



Easements and Access Track Maintenance Policy

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Easements and Access Track Maintenance Policy GM AS L1 002	Revision No 5 Revision Approval Date: 30 May 2008
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1. Purpose

This standard sets out the maintenance policy for transmission line easements and access tracks.

2. Scope

This standard applies to the maintenance of all TransGrid transmission line easements and access tracks. It includes the following:

- (a) Maintenance of vegetation clearance to conductors, and
- (b) Methods of vegetation control.

3. Definitions

<i>Easement</i>	the area of land specified in an actual easement right granted to TransGrid on a title of land, or where an easement right does not exist, to a corridor of land centred on the transmission line. Typically the width of this corridor is as defined in GM AS L1 008, section 4.3.
<i>Environmental impact</i>	any change to the environment, whether adverse or beneficial, wholly or partially resulting from TransGrid's activities.
<i>Machine Work</i>	work that involves the use of machinery such as backhoes, bobcats, excavators, and the like for site development or vegetation management that could disturb the soil.
<i>Work</i>	any physical maintenance, survey or construction/augmentation activities with the potential to have an adverse <i>environmental impact</i> .

4. Preamble

The maintenance of safe clearances from conductors to vegetation is essential to eliminate the risk of lines causing bushfires, to ensure the safety of the public, and to maintain high levels of system reliability. This document specifies the minimum standards for easement maintenance that are aimed at satisfying these requirements.

Access tracks are used for all weather access to transmission lines and structures for emergency repairs, routine maintenance, inspection or construction. This document specifies the requirements for access tracks.

Nothing in this standard diminishes the responsibility of Regions to consult with all parties having an interest in easement and access track maintenance practices. TransGrid aims to ensure a high level of community consultation and satisfaction in regards to these maintenance practices. In cases where an easement right does not exist it cannot be assumed that TransGrid has automatic rights within this corridor to carry out maintenance (e.g. for lines within National Parks).

Further, under the Energy Services Corporations Act, TransGrid "has the special objective of minimising the environmental impact on land of activities authorised by easements for transmission facilities created in favour of the energy transmission authority. In implementing this special objective, the transmission operator is bound by all relevant laws (such as those concerning native vegetation, soil conservation and easement management) applying at the time."

5. References

[GD AS G3 015](#) - Principles for the Clearing of Transmission Line Easements

[GD EN G2 002](#) - TransGrid Environmental Management System (EMS) Manual

GD EN G2 010 - Environmental Rules for Easements, Underground Cables and Access Tracks

[GD EN G3 008](#) - Identification of Environmental Legislative and Other Requirements

GD SA G2 012 - Safety Rules

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[GM AS L1 001](#) - Inspection and Maintenance of Transmission Lines

[GM AS L3 008](#) - Use of Herbicide for Vegetation Control

[GM AS L3 017](#) - Use and Update of Environmental and Property Owner Data

GM AS L3 019 - Environmental Controls – Maintenance of Transmission Lines, Easements and Access Tracks

GM AS L5 002 - Asset Management Strategy – Transmission Line Easements

[Agreement](#) between the NSW National Parks and Wildlife Service and TransGrid for the inspection and maintenance of TransGrid infrastructure on NPWS areas

Agreement between Environment ACT and TransGrid for the inspection and maintenance of TransGrid infrastructure in the ACT

Energy Services Corporations Act 1995 No 95 – Section 6B

Rural Fires Act 1997 – Part 4, Division 5

6. Actions and Responsibilities

6.1 General Principles

Easements are to be maintained in a state that allows for regular planned visits to a location to carry out vegetation maintenance activities. The requirements for easement condition and preferred maintenance practices are outlined in GD AS G3 015.

Some locations on a transmission line require more frequent vegetation maintenance visits due to constrained conditions. These locations may be steep slopes, watercourses, areas of threatened species or particular wildlife corridors. These locations shall be scheduled for maintenance on a 'hot spot' basis with specific locations programmed on a separate maintenance scheduled task. The frequency of maintenance at these locations is not expected to drive the frequency for general routine maintenance for the remainder of the line.

The annual aerial inspection of each line, and any ground based inspections as described in GM AS L1 001, are expected to identify any defects that require targeted vegetation work outside the routine maintenance periods.

Access track maintenance is to be performed on an as required basis. Where specific environmental conditions such as a large rain storm cause extensive damage to a particular area of access tracks, the rectification work can be carried out under a MOPS project.

6.2 Easement Maintenance Process

The easement maintenance process involves the following steps:

- An assessment of the expected maintenance frequency
- An assessment of locations of 'hot spots' for more frequent maintenance
- A maintenance assessment to scope the work for the easement maintenance visit
- The easement maintenance works
- A follow up application of herbicide in the following months where required to reduce the likelihood of defect vegetation works prior to the next routine maintenance visit.

The easement routine maintenance work order will cover:

- The maintenance assessment to scope the work for the easement maintenance visit
- The easement maintenance works

A separate defect work order will be raised to cover any required follow up herbicide visit.

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The expected maintenance frequency will be reviewed on a regular basis in response to conditions within the easements varying, such as due to weather or changes in land use.

6.3 Environmental Requirements

An environmental assessment must be undertaken, and appropriate approval granted, prior to any work being performed within an easement or on an access track. This assessment shall be carried out in accordance with GD EN G2 010- Environmental Rules for Easements, Underground Cables and Access Tracks and associated Minor Environmental Impact Assessment (EIA) requirements.

6.4 Types of Maintenance and Frequencies

6.4.1 Scheduled Vegetation Maintenance

This type of maintenance is a periodic based maintenance. Easements involved in this type of maintenance include

- *Optimally Managed Easements*: currently constructed or maintained in accordance with the Easement Principles. Maintenance is carried out under a planned, low cost regime, with minimal defects.
- *Managed Easements*: maintained on a planned basis however still at high cost where TransGrid has some control in reducing those costs which will convert to “*Optimally Managed Easements*” eventually.
- *Constrained Easements*: maintained more frequently at high cost where TransGrid is constrained in reducing those cost e.g. by conditions of approval, legislation, regulation etc.

For the specific locations on these lines where more frequent constrained maintenance is required such as waterway crossings, a separate maintenance scheduled task is required noting these specific locations.

6.4.2 Condition based Vegetation Maintenance

This type of maintenance is based on regular inspection and the identification of potential/current vegetation risks. The regular inspections shall comply with GM AS L1 001. Easements involved in this type of maintenance are

- *Nil Veg Concerns Easements*: pasture land or urban area where minimal vegetation maintenance is required.
- *Reactive Easements*: not currently constructed to Easement Principles that are exposed to high cost vegetation maintenance. Under GM AS L5 002, these locations are planned to be converted to “*Optimally Managed Easements*”, in accordance with the principles (no external constraints).

6.4.3 Vegetation Defect Maintenance

This type of maintenance refers to vegetation that has been identified through a routine inspection as likely to pose a threat to the transmission line prior to the next scheduled vegetation management visit. It is expected that this vegetation will be noted during the line inspections undertaken as part of GM AS L1 001. There may be instances where vegetation defects are identified when staff are on site for other works.

Vegetation defects that are identified shall have a work order raised in Ellipse, prioritised as outlined in section 6.3.1 of GM AS L1 001. In the case of vegetation defects, it is allowable to use Ellipse Priority 5 for a vegetation defect that requires action within 24 months.

A review of defect frequencies on each line will guide any decision on modification to the frequency of the work on a line or section of line.

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6.4.4 Vegetation Maintenance Frequency

The available frequencies of each type of maintenance for vegetation control for different types of easements are shown in the table below.

Type of Maintenance	Type of Easement	Available Frequencies (time between maintenance works)	Factors to be considered for more frequent Maintenance Works
Scheduled	<i>Optimally Managed</i>	3-6 years	Forested areas where seeding may occur, higher rainfall areas, high growth species, etc
	<i>Managed</i>	1-3 years	Dense vegetation that will take a number of maintenance cycles to transform to Optimally Managed
	<i>Constrained</i>	1-3 years	National Parks where reduced clearing is required, threatened species, property owner constraints, etc
	<i>'Hot Spot'</i>	1-2 years	Growth rates, clearances that can be maintained while retaining creek bank stabilisation, etc.
Condition based	<i>Nil Veg Concerns</i>	When required, as assessed during routine inspections	These locations would only be expected to have a handful of trees or shrubs to maintain on an irregular basis.
	<i>Reactive</i>	Continual works	These locations have been heavily timbered for a number of years, and are subject to continual works to bring them under control and convert them to Optimally Managed
Defect Maintenance	All	N/A	Where vegetation is identified as likely to infringe clearances before the next scheduled maintenance visit, a defect shall be raised and prioritised.

6.4.5 Condition Based Access Track Maintenance

This is based on regular inspection and the identification of potential or existing access risks. The regular inspections shall comply with GM AS L1 001 "Transmission Line Maintenance Policy".

6.5 Requirements for Maintenance

6.5.1 Easement and Access Track Maintenance Requirements

- In no circumstances shall vegetation within the easement be allowed to approach the conductor profile at its design temperature closer than the "absolute limit" clearances defined in Appendix A.
- In any assessment of vegetation for removal within the easement, greater clearance than the "absolute limit" clearances must be included to allow for vegetation growth between scheduled maintenance periods.

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This additional clearance depends on the nature of the vegetation and terrain. In lopping or removing vegetation it is essential that due allowance for growth is made, as detailed in Appendix A. Appendix B Clearing Calculation Worksheet is provided to assist with calculation of maximum vegetation heights, and Appendix C Blowout Calculation Worksheet is provided to assist with calculation of required clearance of vegetation from the centre line of the transmission line.

- (c) Access shall be available to all structures. Vehicular access need not be provided to all structures for routine activities, but must be able to be provided in emergencies. Access tracks, where provided, shall be maintained to all weather 4 wheel drive standard.
- (d) Easements and access tracks shall be managed to minimise impact on the land's existing use.
- (e) Damage to the easement or access tracks and surrounding land shall be prevented by taking steps to avoid erosion that will lead to silting of waterways, diversion of water from natural drainage paths, or prevent 4WD access.
- (f) If Tree Preservation Orders are in force the relevant local council shall be advised concerning the nature and extent of clearing work to be undertaken.
- (g) Damage to historical sites, aboriginal sacred sites, aboriginal relics, monuments and other memorials shall be prevented. Each Region shall maintain a register of such sites in TAMIS.
- (h) Destruction of, or damage to, endangered flora or the habitat of endangered fauna shall be prevented.
- (i) Adequate advance notice of intended maintenance activities shall be provided to landowners or managers, and to statutory authorities and local councils as relevant to the proposed work.
- (j) Special requirements for easement or access tracks maintenance for transmission lines covered by an Environmental Impact Statement or an Operational Environmental Management Plan shall be adhered to in the assessment of vegetation to be removed. Each Region shall include these requirements within TAMIS.
- (k) In the case of a tree which is outside the easement, but by virtue of disease, instability or other problem poses a danger to the line, then negotiation shall be undertaken with the owner of the land to lop or remove the tree.
- (l) Tower base vegetation is to be cleared on towers where OPGW joint boxes are installed (to reduce damage during bushfires). In bushfire prone areas, additional inspection and maintenance of these tower bases may be required immediately prior to the bushfire season.

6.5.2 Vegetation Control Requirements

- (a) The preferred method of vegetation control is to remove, rather than lop, vegetation that will eventually infringe the "absolute limit" clearances defined in Appendix A.
- (b) If stumps cannot be removed, these shall be treated with herbicide to prevent regrowth (except in circumstances where chemicals cannot be used).
- (c) Vegetation control shall be carried out in the safest and most cost effective and environmentally acceptable manner, in consultation with property owners or managers, and other statutory authorities, local councils and special interest groups as necessary.
- (d) *Machine work* requires approval in accordance with GD EN G2 010 Environmental Rules for Easements, Underground Cables and Access Tracks. *Machine work* may include but is not limited to:
 - 1. Felling of trees
 - 2. Stump removal and other easement preparation to allow use of mechanical methods such as slashers.
 - 3. Slasher or mulcher clearing.
 - 4. Selective lopping in special circumstances.

Removed vegetation shall be mulched or chipped and removed from site or retained on site in accordance with property owner/stakeholder requirements

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- (e) Where herbicide is planned to be used, it shall be used strictly in accordance with GM AS L3 008 Use of Herbicide for Vegetation Control
- (f) The use of approved vegetation control techniques at any specific location shall be strictly in accordance with local soil conservation, climatic and environmental requirements. Accordingly, some techniques are not suitable in all circumstances.
- (g) The use of techniques other than those described in this section are not precluded. Approval shall be obtained from Manager/Corporate Environment regarding the acceptability of the environmental impacts before any other techniques are applied.

6.5.3 Lighting of Fires

Where timber needs to be burnt, all necessary permits shall be obtained under Part 4, Division 5 of the Rural Fires Act 1997. The local Rural Fire Service should be notified. The Hot Work provisions of TransGrid's Safety Rules shall apply. The lighting of fires is not standard practice.

6.5.4 Lands Administered by the National Parks and Wildlife Service

Lands administered by the National Parks and Wildlife Service include national parks, nature reserves, historic sites, aboriginal areas, game reserves, state recreational areas and any other areas gazetted under the National Parks and Wildlife Act.

All easement and access track maintenance activities within these lands shall be carried out in accordance with the "Agreement between the NSW National Parks and Wildlife Service and TransGrid for the inspection and maintenance of TransGrid infrastructure on NPWS areas", as available on TransNet.

Within the ACT, easement and access track activities are to be carried out in accordance with "Agreement between Environment ACT and TransGrid for the inspection and maintenance of TransGrid infrastructure in the ACT", as available on TransNet.

6.6 Responsibilities

Regional Managers shall ensure that vegetation clearance to conductors is maintained, and that all easement maintenance activities are carried out in accordance with the requirements of this standard.

7. Appendices

Appendix A - Conductor Clearing Criteria

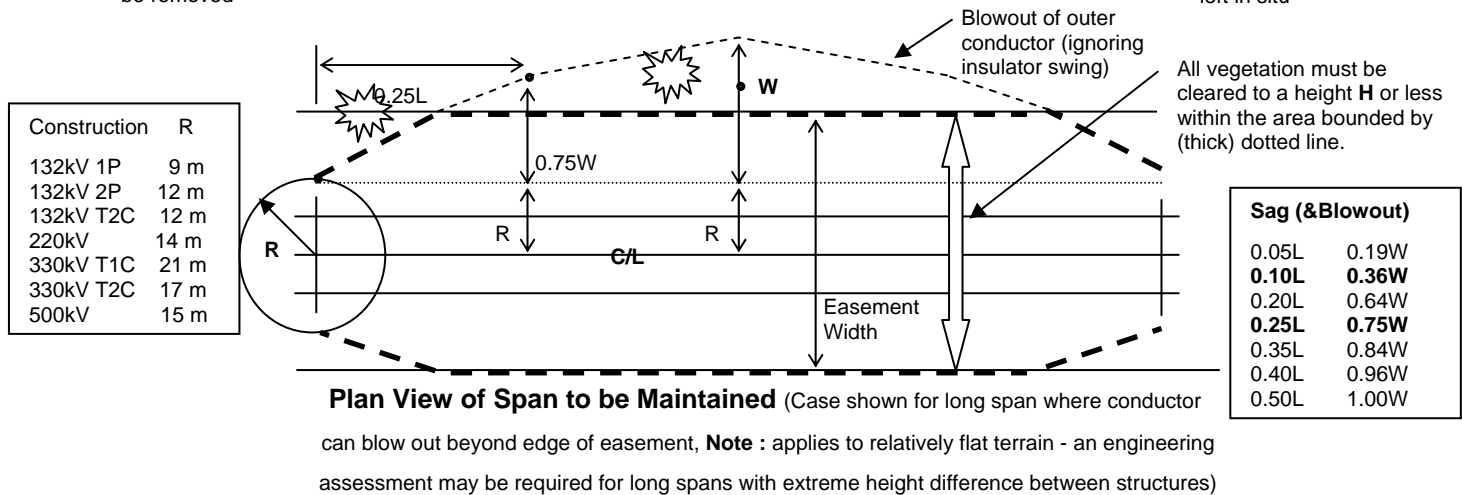
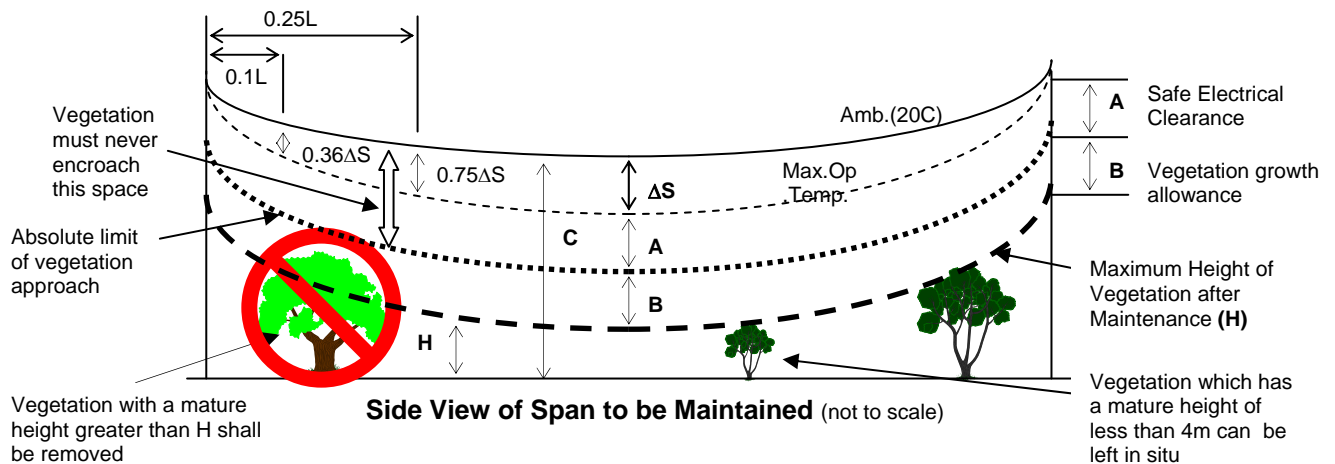
Appendix B - Clearing Calculation Worksheet

Appendix C - Blowout Calculation Worksheet

8. Amendments from Previous Issue

- Document title amended from Maintenance of Easements and Access Tracks
- Added the requirements for easements to be maintained in accordance with the Principles for the Clearing of Transmission Line Easements.
- Thoroughly revised to become a maintenance policy with scheduled frequencies rather than an instructive document.
- Reference to the use of tree growth regulating chemicals has been removed

APPENDIX A - VEGETATION CLEARING CRITERIA



L = Actual Span Length

W = Mid-span blowout at 50°C (for calculation of blowout)

ΔS = Difference in mid span Sag from Conductor at Ambient Temperature (taken to be 20°C) to Maximum Operating Temperature (eg 85°C or 120°C).

A = Safe Electrical Clearance at Line Operating Voltage

B = Allowance for Vegetation Growth between Inspection Cycles

R = Work Area = distance from centre of structure, to make a safe place of work

H = Maximum Height of Vegetation after Maintenance

C = Conductor Height (at time of Measurement) = $A + B + \Delta S + H$

Notes:

1. Maximum height (**H**) of vegetation after clearing shall be the conductor height less $\Delta S + A + B$ at mid span. At 10% of span, it shall be conductor height less **0.36ΔS + A + B**.

2. Blowout shall be calculated at mid span as $W + A + B + R$ from the easement centreline. At 25% of span it will be **0.75W + A + B + R** from the centreline. Clearing shall be limited to the easement edge, even if blowout exceeds this distance.

1) Additional Sag, ΔS

This is the difference in sag between the conductor at operating temperature and where the conductor would be at line design temperature. Note that ΔS varies along the span.

Note: Equivalent span (or ruling span) is obtained from the line schedule or TAMIS. It is a calculated length, which governs the collective behaviour of a series of suspended spans between termination structures.

ΔS : SAG DIFFERENCE TABLE FROM 20°C TO 120°C - ACSR CONDUCTORS															
		EQUIVALENT SPAN LENGTH (m)													
		100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
ACTUAL SPAN LENGTH (m)	100	1.7	0.7	0.4	0.3	0.2									
	200	6.8	2.8	1.6	1.0	0.7	0.6								
	300	15.4	6.2	3.5	2.3	1.6	1.2	0.9							
	400	27.5	11.1	6.2	4.0	2.8	2.1	1.6	1.3						
	500	43.4	17.3	9.8	6.3	4.4	3.3	2.5	2.0	1.6					
	600		25.1	14.1	9.1	6.4	4.7	3.6	2.9	2.3	1.9				
	700			19.2	12.4	8.7	6.4	4.9	3.9	3.1	2.6	2.2			
	800				16.3	11.4	8.4	6.4	5.1	4.1	3.4	2.8	2.4		
	900					14.5	10.6	8.2	6.4	5.2	4.3	3.6	3.1	2.6	
	1000						13.2	10.1	8.0	6.4	5.3	4.5	3.8	3.3	2.8
	1100							12.3	9.7	7.8	6.4	5.3	4.5	3.8	3.3
	1200								11.6	9.3	7.7	6.4	5.5	4.7	4.1
	1300									11	9.1	7.6	6.5	5.5	4.8
	1400										10.6	8.8	7.5	6.5	5.6

ΔS : SAG DIFFERENCE TABLE FROM 20°C TO 85°C - ACSR CONDUCTORS															
		EQUIVALENT SPAN LENGTH (m)													
		100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
ACTUAL SPAN LENGTH (m)	100	1.1	0.5	0.3	0.2	0.1									
	200	4.5	1.8	1.0	0.7	0.5	0.4								
	300	10.2	4.2	2.4	1.5	1.1	0.8	0.6							
	400	18.2	7.4	4.2	2.7	1.9	1.4	1.1	0.9						
	500	28.6	11.6	6.6	4.3	3.0	2.2	1.7	1.4	1.1					
	600		16.7	9.5	6.1	4.3	3.2	2.5	1.9	1.6	1.3				
	700			12.9	8.4	5.9	4.4	3.4	2.7	2.1	1.8	1.5			
	800				11.0	7.7	5.7	4.4	3.5	2.8	2.3	2.0	1.7		
	900					9.8	7.2	5.6	4.4	3.6	3.0	2.5	2.1	1.8	
	1000						9.0	6.9	5.5	4.4	3.7	3.1	2.6	2.3	2.0
	1100							8.3	6.6	5.4	4.4	3.7	3.2	2.7	2.4
	1200								7.9	6.4	5.3	4.4	3.8	3.2	2.9
	1300									7.5	6.2	5.2	4.5	3.9	3.4
	1400										7.3	6.1	5.2	4.5	3.9

ΔS : SAG DIFFERENCE TABLE FROM 20°C TO 85°C - AAAC															
		EQUIVALENT SPAN LENGTH (m)													
		100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
ACTUAL SPAN LENGTH (m)	100	1.3	0.5	0.3	0.2	0.1	0.1	0.1							
	200	5.2	2.0	1.1	0.7	0.5	0.4	0.3	0.2	0.2					
	300	11.8	4.6	2.6	1.6	1.1	0.8	0.6	0.5	0.4	0.3	0.3			
	400	21.2	8.2	4.5	2.9	2.0	1.4	1.1	0.9	0.7	0.6	0.5	0.4		
	500	33.4	12.9	7.1	4.5	3.1	2.3	1.7	1.3	1.1	0.9	0.7	0.6	0.6	
	600	48.7	18.7	10.3	6.5	4.5	3.3	2.5	2.0	1.6	1.3	1.1	0.9	0.8	0.7
	700	67.3	25.7	14.1	8.9	6.1	4.5	3.4	2.7	2.1	1.8	1.5	1.2	1.1	1.0
	800	89.4	33.8	18.5	11.7	8.1	5.9	4.4	3.5	2.8	2.3	1.9	1.6	1.5	1.3
	900		43.1	23.5	14.9	10.2	7.5	5.7	4.4	3.6	2.9	2.4	2.1	1.9	1.6
	1000			29.2	18.5	12.7	9.3	7.0	5.5	4.4	3.6	3.0	2.6	2.3	2.0
	1100				22.5	15.5	11.3	8.5	6.7	5.4	4.4	3.7	3.1	2.8	2.5
	1200					18.5	13.5	10.2	8.0	6.4	5.3	4.4	3.7	3.4	3.0
	1300						16.1	12.3	9.7	7.8	6.4	5.4	4.6	4.0	3.5
	1400							14.4	11.3	9.1	7.5	6.3	5.4	4.7	4.1

2) Safe Electrical Clearance at Line Design Temperature, **A**

Nominal System Voltage	Safe Electrical Clearance at Line Design Temperature (A = minimum safe working distance+1m measurement uncertainty)
Up to 132kV	$1.5 + 1.0 = 2.5\text{m}$
220/330kV	$3.0 + 1.0 = 4.0\text{m}$
500kV	$4.0 + 1.0 = 5.0\text{m}$

Action shall be taken to ensure vegetation never encroaches within these clearances **plus** the additional sag, i.e. it never comes closer than **ΔS+A**.

3) Allowance for Vegetation Growth between Inspection Cycles, **B**

Allowance for Vegetation Growth Between Inspection Cycles (B)		
Shrubs and Mature Trees	Typical Native and Introduced Vegetation	Fast Growing Species in Favourable Environments and Lopped Native Vegetation
1.0m	3.0m (vertical) 1.5m (horizontal)	6.0m (vertical) 3.0m (horizontal)

Allowance for growth must be assessed on a case-by-case basis. These columns indicate the normal additional growth allowance that would be applied in the different vegetation circumstances.

4) Mid-span Blowout (W)

If Equivalent Span < Span, use Equivalent Span = Span value.

W: MID-SPAN BLOWOUT TABLE CALCULATED AT 50°C, 500pA WIND LOAD, ACSR CONDUCTORS															
		EQUIVALENT SPAN LENGTH (m)													
		100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
ACTUAL SPAN LENGTH (m)	100	1.1													
	200	4.3	3.0												
	300	9.7	6.7	5.6											
	400	17.3	12.0	10.0	9.0										
	500	27.1	18.7	15.6	14.0	13.1									
	600	39.0	26.9	22.4	20.2	18.9	18.1								
	700	53.0	36.6	30.5	27.5	25.7	24.6	23.9							
	800	69.3	47.8	39.9	35.9	33.6	32.1	31.2	30.5						
	900	87.7	60.5	50.5	45.4	42.5	40.7	39.4	38.6	37.9					
	1000	108.2	74.7	62.3	56.1	52.5	50.2	48.7	47.6	46.8	46.3				
	1100	133.4	91.2	75.9	68.2	63.8	61.0	59.1	57.8	56.9	56.2	55.6			
	1200	159.4	108.7	90.4	81.3	76.0	72.6	70.4	68.9	67.7	66.9	66.3	65.8		
	1300	187.8	127.8	106.2	95.5	89.2	85.3	82.7	80.9	79.6	78.6	77.8	77.2	76.8	
	1400	218.7	148.6	123.4	110.8	103.6	99.0	96.0	93.9	92.3	91.2	90.3	89.6	89.1	88.6

W: MID-SPAN BLOWOUT TABLE CALCULATED, 50°C, 500pA WIND LOAD, AAAC CONDUCTORS															
		EQUIVALENT SPAN LENGTH (m)													
		100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
ACTUAL SPAN LENGTH (m)	100	1.6													
	200	6.4	4.3												
	300	14.4	9.6	7.9											
	400	25.7	17.0	14.0	12.5										
	500	40.1	26.6	21.9	19.6	18.3									
	600	57.8	38.3	31.6	28.2	26.3	25.1								
	700	78.7	52.2	43.0	38.4	35.8	34.2	33.1							
	800	102.7	68.2	56.1	50.2	46.8	44.7	43.3	42.3						
	900	130.0	86.3	71.0	63.5	59.2	56.6	54.8	53.6	52.7					
	1000	160.5	106.5	87.7	78.4	73.1	69.8	67.6	66.1	65.0	64.2				
	1100	194	129	106	95	88.5	84.5	81.9	80	78.7	77.7	76.9			
	1200	231	153	108	113	105	100.6	97.4	81.6	93.6	92.5	91.6	90.9		
	1300	271	180	148	132	124	118	114	112	109	108	107	106	106	
	1400	314	209	172	153	143	137	133	130	127	126	125	124	123	122

APPENDIX B - CLEARING CALCULATION WORKSHEET

Calculate Maximum Vegetation Height after Clearing

1.1 Span Data

Actual Span m
Length m

Equivalent Span m

Design Temp C

1.2 Calculate Mid Span Sag Difference

ΔS m

Multiply by X

%Span	X
5%	$0.19 \times \Delta S$
10%	$0.36 \times \Delta S$
25%	$0.75 \times \Delta S$
50%	$1.00 \times \Delta S$

1.3 Calculate Sag Difference at location in span

$x \times \Delta S$

m

Add

132kV	2.5m
220kV	4m
330kV	4m
500kV	5m

1.3 Safe Electrical Clearance **A**

m

Add

Shrubs	1.0m
Native Mature	3.0m
Native Lopped	6.0m

1.4 Growth Allowance

B

m

Add

1.5 Calculate Clearance to Conductor After Clearing

$x \times \Delta S + A + B$

m

1.6 Conductor Height

C

m

Subtract

m

1.7 Calculate Maximum Vegetation Height

$H = C - (x \times \Delta S + A + B)$

m

APPENDIX C – BLOWOUT CALCULATION WORKSHEET

Calculate Minimum Vegetation Width after Clearing

1.1 Span Data	Conductor Type (ACSR or AAAC)	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>
Actual Span Length	<div style="border: 1px solid black; display: inline-block; width: 100px; height: 20px; text-align: center;">m</div> m	Equivalent Span <div style="border: 1px solid black; display: inline-block; width: 100px; height: 20px; text-align: center;">m</div> m

1.2 Read Mid Span Blowout from Table	W	<div style="border: 1px solid black; display: inline-block; width: 100px; height: 20px; text-align: center;">m</div>	
		↓	
		Multiply by X	
		↓	
1.3 Calculated Blowout at location in span	W x X	<div style="border: 1px solid black; display: inline-block; width: 100px; height: 20px; text-align: center;">m</div>	
		↓	
	Add		
1.4 Safe Electrical Clearance	A	<div style="border: 1px solid black; display: inline-block; width: 100px; height: 20px; text-align: center;">m</div>	
		↓	
	Add		
		↓	
1.5 Growth Allowance	B	<div style="border: 1px solid black; display: inline-block; width: 100px; height: 20px; text-align: center;">m</div>	
		↓	
	Add R		
		↓	
1.6 Calculate Safe Electrical Clearance from centre line	W x X + A +B+ R	<div style="border: 1px solid black; display: inline-block; width: 100px; height: 20px; text-align: center;">m</div>	

%Span	X
5%	0.19 x W
10%	0.36 x W
25%	0.75 x W
50%	1.00 x W

132kV	2.5m
220kV	4m
330kV	4m
500kV	5m

Shrubs	1.0m
Native Mature	1.5m
Native Lopped	3.0m

Construction	R
132kV 1P	9 m
132kV 2P	12 m
132kV T2C	12 m
220kV	14 m
330kV T1C	21 m
330kV T2C	17 m
500kV	15 m



Appendix C-2

Principals for the Clearing of Transmission Line Easements

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Principles for the Clearing of Transmission Line Easements

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Signed by K Murray 7/8/06
Original document retained
within Quality & Records

Approved: _____

Managing Director

Document Location: TransNet/Quality Documents/By Function/Asset Management/Procedures

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1. Application

This document describes the principles for clearing transmission lines easements and is to apply both to construction of new transmission lines and to maintenance of existing lines.

2. Reference Documents

- [GM AS L1 002](#) – Maintenance of Easements and Access Tracks
- Electricity Supply Act 1995
- NSW Threatened Species Conservation Act 1995
- NSW Native Vegetation Act 2003
- Commonwealth Environment Protection and Biodiversity Conservation Act 1999
- NSW Rural Fire Service Bush Fire Environmental Assessment Code

3. Definitions

<i>Easement</i>	for the purpose of this document, <i>easement</i> refers to any transmission line right of way, irrespective of whether a legal easement has been obtained.
<i>Conditions of Development Approval</i>	Conditions prescribed by an approval authority which may be documented in contract specifications, approval documentation, Operational Environmental Management Plans (OEMP) or Construction Environmental Management Plans (CEMP).
<i>Safe Clearance</i>	The “absolute limit” clearances defined in Appendix A of GM AS L1 001 Maintenance of Easements and Access Tracks, defined as the Safe Electrical Clearance to the conductor plus an allowance for vegetation growth plus an allowance for sag at maximum operating temperature.

4. Principles

- 4.1** Except as indicated in section 4.2, in order to create an *easement* that can be maintained efficiently (in terms of cost and time) and that meets TransGrid’s statutory obligations, it is required that the clearing works be generally completed as follows:
- Tall-growing species likely to infringe *safe clearances* are to be removed regardless of existing height at time of construction;
 - Trees likely to fall onto conductors or towers are also to be removed whether on the *easement* or off the *easement*. (ref sec.48 of the Electricity Supply Act 1995);
 - Shrubs and other vegetation of lower mature height within the easement will be reduced and managed, generally by slashing with ground cover retained;
 - Vegetation management will aim to reduce available fuel and subsequent bushfire risks in accordance with NSW Rural Fire Service Bush Fire Environmental Assessment Code, which sets out requirements for hazard reduction strategies such as Asset Protection Zones and Strategic Fire Advantage Zones;
 - Removed vegetation will be mulched or chipped and removed from site or retained on site in accordance with property owner/stakeholder requirements and;
 - Other works considered necessary in order to provide a safe working environment for maintenance staff and contractors and a safe environment for the property owner/manager will be undertaken.
- 4.2** In specific areas nominated for vegetation retention, clearing works are to proceed as outlined below.
- Retain individual plants and surrounding habitat of threatened species, listed under the NSW *Threatened Species Conservation Act 1995*, NSW *Native Vegetation Act 2003* or Commonwealth

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Environment Protection and Biodiversity Conservation Act 1999, that do not have potential to infringe *safe clearances*;

- Retain vegetated gullies or other locations where the mature height of vegetation will clearly not infringe *safe clearances* or constitute a flashover hazard under bushfire conditions;
- Retain vegetation, or selectively remove tall-growing species only, at sites specifically selected and nominated for fauna corridors;
- Retain and trim as required vegetation specifically selected to be retained, or lopped and retained, to stabilise soil on steeply sloping lands (i.e. > 18 degrees);
- Retain and trim as required hollow bearing trees or other vegetation specifically selected to be retained, or lopped and retained, or lopped poisoned and retained, as locally significant fauna habitat;
- Retain and trim, or selectively remove tall-growing species only, if it is riparian vegetation in the overflow zone or within 40 m of a prescribed stream, river or watercourse, and does not represent a significant maintenance/encroachment risk;
- Retain and trim as required selected vegetation to provide screening at sites specifically nominated as visually sensitive. Retained vegetation may be subject to subsequent progressive replacement strategies with more suitable species.
- Retain and trim as required any cultural heritage tree, e.g. scarred tree that could not be avoided during the route selection phase.
- Variations to the above may be prescribed by other legislation or regulation or by Conditions of Development Approval.

4.3 The strategy to be applied for the maintenance of existing *easements* is the achievement of the objectives outlined in sections 4.1 and 4.2. For existing *easements*, vegetation control shall be carried out in the safest and most cost effective and environmentally acceptable manner, in consultation with property owners or managers, and other statutory authorities, local councils and special interest groups as necessary. Nothing in this standard diminishes the responsibility of Regions to consult with all parties having an interest in *easement* maintenance practices. TransGrid aims to ensure a high level of community consultation and satisfaction in regards to these maintenance practices.

5. Responsibilities

The General Manager/Network Performance and Development is responsible for the implementation and verification of this procedure.

The General Manager/Human Resources and Business Services shall provide guidance on environmental issues.

The General Manager/Transmission Operations is responsible for maintaining *easements* in accordance with the principles set out in this document and in accordance with GM AS L1 002.

The General Manager/Capital Program Delivery is responsible for constructing *easements* in accordance with the principles set out in this document.

6. Implementation and Verification Plan

6.1 Implementation

The Manager / Primary Systems has the overall responsibility for implementation of this procedure and the Transmission Systems Engineer / Primary Systems has the following specific responsibilities:

- Undertake the periodic review of this procedure in accordance with the requirements of GD RI G2 001 - Document Control.
- Ensure that GM AS L1 002 complies with the principles outlined in this document.
- Notify the relevant General Managers of their responsibilities as outlined in this procedure.

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- Maintain a record or copy of these notifications with the original signed document.

6.2 Verification

Responsibility for verifying compliance to this procedure for easement maintenance resides with the Transmission Systems Engineer / Primary Systems through the Technical Performance Assessment Process (GM AS G2 005, Attachment A).

Responsibility for verifying compliance to this procedure for easement construction resides with the Manager/Projects/CPD.

7. Attachments

- Nil

8. Amendments from Previous Issue

Not applicable – Original issue.