Vegetation and Access Track Management Strategy 2015-20

If this strategy is a printed version, to ensure compliance, reference must be made to the Process Zone to obtain the latest version.

Abstract: This document outlines the strategy that Ergon Energy will adopt for vegetation and access track management during the regulatory control period 2015-20. The strategy applies to maintenance of vegetation and access track condition relating to the Ergon Energy overhead distribution network. It does not cover vegetation management around substations, communication towers, or non-overhead network infrastructure.

Keywords: vegetation; access track; management; strategy; ROAMES

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1 Overview

The purpose of this document is to provide an outline of the vegetation and access track management strategy that Ergon Energy will adopt for the regulatory control period 1 July 2015 to 30 June 2020. This strategy applies to vegetation and access track management operations and planning relating to the Ergon Energy owned overhead distribution network. It does not cover vegetation management around substations, communication towers, or other non-overhead line network infrastructure.

This strategy covers all aspects of the vegetation and access track management programs, including: inspection; treatment; auditing; contract management; program management; communication; safety; reliability; legislation; expenditure, and; additional activities.

This strategy document forms part of the Network Asset Management Framework, which serves to provide clear direction for all current, and future, asset management activities.

1.1 Extent of overhead network

Ergon Energy manages electricity network assets, comprising transmission and distribution lines, substations and isolated generation covering 97% of Queensland, including the Torres Strait Islands. The Ergon Energy overhead distribution network covers a distance of approximately 129,349 kilometres. The tables below summarise the number of poles and the length of line in the regulated network.

Table 1 Summary of Line Length (km) by Region (Source Ellipse Nameplate data January 2013)

Region	Northern	Central	Southern	Total
Rural Km	25,929	33,888	47,892	107,710
Urban Km	3,203	1,741	1,923	6,867
Sub-Transmission	5,659	3,631	5482	14,772
Total	**34,791**	**39,260**	**55,298**	**129,349**

Table 2 Summary of Spans by Region (Source Ellipse VZ Nameplate data January 2013)

Region	Northern	Central	Southern	Total
Rural spans	158,656	185,371	319779	663,806
Urban spans	120,633	82,580	98,613	301,826
Sub-Transmission	21,755	18,301	25,473	65,529
Total	**301,044**	**286,252**	**443,865**	**1,031,161**

Table 3 Summary of Line Length by Voltage including Dual Circuit Lines (Source AER RIN Tables)

Line Voltage Rating	Northern	Central	Southern	Total
Low Voltage (<1000V)	6,124	3,944	8,038	**18,106**
High Voltage (1kV-110kV)	28,364	36,204	47,254	**111,822**
Transmission (>110kV)	4,994	3,042	7,302	**15,338**
Total	**39,482**	**43,190**	**62,594**	**145,266**

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Table 4 Summary of Vegetation Zones by Region (Source Ellipse VZ Nameplate data January 2013)

Vegetation Zones	Northern	Central	Southern	Total
Rural	291	277	666	**1,234**
Urban	231	85	118	**434**
Sub-Transmission	82	115	112	**309**
Total	**604**	**477**	**896**	**1,977**

1.2 Distribution Service Area

Ergon Energy is a Distribution Network Service Provider (DNSP), managed using a structure of three regions: Northern, Central, Southern, with these regions further subdivided into districts: Northern: Far North, North Queensland, Central: Mackay, Capricornia, and Southern: Wide Bay, and South West.

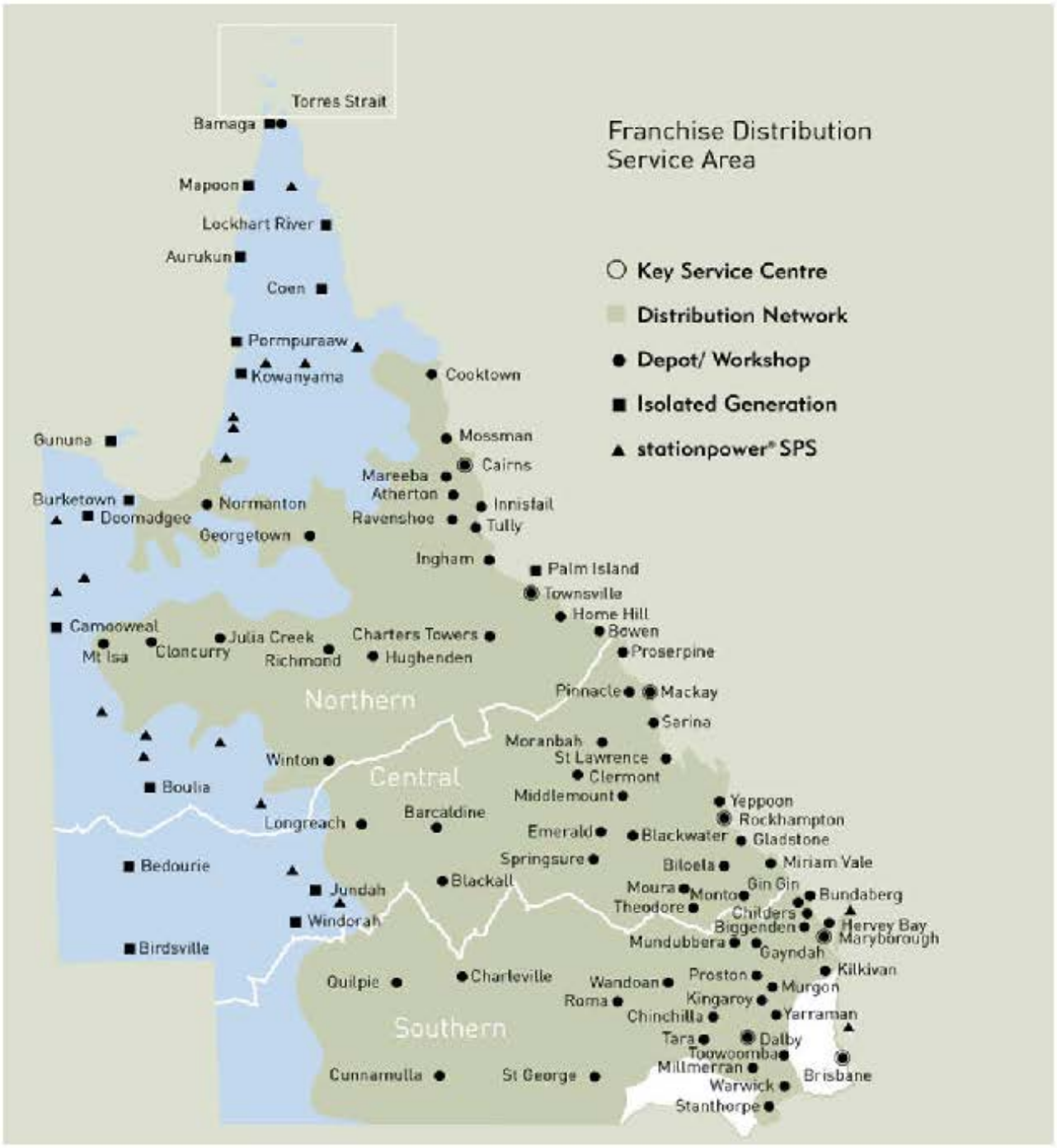

Figure 1 Ergon Energy Distribution Service Area

1.3 The Ergon Energy Vegetation Management Program

For further information, refer to the 'Management Plan Vegetation and Access Tracks' and the *Standard for Managing Vegetation Management Preventative Maintenance (STNW0607).*

1.3.1 Vegetation zones

Vegetation zones (VZ) introduced in 2009 allow tailoring of variable maintenance cycles to individual area. These are determined as much as possible by vegetation growth rates. In recognition of the differences in treatment techniques required between urban and rural areas, vegetation zones are split into distinct rural and urban zones, with urban zones typically having shorter cycle times and less intrusive treatment techniques than rural zones.

Vegetation zones are represented in Smallworld as polygons with defined boundaries, and this allows tracking and management of the vegetation program through Ellipse with defined pole quantities, line length, cycle time and expenditure all captured on equipment nameplates.

1.4 The Ergon Energy Access Track Management Program

For further information, refer to *Standard for Access Track Management (STNW0627*).

1.4.1 Maintenance zones

Maintenance zones (MZ) are spatial polygons that delineate sections of the Ergon Energy electricity network for management purposes. These zones are used to plan maintenance of network components, such as poles and conductors, as well as Ergon Energy's access tracks. MZs are different to VZs in that they delineate areas of similar line construction or individual feeders and typically do not consider the natural environment.

2 References

2.1 Ergon Energy controlled documents

Document number or location (if applicable)	Document name	Document type
NA000403R376	Access Track Construction Standards and Specifications	Standard
STCR001	Standard for Corporate Risk Management (Ver.1; Sect.7.3)	Standard
STN0602	Standard for Vegetation Clearance Profile	Standard
STNW0601	Standard for Vegetation Management	Standard
STNW0602	Standard for Vegetation Clearance Profile	Standard
STNW0607	Standard for Managing Vegetation Management Preventative Maintenance	Standard
STNW0609	Standard for Vegetation Management – Inspection and Assessment	Standard
STNW0612	Standard for Vegetation Management – Treatment	Standard
STNW0614	Standard for Vegetation Management – Negotiation for Removal of Unsuitable Trees	Standard
STNW0626	Standard for Managing, Developing, and Amending Access Track Maintenance Plans	Standard
STNW0627	Standard for Access Track Management	Standard
STNW0707	Standard for Preventative Maintenance Programs	Standard
STNW0253	Standard for Managing Developing and Amending Preventative Maintenance Plans	Standard
STMM001	Standard for Vegetation Management Data Collection	Standard
STOP002	Standard for Vegetation Worker Clearances	Standard
ES000200R100	Ergon Energy Health Safety & Environment Improvement Plan 2012-2017	Plan
EP02	Ergon Energy Health and Safety Policy	Policy
EP12	Ergon Energy Environment and Cultural Heritage Policy	Policy
EP12	Ergon Energy Environment and Cultural Heritage Policy	Policy
EP26	Ergon Energy Risk Management Policy	Policy
EP26	Ergon Energy Risk Management Policy	Policy
OP02	Our Health and Safety Policy	Policy
PRNF001	Protocol for Network Maintenance	Protocol
ME000301R121	EPW – Environmental Legislation and Triggers	Reference
ME000304R101	EPW – Environmental Issues Reference	Reference
NA000403R335	Manage Access Tracks	Reference
NA000403R384	Ergon Energy Vegetation Management Auditing Guidelines	Reference

Document number or location (if applicable)	Document name	Document type
BP000204R101	Ergon Energy Corporate Risk Assessment Tables	Risk Assessment
RSC04	Specification for Clearing and Access Works for Overhead Powerlines	Specification
http://esp/ess/env/env/Site%20Content/Strategy%20and%20Policy.asp	0802-29 Ergon Energy Environment Strategy)	Strategy
SGMM001	Ergon Energy Weed Management Strategy	Strategy
SGNW0003	Bushfire Mitigation Strategy	Strategy
SGNW0004	Asset Management Asset Strategy	Strategy
ES000904R120	Management of Declared Plants Guideline	Reference

For further detail of the Lines Maintenance Vegetation Management Document Hierarchy, please refer to Annex A

2.2 Other documents

Document number or location (if applicable)	Document name	Document type
	Climate Change Response Framework and Action Plan	Plan
	ENA Doc 023-2009 ENA Guidelines for Safe Vegetation Management Work Near Live Overhead Lines	Guidelines
	Environment Protection and Biodiversity Conservation Act 1999	Reference
	Goodfellow, J. 2008. Overhead distribution vegetation challenges: Touch potential voltage at ground level and aloft in trees contacting energized distribution conductors. Report No: 1018463. Electric Power Research Institute USA. (Cited in Coldham 2011).	Reference
Sharepoint	Management Plan Vegetation and Access Tracks'	Management Plan

3 Legislation, regulations, rules, and codes

This document refers to the following:

Legislation, regulations, rules, and codes
Environmental Protection Biodiversity Conservation Act 1999
Electrical Safety Act 2002
Electrical Safety Code of Practice 2010 - Working near Exposed Live Parts (ESO QLD)
Electrical Safety Code of Practice 2010 – Works (ESO QLD)
Electrical Safety Regulation 2013
Electricity Act 1994
Environmental Protection Act 1994
Land Protection (Pest and Stock Route Management) Act 2002
Nature Conservation Act 1994
Queensland Agricultural Chemicals Distribution Control Act 1966
Queensland Heritage Act 1992
Vegetation Management Act 1999
Work Health and Safety Act 2011
Work Health and Safety Regulation 2011
Electrical Safety Regulation 2002
Nature Conservation (Protected Plants) Conservation Plan 2004

4 Definitions, acronyms, and abbreviations

4.1 Definitions

For the purposes of this strategy, the following definitions apply:

Term	Definition
Biodiversity Model	Term used to describe the vegetation management strategy used for the period of 2005 to 2010, based on Normalised Difference Vegetation Index (NDVI)
Normalised Difference Vegetation Index	Measurement of plant 'greenness' and vegetation growth
Agforce	Regional natural resource management organisation
Declared Plants	Weeds
ROAMES LiDAR program	Aerial LiDAR program
Clearance Profile	Design and specification of the clearance space that must be maintained between the network and vegetation
Ellipse	Ergon Energy Enterprise Management System
Smallworld	SmallWorld is Ergon Energy's Geographic Information System (GIS). It is a commercial product provided by GE Energy and customised for Ergon Energy's use.
Span Rate	Style in which a contractor is paid a set unit rate for completing required work occurring between two overhead network poles

4.2 Acronyms and abbreviations

The following abbreviations and acronyms appear in this strategy.

Abbreviation or acronym	Definition
AER	Australian Energy Regulator
DEE	Dangerous Electrical Event
DERM	Department of Environment & Resource Management (is now Department of Environment and Heritage Protection)
DNSP	Distribution Network Service Provider
EMP	Environmental Management Plans
EPW	Environmental Planning for Work
EVNT	Endangered, Vulnerable or Near Threatened
FN	Far North
GIS	Geographic Information System
IVM	Integrated Vegetation Management
KPI	Key Performance Indicator
LiDAR	Light Detection and Ranging
NDVI	Normalised Difference Vegetation Index
ROAMES	Remote Observation Automated Modelling Economic Simulation
SAIDI	System Average Interruption Duration Index (planned & unplanned)
SAIFI	System Average Interruption Frequency Index (planned & unplanned)
STPIS	Service Target Performance Incentive Scheme
TMD	Tree Management Database (also known as the Vegetation Management Database)
UAAA	Utility Arborists Association
VMO	Vegetation Management Officer
VZ	Vegetation Zones
WB	Wide Bay
CA	Capricornia
MK	Mackay
SW	South West
NQ	North Queensland
SLATS	Statewide Landcover And Trees
QAA	Queensland Arborists Association

5 Stakeholder analysis

5.1 External stakeholder organisations

Various state government agencies, principally those involved in land management, have specific interests in Ergon Energy's vegetation and access track management programs to ensure that conduct of operations is compliant with safety and environmental legislation, and is efficient and effective.

Local government councils also have an ongoing interest in the vegetation and access track programs through their ownership of trees in public places, and management of their amenities on behalf of the community. Unions and contractors involved in the programs are interested in the impact on employment levels and employment conditions.

5.2 Landholders

The Ergon Energy network crosses freehold and leasehold land, and there is ongoing liaison with landholders to gain access for inspection and maintenance of assets. Techniques used for vegetation and access track management need to be compatible with the long-term management of land by individual landowners. There are also increasing demands from landholders for Ergon Energy to undertake weed management on power line easements because of a perception that power-line maintenance works contribute to the introduction and spread of weeds. The increasing trend of organic certification of agricultural enterprises also demands some compromise in the techniques used to control powerline vegetation, generally at increased cost. Refusal to carry out requested works could result in denial of access and strained relationships with customers. Landholder expectations need ongoing management, and communications maintained through direct contact and awareness campaigns, using different types of media. Feedback from Ergon Energy customers indicates satisfaction with electricity supply reliability but there is increasing concern about the cost and affordability of electricity. The vegetation management program involves balancing customer expectations against long-term costs to ensure ongoing compliance with legal obligations to keep vegetation clear of network assets.

5.3 Internal stakeholders

The main internal stakeholders within Ergon Energy are those involved in the delivery and management of the vegetation and access track management programs; namely, the vegetation management, corridor maintenance and works delivery staff within the External Works Contracts group. The Maintenance Programs group within Network Optimisation and the Works Planning Manager – Refurbishment & Maintenance within the Works Enablement group are responsible for planning and oversight of the programs. Other groups with interest in the vegetation and access track management programs include the Environmental Operations Group and the Regional Asset Management groups.

6 Strategic vision

The strategic vision for the Ergon Energy vegetation and access track management programs is to be sustainable in terms of safety, reliability, natural environment, and cost, through delivery of the best value compromise between these factors.

For the program to be sustainable, Ergon Energy will meet community and legal expectations relating to safety, reliability and the environment, while implementing cost reduction measures that do not impinge on those expectations.

Key objectives of this strategic vision include:

- upholding a strong safety record by maintaining suitable vegetation clearances and access track conditions
- maintaining electricity supply reliability through risk assessment and prioritisation of efforts to target poor performing parts of the network
- minimising the impact of vegetation and access track management on the environment
- reducing maintenance costs

For the duration of the regulatory control period 2015-20, Ergon Energy will achieve reduced costs for vegetation and access track management through:

- pursuing efficiency-improving technologies that reduce reliance on labour-intensive practices relating to inspection, treatment, and audit activities
- optimising treatment cycle lengths, whereby vegetation is treated at the point of time which represents the maximum return in value in terms of safety and reliability for minimum expenditure
- managing contractors in a manner that maximises productivity, while maintaining quality and safety
- using contract styles that represent best value for money on a sustainable basis, including required overhead costs
- using best management practices and integrated vegetation management (IVM)
- communicating and educating all influential stakeholders regarding the safety, reliability and cost drivers.

This Vegetation and Access Track Management Strategy documents Ergon Energy's objectives, targets, and the methods it will employ during the regulatory control period 2015-20 to realise this strategic vision.

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7 Linkages to other strategies

7.1 Asset Management Asset Strategy

The Ergon Energy 'Asset Management Asset Strategy' (SGNW0004) is a key long-term planning document and decision-making tool, reviewed annually by Network Optimisation. The purpose of the Asset Strategy is to specify objectives and outcomes that provide the link between the high-level aspirations and guiding principles articulated in the Asset Management Policy, and the operational and tactical aspects within Ergon Energy's asset management plans and strategies, such as this Vegetation Management and Access Tracks Strategy.

The Asset Management Asset Strategy guides Ergon Energy asset management to ensure that today's decisions and investments support our network requirements, and customer needs for the near future. The scope of the initial asset strategy includes all regulated assets as well as isolated generation assets.

This Vegetation and Access Track Management Strategy for 2015-20 refers specifically to 'Section 5.4 Lifecycle Optimisation' in terms of setting Ergon Energy's strategy for reducing vegetation operational expenditure through the pursuit of efficiencies gained using available technology, optimisation of treatment cycles, best management practices, integrated vegetation management, and improved education.

This Vegetation and Access Track Management Strategy also relates specifically to 'Section 9.3 Manage the risk that vegetation poses to the Network in a cost effective manner' of the Asset Management Asset Strategy. This details how Ergon Energy will address:

- influencing of customer behaviour
- provision of better education and improved efficiencies of qualified contractors
- superior technology and equipment
- reduction of treatment costs
- continuous improvement of processes, standards and practices.

7.2 Protocol for network maintenance

The 'Protocol for Network Maintenance' (PRNF001) constitutes the inspection and maintenance protocol for Ergon Energy's electrical network assets. Section 16.1 of the protocol defines the philosophy and direction of the vegetation and access track management programs, and reflects the strategic vision contained in this strategy. Section 16.2 of the protocol defines requirements relating to vegetation management and specifically states:

'The requirement for targeted and reactive tree trimming / vegetation clearance activities shall be determined from routine and non-routine patrols of overhead line circuits.

Any trees / vegetation that are either within designated clearance zones around overhead lines or are expected to grow within these zones in a designated time period shall be trimmed or removed. These shall be prioritised and managed in accordance with the Company's Vegetation Management Standard. Designated clearance zones, re-growth zones and clearance periods shall be defined in the Company's Maintenance Standard for Tree Trimming and Vegetation Clearance.

Priority shall be given to carrying out tree trimming / vegetation clearance activities around overhead lines that are located in populated areas accessible to the public or that are in close proximity to buildings.

The frequency of routine tree trimming and vegetation clearance shall be based upon the time last cut and growth rates.

Tree trimming and vegetation clearance activities shall be carried out in accordance with Australian Standards and the Company's Maintenance Standard for Tree Trimming and Vegetation Clearance.

The Construction shall ensure that easements and wayleaves necessary for tree trimming and vegetation clearance activities are obtained. A record of easements and wayleaves shall be kept that are accessible to maintenance service providers.

The Network Design Manager shall be responsible for evaluating other engineering measures with the objective of reducing System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI) caused by trees and vegetation.

The number of faults, where the cause has been attributed to contact with trees / vegetation shall be monitored by the Network Maintenance Manager to measure the performance of tree trimming / vegetation programs' (PRNF001 Sect.16.2).

This Vegetation and Access Track Management Strategy describes Ergon Energy's intentions and the methods used to fulfil these requirements, and measure success, during the regulatory control period 2015-20.

7.3 Bushfire mitigation strategy

The 'Bushfire Mitigation Strategy' (SGNW003) complements the Vegetation and Access Track Management Strategy, and outlines the actions that Ergon Energy will take to manage its assets to maintain compliance with the Electrical Safety Regulation 2002 with regard to bushfire mitigation:

- reducing the risk of personal injury arising from fire ignition from electrical assets
- reducing the risk of damage to network assets arising from fire ignition from electrical assets
- reducing the risk of damage to third party assets arising from fire ignition from electrical assets.

The Bushfire Mitigation Strategy covers the following major areas:

- identifying all areas prone to high bushfire hazard and the location of all electricity assets within those areas
- adopting Bushfire risk mitigation strategies and practices
- ensuring bushfire incident response and management capability
- ensuring public awareness and the responsibilities of owners of private overhead electric lines
- investigating bushfire related incidents and monitoring trends.

Mitigation of bushfire risk to the public and the network is achieved primarily through maintenance of the network condition as well as the vegetation clearance space. Due to the low likelihood of weather and fuel conditions facilitating extreme or catastrophic fire danger in areas covered by the Ergon Energy network, bushfire mitigation is not as significant driver of the vegetation management or access track programs as for other distribution network service providers.

7.4 Weed management strategy

The Weed Management Strategy (SGMM001) outlines the measures Ergon Energy staff and contractors must take to prevent the introduction and spread of declared pests. The Vegetation and Access Track Management Strategy recognises the increasing importance of effective weed management in maintaining land access and minimising maintenance costs.

7.5 Previous vegetation and access track management strategies

Ergon Energy is proud to be an industry leader in utility vegetation management, often being on the leading edge in introducing new techniques or technology to reduce ongoing expenditure. Since 2005, Ergon Energy has adopted a formal vegetation management strategy to guide the development of its vegetation program. Significant developments including the introduction of Vegetation Zones with varied maintenance cycles, identification and completion of 'backlog' areas, and improvement in contract management have all occurred under direction of this strategy.

2005 to 2010

Prior to 2005, there was little knowledge of vegetation and access track condition, and the maintenance history. During the early years of the regulatory control period 2005 to 2010, the program was highly reactive, with inadequate funding to maintain vegetation clearances along the entire network. Work focussed on poor performing feeders where vegetation incidents were prevalent. However, this was not preventative in nature, and so maintenance costs and risk exposure escalated across the network.

2010 to 2015

There have been significant changes to the vegetation and access track managements program during this period, with alterations to maintenance cycle lengths, data collection, and contract management. Vegetation treatment cycles changed from fixed three-year terms for rural and one-year terms for urban vegetation zones, to Normalised Difference Vegetation Index (NDVI) based variable treatment cycle lengths, with rural cycle lengths between two and six years in length, and urban cycle lengths between one and two years.

There was also recognition that there were significant areas of the network that had had inadequate vegetation management for over a decade. This led to the need for the creation and successful completion of a number of 'backlog' lump sum contracts, and an increase in budget. In June 2013, the backlog of work was completed and the whole network is now on a regular maintenance cycle. Average treatment costs are now reducing as appropriate cycle lengths and treatment techniques are now applied.

Furthermore, improved data collection relating to treatment methods and costs, and management of expenditure and contract progress against plan from the Ellipse System, has meant that contract management has improved and direct operational expenditure has decreased.

8 Failure modes, effects and risks

8.1 Asset deterioration mechanisms, causes and effects

The principle impact that vegetation growth has on network operation occurs when vegetation contacts live conductors or other parts of the Ergon Energy overhead network, with potential for mechanical damage or interruptions to electricity supply.

Asset deterioration caused by vegetation occurs through inadequate vegetation treatment practices and the frequency of that treatment. Inadequate vegetation management over the asset lifecycle can affect the safety and reliability of the network, as well as the financial and environmental performance of Ergon Energy.

Usage and the effects of weather cause deterioration of access tracks. Other influences on access track deterioration include construction standard, underlying soil type, ground cover, slope, and water runoff.

8.2 Failure modes

Safety related failure modes include: climbable trees providing access to live conductors; trees existing within arcing distance from live conductors that can cause electrocution through contact with that tree; bushfire ignition from trees contacting lines; customer or public injury from vegetation management activities; as well as injury from use of poorly maintained access tracks.

Reliability related failures modes for the vegetation program include trees in contact with the network that cause outages or current leakage; trees that cause clashing of conductors; branch or whole tree failure that results in an outage; as well as vegetation which causes an outage through facilitating the start of a bushfire.

Potential environmental failure can occur through the introduction or spread of declared plants (weeds); negative impact on Endangered, Vulnerable or Near Threatened (EVNT) species; soil erosion; fuel or chemical spill; damage to riparian habitat; loss of biodiversity; or soil erosion resulting from poor track construction.

8.3 Existing or proposed risk controls

The existing vegetation clearance standards and practices adopted ensure the maintenance of a safe distance between trees and network assets during normal weather conditions and changes in the physical condition of assets due to ambient weather conditions and demand loads. These clearances balance an inspection and treatment interval that takes into account safety, reliability, tree growth, line voltage, cost, and public acceptability of tree management practices.

Ergon Energy's ROAMES LiDAR program will provide accurate assessment of clearances between lines and vegetation, and contribute to a risk-assessment modelling program currently under development to identify locations with higher than acceptable risk from vegetation. Where unacceptable risk from vegetation is found to exist, Ergon Energy can shorten treatment cycle lengths, introduce engineering solutions, or remove the cause of the risk all-together, depending on the scenario.

Inspection frequencies appropriate to the rates of erosion and vegetation growth can mitigate access track deterioration, enabling remediation actions before significant damage makes repair expensive, or uneconomic, or vegetation regrowth makes the track impassable to normal vehicles. Currently access track inspection is concurrent with pole inspection program. The maintenance of access tracks must find a balance between the amount of use that the track will require, and the funds available to maintain it to a stable condition.

8.4 Level of risk in terms of consequence and likelihood

Calculation of the risk associated with the Ergon Energy vegetation management program uses the 'Ergon Energy Corporate Risk Assessment Tables' (BP000204R101 Ver. 3) and the 'Basic Risk Management Method detailed within Section 7.3 of Ergon Energy's *Standard for Corporate Risk Management (STCR001 Ver.1)*.

8.4.1 Vegetation management

In general, a combination of factors influence the level of risk related to the vegetation management program, and maintaining clearance between vegetation and the overhead network. These include:

- vegetation regrowth rate (dependant on environmental factors)
- vegetation density (number of trees capable of contacting the line)
- treatment frequency
- treatment effectiveness
- line voltage
- line construction (insulated or bare)
- feeder age
- feeder design (radial or meshed)
- customer numbers
- urbanisation
- land tenure (private, agriculture, reserve, national park)
- bushfire hazard
- exposure to severe storms or cyclones

8.4.2 Access tracks

Despite driver training, incidents where inexperienced and experienced operators damage vehicles and plant due to access track defects still occur. Well-maintained tracks often attract other users, with the resulting additional traffic triggering more maintenance. Allowing tracks to deteriorate to an impassable state introduces a public safety risk, results in access delays for required emergency work on assets and results in adverse environmental impacts. Overall, poorly maintained access tracks present safety and environmental risks with a minor risk of landowners refusing access to assets because of the expectation that Ergon Energy will contribute to the need for ongoing maintenance of tracks.

8.5 Management of risk

Acceptable risk is a key element of the vegetation management philosophy that Ergon Energy will follow during the regulatory control period 2015-20. The management of risk in the vegetation management program has become more significant as Ergon Energy balances risk and cost to provide customers the combination of safety and affordability. This is being facilitated by and new tools becoming available to provide more timely information on vegetation condition around the network.

ROAMES will allow for further cost savings in addition to better understanding of the current risk posed by vegetation to the network each year. The integration of ROAMES will add to Ergon Energy's knowledge base and in time provide scenario-modelling capabilities to manage vegetation more effectively.

A risk assessment model will be used in conjunction with ROAMES to compare the impact of all measureable risk factors for each Vegetation Zone. This will assist in determining treatment cycle lengths and maintenance practices. This will allow Ergon Energy to manage risk to an acceptable level across the network.

8.5.1 Risks to safety

Ergon Energy is committed to the health and wellbeing of all personnel, including contractors that are engaged in work on or around its assets. The expectation is that practical occupational health and safety systems and plans will always be in place, together with proactive employee education, and support mechanisms outworked to underpin operations.

As a minimum standard, contractor occupational health and safety programs are required to link directly with Ergon Energy corporate requirements, meeting the standards applying to Ergon Energy internal operations.

The number of Serious Electrical Incidents and Dangerous Electrical Events (DEEs) provide measurement to monitor and report on the safety performance of the Vegetation Program and its Contractors. These incidents and events can arise from the manner used to conduct vegetation inspection and clearing work, and from the consequence of vegetation related events such as fallen conductors owing to vegetation impact.

Safety performance is a significant consideration in planning and scheduling the vegetation inspection and treatment program. Close monitoring and analysis of all safety incidents related to vegetation and access tracks ensure that line design and location, maintenance planning practices, and field working practices are appropriate to the risks posed by vegetation to the operation of the network.

Ergon Energy's vegetation and access tracks management strategies, standards, and plans contain principles and practices that aim to ensure mitigation of these potential risks to an acceptable level. While consequences relating to potential safety risks surrounding electrical networks may be high, the vegetation and access track management programs mitigate the relative risk posed by vegetation and access tracks to safety around the Ergon Energy network. Consequently, this is inherently lower than may be experienced in other parts of Australia. This latter point is primarily due to low population density and the lower likelihood of a severe bushfire occurring within locations covered by the network.

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Currently appropriate clearances, treatment practices, and treatment cycle frequency assist in mitigating the likelihood of injury of members of the public from the overhead network through contact with – or access via – vegetation. While the potential consequence of a person being in contact with a tree conducting significant electrical current could be catastrophic, recent research into the ability of electrical current to flow between conductor and person via a tree (Goodfelow 2008) illustrates that this risk is likely to be much less severe, on distribution voltage, lines than previously thought. Further research proposed by the Utility Arborists Association of Australia (UAAA) will serve to confirm Goodfellow's research within Australia and would serve to reduce the expected consequence of a tree in contact with a distribution network, and to confirm that Ergon Energy's current practices (controls) are effective in managing related risks. As such, Ergon Energy intends to sponsor and participate in this research and future research of this nature in an effort to review and improve Standards and operational risk controls.

Mitigation of the likelihood of direct injury of members of the public because of vegetation management activities of an Ergon Energy contractor is achieved through thorough safe work procedures, daily risk assessments, and management plans. See the *Ergon Energy Standard for Vegetation Management (STNW0601)* for more information.

The likelihood of members of the public being injured from undertaking their own vegetation management activities near the Ergon Energy overhead network is low, but Ergon Energy's risk control measures for this have been evaluated as marginally effective as 'near miss' incidents of this nature still occur. The assumption is that the application of vegetation related safety education initiatives through Plant Smart and other avenues is not as consistent or as effective as required. Ergon Energy will undertake further development of risk controls for this aspect by improving communication and industry association sponsorship, as outlined in this strategy.

8.5.2 Risks to network reliability

Vegetation management directly affects reliability performance in terms of the numbers of customers affected, and the damage caused to network infrastructure. Although, as the figure below shows, vegetation related incidents do not, on average, account for a large percentage of Ergon Energy customer interruptions. However, incident analysis shows that vegetation does have a significant impact in certain locations where vegetation density is high.

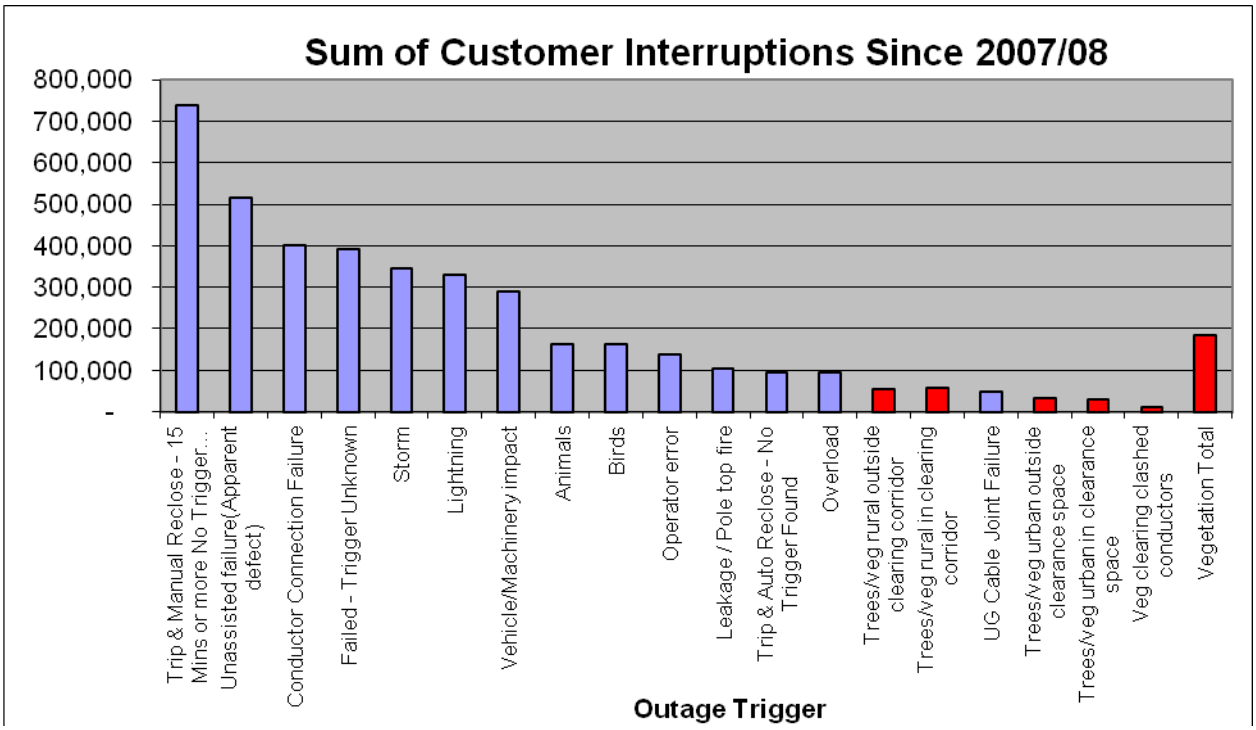

Figure 2 Comparison of impact of Outage Triggers on network reliability (Source: Feederstat)

Inability to access assets for maintenance or urgent repair will result in extended outages, resulting in significant inconvenience to customers, and increased penalties under schemes such as Service Target Performance Incentive Scheme (STPIS). Sub-transmission feeders and distribution feeders serving high customer numbers should receive priority for maintenance.

8.5.3 Risks to network infrastructure

Outages associated with vegetation typically involve damage to physical network infrastructure, through branch or whole-tree failure. Damage also occurs to the network by vegetation in the form of abrasion of conductor insulation, wearing of attachment points, and deviation of stay wires.

The vegetation management program does not aim to remove all risk to the network, as this is excessive risk control, and is not affordable. Ergon Energy's vegetation management standards and strategy aim to mitigate risk to an acceptable level that will achieve the required levels of safety, reliability, and expenditure, as is further discussed in other parts of this Strategy.

8.5.4 Risks to the environment

Environmental risk in relation to the Ergon Energy vegetation and access track management programs is controlled and mitigated through the direction of the Ergon Energy 'Environment and Cultural Heritage Policy' (EP02). Ergon Energy carries out the directives of the policy under its Environmental Planning for Work Standards and Procedures, which encompass all legal requirements for operations undertaken during vegetation and access track management. In identified 'high risk' areas, such as National Parks and reserves, there have been Environmental Management Plans (EMPs) created, which stipulate further controls and management restrictions.

The Ergon Energy 'Weed Management Strategy' (SGMM001) describes how Ergon Energy intends to control risks relating to the introduction or spread of Declared Plants by Ergon Energy staff or contractors. During 2010 to 2015, there has been an ongoing increase in precautionary and restorative efforts required from Ergon Energy staff and contractors as a direct result of land managers requesting vehicle wash-downs before allowing access to the Ergon Energy network. The expectation is that this trend will continue.

8.5.5 Risks to the cost of the vegetation and access tracks programs

Since 2005, Ergon Energy's vegetation management program has continually improved through the adoption of innovative management strategies and the pursuit of ongoing cost reductions. With the completion of the areas of backlog, the entire Ergon Energy overhead network could be considered as being in a cyclic vegetation management program.

In order to maintain achieved cost reductions, Ergon Energy will continue to utilise technology to improve efficiencies and drive desirable management outcomes through increased workforce autonomy and increased program transparency.

Ergon Energy has specified clearances in its *Standard for Vegetation Clearance Profile (STNW0602)*, Ergon Energy has control over this standard, and how it is interpreted, so long as it meets legal requirements, whereas other Distribution Network Service Provider (DNSPs) that must work to literal compliance, have their vegetation clearances specified within legislation. Through having control over clearance dimensions, management cycles and treatment methods, Ergon Energy is able to exercise better control over expenditure while maintaining legal compliance producing a sustainable and effective management program.

9 Current state

9.1 Vegetation inspection

9.1.1 Urban

In urban vegetation zones, the Inspection process typically takes place between two and four weeks prior to the treatment crew entering the area. The person undertaking the inspection must estimate the work requiring treatment as per the *Standard for Vegetation Management – Inspection and Assessment (STNW0609)* and negotiate any required tree removals as per the *Standard for Vegetation Management – Negotiation for Removal of Unsuitable Trees (STNW0614)*. Only vegetation expected to enter the clearance space and not conforming to the *Standard for Vegetation Clearance Profile (STN0602)* typically requires treatment.

9.1.2 Rural

In rural vegetation zones, the person conducting the inspection must undertake work to requirements specified in the same standards as those used in urban vegetation zones. Additional effort is required to gain access to properties, and for approvals to use herbicide. The rural inspection process can require considerable labour effort where there are difficult access locations. Inspection in rural areas targets all vegetation likely to enter the clearance space and pose an unacceptable risk in the next 10 years.

9.2 Access tracks inspection

The approved annual Asset Inspection Plan underpins the Access Track Inspection Program. The plan's development is in accordance with *STNW0626 Standard for Managing, Developing, and Amending Access Track Maintenance Plans*. The plan schedules access track inspections six months before pole inspections. 'Manage Access Tracks' (NA000403R335) guides inspection activities.

9.3 Vegetation treatment

9.3.1 Treatment cycle format

Treatment cycle lengths, based on vegetation growth rates and line voltage, vary between vegetation zones. Within urban areas, treatment cycles can be between 12 and 24 months in length. In rural zones, the cycle lengths between treatments can be up to 72 months (six years).

Table 5 Summary of VZs, Poles, and Line Length per Cycle Length (Source Ellipse January 2013)

Program	Cycle in months	No of VZ	Sum of EE_poles	Line_length (km)
Urban	12	153	90,015	2,295.01
	15	34	29,534	766.8
	18	179	154,394	3,208.31
	24	68	27,883	596.44
Urban total		**434**	**301,826**	**6,866.56**
Rural	12	4	844	48.67
	18	6	2,906	202.45
	24	179	112,672	11,109.7
	36	662	318,999	44,335.51
	48	181	109,396	22,620.52
	60	202	118,989	29,393.15
Rural total		**1,234**	**663,806**	**107,710**
Transmission	18	9	1,700	212.73
	24	42	11,252	2,177.39
	36	197	42,255	8,717.14
	48	47	7,381	1,631.19
	60	14	2,941	2,033.81
Transmission total		**309**	**65,529**	**14,772.26**
Grand total		**1,977**	**1,031,161**	**129,348.82**

Expenditure and treatment frequency remain sufficient to allow completion of a cyclic maintenance program that is cost effective and efficient, and the completion of all scheduled work, with limited carry over. The application of cycles to vegetation zones is under continual review with the basis of consideration being whether treatment deferral can be achieved without increasing eventual treatment costs or risk. ROAMES information and eventual modelling (growth rate and cycle optimisations) is a key tool in managing in the most prudent and efficient manner. Table 6 shows the programing of routine inspection and clearing of vegetation on power lines.

Table 6 Extract from STNW0707 Preventive Maintenance Plans 2013-14

Assets to be Inspected	Inspection Interval or criteria	MST	Standard Job	Level MST Applied
Regulated Network and Isolated Generation Network				
Vegetation on urban power lines	Variable		VCRU**	Regulated Clearing – Vegetation Zone Level
	12 months	VSU1		
	15 months	VSU4		
	18 months	VSU2		
	24 months	VSU3		
Vegetation on rural power lines	Variable		VCRR**	Regulated Clearing – Vegetation Zone Level
	12 months	VSR9		
	18 months	VSR0		
	24 months	VSR1		
	36 months	VSR2		
	48 months	VSR3		
	60 months	VSR4		
	72 months	VSR5		
Note: ** in the Standard Job represents the two letter code for region (i.e. FN, NQ, CE, WB, SW)				

9.3.2 Treatment methods

The *Standard for Vegetation Management (STNW0601)* and the *Standard for Vegetation Management – Treatment (STNW0612)* describe the methods for treating vegetation. Ergon Energy's promotion of the use of appropriate herbicides and reduced usage of mechanical treatment methods has resulted in continued decreases in expenditure through a decreased rate of subsequent vegetation regrowth, and reduced easement repopulation requiring less work in successive treatments. The use of appropriate herbicides and retention of low growing species is favoured in place of more soil and environmental disturbing mechanical practices. The success of this preference has made the extension of treatment cycles possible in many areas.

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9.3.3 Clearance profile design

The cross-sectional profile design for clearance of vegetation from the network is the clearance profile. In general, the higher the voltage of the conductor, and the larger the span of conductor between supporting poles is, the greater the propensity for vertical and horizontal movement (sag and swing), and therefore the greater the required clearance space.

The *Standard for Vegetation Clearance Profile (STNW0602)* specifies the design of the clearance profile, and relevant clearance distances. Generally, on rural lines, the cross-section of the profile can be broken down into three types of areas:

- V1 (required clearance)
- V2 (area containing vegetation expected to enter the clearance space (V1) before the next scheduled treatment)
- V3 (areas containing vegetation which will enter the clearance space in the future or which presents unacceptable risk to the network)

While Ergon Energy restricted vegetation treatment to the V2 profile to manage expenditure during the treatment of the 'Backlog', Ergon Energy prefers to treat vegetation to the V3 profile, as comparatively it is more cost efficient and effective over successive treatments than maintenance to the V2 profile.

Under the current *Standard for Vegetation Clearance Profile (STNW0602)* there is limited variation of clearance profile design between voltages and between locations. For example, the standard clearance profile design for a rural 11kV uninsulated line is the same anywhere on the Ergon Energy network, regardless of vegetation density, tree heights, or number of customers reliant on the line for electricity supply.

Pressure to complete the backlog of work between 2009 and 2012 resulted in narrowing of rural corridor widths, and leaving of all vegetation posing no immediate threat to the line or safety until the following treatment cycle. The negative legacy of this practice has only recently become clear, with treatment costs in Central Region increasing dramatically during 2012-13, as vegetation left untreated during 2009 to 2012 now requires treatment using more costly methods. Treatment costs in a number of vegetation zones have come in at over 200% of allocated budget for this reason.

Additionally, a recent outage on a 132kV Sub-Transmission Line in Central Region occurred because of vegetation growing through the clearance space and touching the conductor causing electrical leakage and a subsequent ground fire. The treatment of vegetation on this line was previously to the V2 profile and several trees, which normally would undergo the V3 profile treatment, grew up into the clearance space prior to the next scheduled treatment.

The *Standard for Vegetation Clearance Profile (STNW0602)* was revised in 2012 to return rural corridor widths to original dimensions wherever possible, or to a more sustainable dimension, wherever the original corridor width could not be afforded or is unclear. For more information on current clearance profile design, see *STNW0602*.

9.3.4 Clearance for new or upgraded lines

Currently the requirements for completing vegetation treatment and removal undertaken as part of new or upgraded line construction are as per the Ergon Energy 'Specification for Clearing and Access Works for Overhead Powerlines' (RSC04). Under this Specification, any vegetation management associated with this type of work must be supervised, and audited, by a liaison person who can be any Ergon Energy Officer. Vegetation Management Officers (VMOs) or other similarly experienced staff members are typically not employed as liaison persons, leaving this role to the Line Design Project Manager and other general staff.

9.3.5 Auditing

Auditing of the vegetation management program is carried out as per the 'Ergon Energy Vegetation Management Auditing Guidelines' (NA000403R384). These guidelines are based on available resources and perceived elements of risk within the program. In its latest revision in 2012, more specific scope of auditing and reduced audit coverage requirements were implemented to reflect reductions in auditing resources contract drivers, and available technology. ROAMES will significantly assist in increasing the amount of work audited through the provision of desktop visual assessment of clearance.

9.4 Access Track Construction and Remediation

The *Standard for Preventive Maintenance Programs STNW0707* is the specification for the maintenance interval for access track inspections.

Table 7 Access Track inspection requirements as per STNW0707.

Assets for inspection	Inspection interval or criteria	MST	Standard Job	Level MST Applied
Regulated Network and Isolated Generation Network				
Access Tracks on rural power lines	Every 4 years. Access Track program aligned to the Overhead Asset Inspection Program, but scheduled six months ahead of when line asset inspection work is scheduled. Access track maintenance scoped for these sites in such a way as to enable access for asset inspectors, vegetation assessors and line maintenance personnel. Completion of Access Track maintenance scheduled as close as possible to, and prior to asset inspections and vegetation assessments commencing on each line.	3700	AIATX	Maintenance Zone Level

9.4.1 New Access Track Construction

The construction of new distribution powerlines generally uses existing roads for maintenance and construction access, with construction of minor tracks from these roads to individual structures. In general, for sub transmission lines, there is more track construction along the easement with a higher standard of construction to enable access by cranes, concrete trucks and other large plant. Ergon Energy refers during construction and maintenance to the following standards developed with reference to the 'best practice' techniques as listed in Section 2, References:

- *NA000403R376 Access Tracks Construction Standards and Specifications*
- NA000403R335 *Manage Access Tracks*. This is the process for inspection and remediation of access tracks

and the following specification:

- 'RSC04 Specification for Clearing and Access Works for Overhead Powerlines'

9.4.2 Data capture and reporting

Work folders containing data on track location and defects detailing land condition, track location, and defects are maintained.

9.5 Contract management

Ergon Energy's effectiveness in managing contracts and driving productivity of contractors directly affects the cost and effectiveness of vegetation management. Suitably trained staff and appropriate levels of resourcing affect the ability to manage contracts.

9.5.1 Contract style

A number of different contract styles were employed by the vegetation program during the regulatory control period 2010-2015:

- Fixed term contracts embracing unit rates for urban areas.
- Fixed term contracts time and materials payment for rural areas.
- Short-term lump sum packages with vegetation assessment carried out by an independent contract scoping company, over discrete geographic areas, with each package valued around $1 million, tendered to a panel of pre-qualified contractors.
- Larger lump sum contracts for the five rural backlog packages, including contractor scoping, which were completed six (6) months ahead of schedule in June 2012.
- Possible Fixed term lump sum contracts for urban or rural areas, pending completion of current tender process being undertaken as of March 2013.

There is ongoing debate both within Ergon Energy and within other DNSPs about the most effective contract style or combination of payment methods. Where there may be savings with one form of contract there may be commensurate increases in overhead costs through increased supervision or auditing costs. Differences in contract styles between DNSPs can also be justified for geographic or legislative reasons, however it is expected that experimentation with different contract styles will continue throughout Australia to determine which arrangement is most effective for each entity's unique geography and legal environment.

Ergon Energy has found through experience that while the current hourly rate style contracts allow a large degree of flexibility in approach to clearance profile design and practices, direct costs are higher than desired and efficiencies are not being realised. The SOR/piece rate style contract within urban areas has worked well and fostered the removal of unsuitable trees over time, reducing ongoing expenditure.

9.5.2 Contract payment

Currently payment claims are submitted on a monthly basis and claims are paid through different means depending on contract style:

- Lump Sum = the percentage of treatment complete of each Vegetation Zone. Whereby the percentage complete is calculated by dividing the number of spans complete by the total number of spans in the Vegetation Zone, or;
- Hourly / SOR = on completion of all work required in a Works Order / Separable Portion, including inspection, treatment and treatment audit.

A 'Non-Compliance Liability Period' applies to all work done by the Contractor. This is for a period of 12 months and commences from when an Ergon Energy VMO is satisfied that the required work has been completed. Any vegetation that enters, or will enter, the Clearance Space during the 12 months is deemed non-compliant and must be rectified by the Contractor at their own cost.

9.6 Program management

9.6.1 Ellipse database management

Planning, scheduling and tracking of the vegetation zones that must be inspected and treated within each financial year is carried out using the Ellipse system as per Ergon Energy *Standard for Managing Developing and Amending Preventative Maintenance Plans (STNW0253)*. The use of Ellipse in relation to the Tree Management Database (TMD) and the steps involved in the Inspection and Treatment process is detailed within the *Standard for Managing Vegetation Management Preventative Maintenance (STNW0607)*.

Increased emphasis has been placed on using the Ellipse System to schedule and manage maintenance programs with sole reliance on Ellipse now expected of Ergon Energy vegetation and access track management staff.

Direct and overhead vegetation management costs are captured and reported from Ellipse via work orders as per Maintenance Reference NA000403R428 'Updating Vegetation Work Orders in Ellipse', and average treatment costs (based on historic costs) are manually attributed to Vegetation Zone Equipment Name Plates for the purposes of budget forecasting.

It is expected that sole reliance on Ellipse by contract managers should force staff to enter accurate information into the system and stimulate identified inaccuracies to be reported and corrected. Some data issues exist and relate to inaccuracies in the Smallworld spatial system. Further work will be required to negotiate improved data quality with Network Data group to ensure that asset spatial data is up to date and fit for purpose.

Developments associated with ROAMES data provision and feedback are expected to influence the movement of information in and out of Ellipse, including the capture of more detail from the TMD into Ellipse or ROAMES on aspects such as treatment methodology used in hourly rate work. Currently only basic treatment information is captured within Ellipse, preventing detailed analysis and addressing of cost drivers. ROAMES will also improve the accuracy of overhead network modelling.

9.6.2 Vegetation management database

In its current state, the Vegetation Management Database – or Tree Management Database (TMD) as it's otherwise known – is an Oracle-based system which acts as the interface between the Contractor and Ergon Energy as a depository for all inspection and treatment information captured as part of the Vegetation Management program. It is also supposed to be the depository for audit information. Current criticisms of the TMD include the slow speed at which information is entered and extracted, and its limited ability to be a true management system in terms of reporting functionality and user friendliness. There is currently no automated connection between the TMD and Ellipse for the transfer of important treatment information (other than total costs) that can be useful in future planning and budgeting, however a SPARQ Continuous Improvement Request is currently in development to ensure this capability is realised.

Collection of data relating to inspection and treatment is specified within Ergon Energy *Standard for Vegetation Management Data Collection (STMM001)* and is required under current contract specifications. Detailed historical data collection since 2006 allows Ergon Energy to analyse trends and averages and confidently predict future vegetation treatment workloads and associated expenditure.

9.7 Communication

9.7.1 External communication

Apart from notification letters deposited in customers' letter boxes prior to Ergon Energy vegetation management Contractors undertaking treatment operations on the customers' property, communication of the objectives of the vegetation program, and general community engagement, is done through the Plant Smart program. The Plant Smart program is delivered by Greening Australia under a Contractual Agreement to promote awareness of the danger surrounding trees in contact with the Ergon Energy network, as well as to advise on appropriate trees to plant near overhead power lines. Councils, plant nurseries and schools are involved. There is also a technical component to the program, which investigates new vegetation treatment technologies and reviews existing practices to preserve low growing and endangered plant species.

Questions surrounding the cost effectiveness of the plant smart program resulted in formal review of the Agreement in October 2012. Cost effectiveness is difficult to quantify when measuring the effectiveness of such an education program, however direct expenditure savings are being pursued throughout Ergon Energy and so the program's future must be assessed based on known expenditure and savings.

9.7.2 Customer complaints

Reported customer complaints are recorded, and managed using the Ergon Energy FACTS system. Monthly reports are generated from FACTS and distributed to Ergon Energy staff involved in the management or supervision of the vegetation management program.

The charts Figure 3 and Figure 4 extracted from FACTS in January 2013, show that complaints have generally decreased in frequency since 2008-09 and the majority of complaints stem from failure to remove debris and manner trimmed. The charts also show that Far North (FN) is the worst performing district, consistently recording the highest number of complaints.

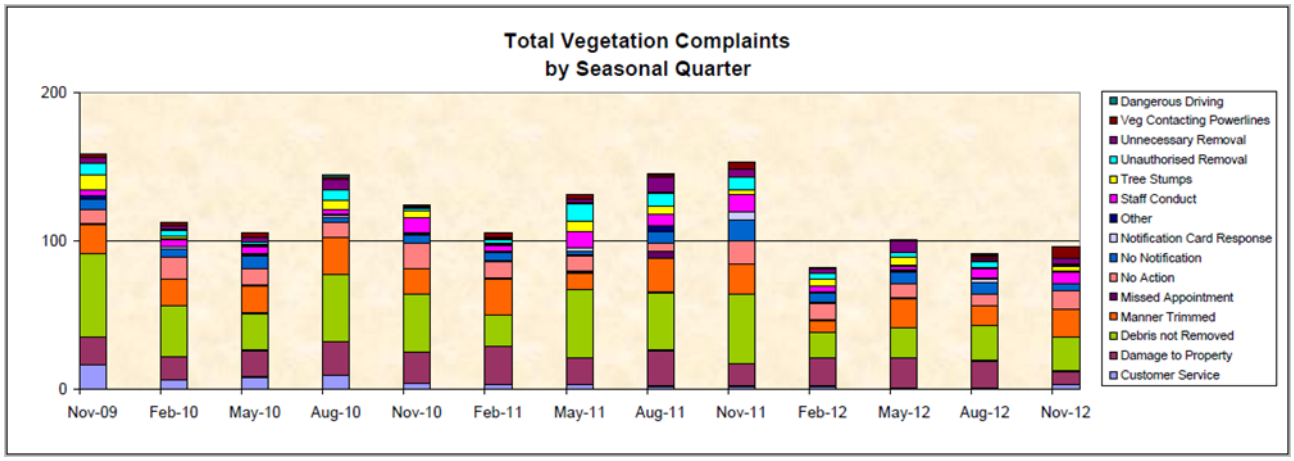

Figure 3 Vegetation Management Complaints by Category

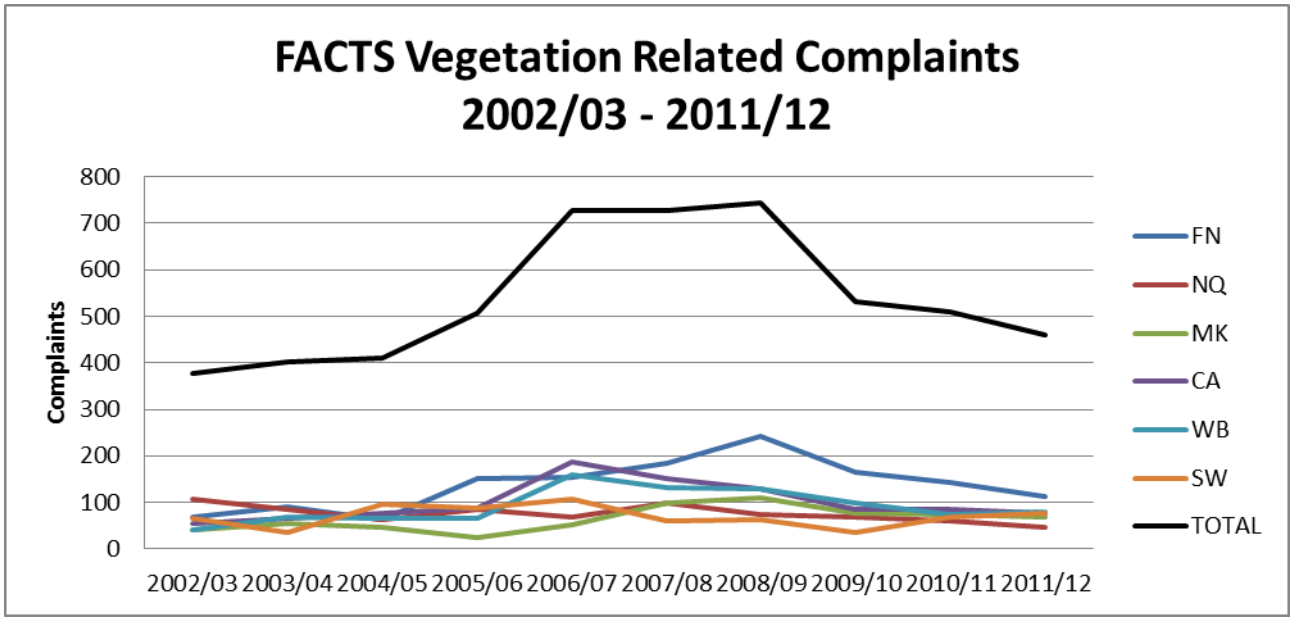

Figure 4 Summary of vegetation related complaints 2002-03 to 2011-12 (Source: FACTS)

Figure 4 illustrates the recent history of complaints in relation to the vegetation management program. In 2005-06, the available budget for the vegetation program increased by approximately 50%, which allowed for more of the network to be cleared of vegetation. As the public had not been exposed to power line vegetation management for a number of years in many areas, this increase in vegetation management drew many complaints. As Ergon Energy vegetation management treatment has become more regular and cyclic, the public have become more aware and accepting of the need for maintenance of vegetation clearances around power lines, which has helped lead to a decrease in complaints.

Relevant staff are responsible for addressing complaints and to 'close out' the complaint record within set time frames. Complaints are generally addressed and closed out within one to two days.

FACTS - VEGETATION MANAGEMENT
All Feedback Types (Complaints, Inquiries, Compliments)
January 2013

Region	District	Subclass	Unresolved Start Month	Created in Period	Response Required	Response on Time	% Response on Time	Avg Days Response	Resolved in Period	Resolved on Time	% Resolved on Time	Avg Days Resolved	Unresolved End Month
CR	CA	Debris not removed		1	1	1	100.0%	1.0	1	1	100.0%	1.0	
		Manner trimmed		3	3	3	100.0%	0.7	2	2	100.0%	0.0	1
		Staff Conduct		1	1	1	100.0%	0.0	1	1	100.0%	1.0	
	CA	Total		5	5	5	100.0%	0.6	4	4	100.0%	0.4	1
	MK	Manner trimmed	1					0.0	1	1	100.0%	3.0	
		No notification		1	1	1	100.0%	1.0				0.0	1
	MK	Total	1	1	1	1	100.0%	0.5	1	1	100.0%	1.5	1
CR	Total	Total	1	6	6	6	100.0%	0.6	5	5	100.0%	0.7	2
NR	FN	Damage to property		1				0.0				0.0	1
		Manner trimmed		4	4	4	100.0%	0.3	4	4	100.0%	1.0	
		Staff Conduct		1	1	1	100.0%	0.0	1	1	100.0%	1.0	
	FN	Total		6	5	5	100.0%	0.2	5	5	100.0%	0.8	1
	NQ	Debris not removed		2	2	2	100.0%	0.0	2	2	100.0%	0.0	
		Manner trimmed		1	1	1	100.0%	0.0	1	1	100.0%	0.0	
		No action		1	1	1	100.0%	2.0				0.0	1
		Unnecessary Removal		1	1	1	100.0%	0.0	1	1	100.0%	0.0	
	NQ	Total		5	5	5	100.0%	0.4	4	4	100.0%	0.0	1
NR	Total	Total		11	10	10	100.0%	0.3	9	9	100.0%	0.5	2
SR	SW	Customer Service		1	1	1	100.0%	0.0	1	1	100.0%	1.0	
		Debris not removed		4	4	4	100.0%	1.0	4	4	100.0%	0.8	
		Manner trimmed	1	1	1	1	100.0%	0.0	2	2	100.0%	7.5	
		No action		1	1	1	100.0%	1.0	1	1	100.0%	1.0	
	SW	Total	1	7	7	7	100.0%	0.6	8	8	100.0%	2.5	
	WB	Customer Service		1	1	1	100.0%	1.0	1	1	100.0%	1.0	
		Debris not removed		1	1	1	100.0%	1.0	1	1	100.0%	1.0	
		Manner trimmed		1	1	1	100.0%	2.0	1	1	100.0%	1.0	
		Notification Card Response		1	1	1	100.0%	2.0	1	1	100.0%	2.0	
	WB	Total		4	4	4	100.0%	1.5	4	4	100.0%	1.3	
SR	Total	Total	1	11	11	11	100.0%	0.9	12	12	100.0%	2.1	
OTHER													
	OTHER	Total											
WOB	Total	Total	2	28	27	27	100.0%	0.6	26	26	100.0%	1.2	4

Figure 5 Example of monthly vegetation management related complaints resolution statistics

9.7.3 Internal communication

Beyond being visible within Ergon Energy, communication between those involved either directly or indirectly with the vegetation program can be improved. There are a number of ongoing issues which are causing increased vegetation management costs, such as capital expenditure works done on new and upgraded lines not being done to standard and overly strict EMP requirements preventing the use of efficient practices and cycle times.

9.7.4 ROAMES

ROAMES (Remote Observation Automated Modelling Economic Simulation) is an aerial-based LiDAR program aimed at improving efficiency and reducing the cost of the Ergon Energy vegetation management program through the provision of timely and highly accurate information on vegetation condition.

As of February 2014, ROAMES has flown and captured data for the entire overhead network. The data can be used to conduct post-treatment audits of vegetation clearances, and will also start to be integrated into the vegetation management Contractors' inspection and treatment process to begin evaluating how effective ROAMES could be to drive inspection, treatment and auditing efficiencies.

Having made significant developments in technology, ROAMES has great potential to provide the following services required for full integration into the vegetation management program:

- Vegetation growth rate measurement
- Vegetation growth projection
- Accurate conductor swing and sag modelling
- Determination of herbicide 'kill' rates
- Plant species identification
- Risk assessment
- Work prioritisation for efficiency
- Management recommendations

9.7.5 Engineering solutions in high vegetative growth areas

Engineering solutions refer to vegetation management alternatives where the network design, for long-term cost or safety reasons is altered to prolong vegetation management cycle lengths or remove the need for ongoing vegetation management all together.

In high vegetative growth locations, such as rainforests, coastal areas, and some urban streetscapes, vegetation management costs are typically much higher than the network average and cycle times need to be shorter to ensure safe clearances are maintained. This high cost and frequent treatment can mean that engineering solution alternatives are sometimes more cost effective than ongoing vegetation management.

Ergon Energy pursues engineering solutions wherever it is deemed prudent or necessary for safety, cost, or reliability reasons. As an example; Ergon Energy is currently trialling the use of insulated High Voltage lines in the Toowoomba urban area as a way to improve safety and reduce vegetation treatment impact on historic street trees.

9.8 Safety

9.8.1 Worker safety

Ergon Energy follows and instructs its contractors to follow the provisions of Chapter 7 of the Code of Practice for Working Near Exposed Live Parts – Electrical Safety Act 2002 as a minimum safety standard for managing vegetation near overhead lines, with workers also required to abide by Ergon Energy Standard for Vegetation Worker Clearances (STOP002).

Current safety performance of workers contracted to Ergon Energy is high, with low rates of lost time injuries and other safety performance indicators.

9.8.2 Bushfire safety

Ergon Energy's principle legal obligations are determined through the *Electricity Act 1994* and the *Electrical Safety Act 2002*. Ergon Energy also has an obligation under *section 148 of the Electrical Safety Regulation 2002*, to ensure that trees and vegetation are trimmed and other measures taken, to prevent contact with an overhead electric line forming part of its works that is likely to cause injury from electric shock to any person or damage to property.

Since the catastrophic Victorian 'Black Saturday' bushfires of 2009, there has been increased pressure for electrical DNSPs such as Ergon Energy to provide greater reassurance to the public that all practicable efforts are made to prevent the ignition of bushfires. While the risk of such catastrophic fires occurring within Ergon Energy's network area is much lower than in other regions of Australia, Ergon Energy has a responsibility to manage any bushfire risks associated with its network.

The legal obligations relating to bushfire mitigation are not specific and flow on from the obligations of the electricity entity to ensure that its works are:

- Electrically safe
- Operated in a way that is electrically safe.1

The Fire and Rescue Authority Act 1990 provides for the management and control of fire in Queensland and gives authority to persons to exercise management and control over fire. In some cases the land management activities of landholders affected by this Act, such as hazard reduction burning, may impact on the potential for bushfires to start or may have some effect on Ergon Energy's vegetation management program.

It is the strategic vision of the 'Ergon Energy Bushfire Mitigation Strategy' (SGNW0003) that Ergon Energy meets its legal obligations and that all reasonable measures are taken to mitigate the risk posed by the overhead network to bushfire ignition, as well as from bushfires to the network. While historical incident records relating to bushfires affecting, or being started by, the Ergon Energy network show a low level of risk exposure to bushfire, there was a dramatic increase in incident numbers during 2011-12 and into 2012-13. This has led to an increased focus on bushfire safety.

For more information on Ergon Energy's bushfire mitigation initiatives refer to the 'Ergon Energy Bushfire Mitigation Strategy' (SGNW0003).

[1] *Electrical Safety Act 2002.* Section 29 Obligation of an electricity entity.

Table 8 Summary of Fire related Dangerous Electrical Events (DEE) (Source eSafe December 2012)

Classification	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total
Bushfire	6	40	16	14	6	13	15	7	97	**214**
Pole top Fire/Insulator Leakage	11	2	14	9	14	13	5	42	10	**120**
Grass Fire	3	4	3	1	2	10	6	13	55	**97**
Lightning	0	2	2	4	1	1	2	15	1	**28**
Other	0	0	0	1	1	1	2	6	1	**12**
Tree	0	1	1	2	2	0	2	0	3	**11**
Transformer	1	3	2	0	0	0	1	3	0	**10**
Cane Fire	1	2	1	2	0	1	1	0	0	**8**
Tie Failure	0	1	0	1	0	0	0	2	4	**8**
Vehicle/Plant/Tools	1	0	0	0	1	0	1	3	0	**6**
Wildlife	0	0	0	0	0	0	0	6	0	**6**
Clashing Conductors	1	0	3	0	1	0	1	0	0	**6**
Cross Arm Failure	0	0	0	0	0	0	0	3	1	**4**
Fuse	0	0	0	1	0	0	1	0	0	**2**
House Fire	0	0	0	0	0	1	0	0	0	**1**
Lightning Arrestor	0	0	0	0	0	1	0	0	0	**1**
Grand Total	**24**	**55**	**42**	**35**	**28**	**41**	**37**	**100**	**172**	**534**

Ergon Energy monitors the cause and location of bushfire related incidents recorded in eSafe, with any emerging trends relating to vegetation being further investigated. An incident summary is kept, as is a corresponding KML file, designed to be used in Google Earth™ for the purposes of visual overview.

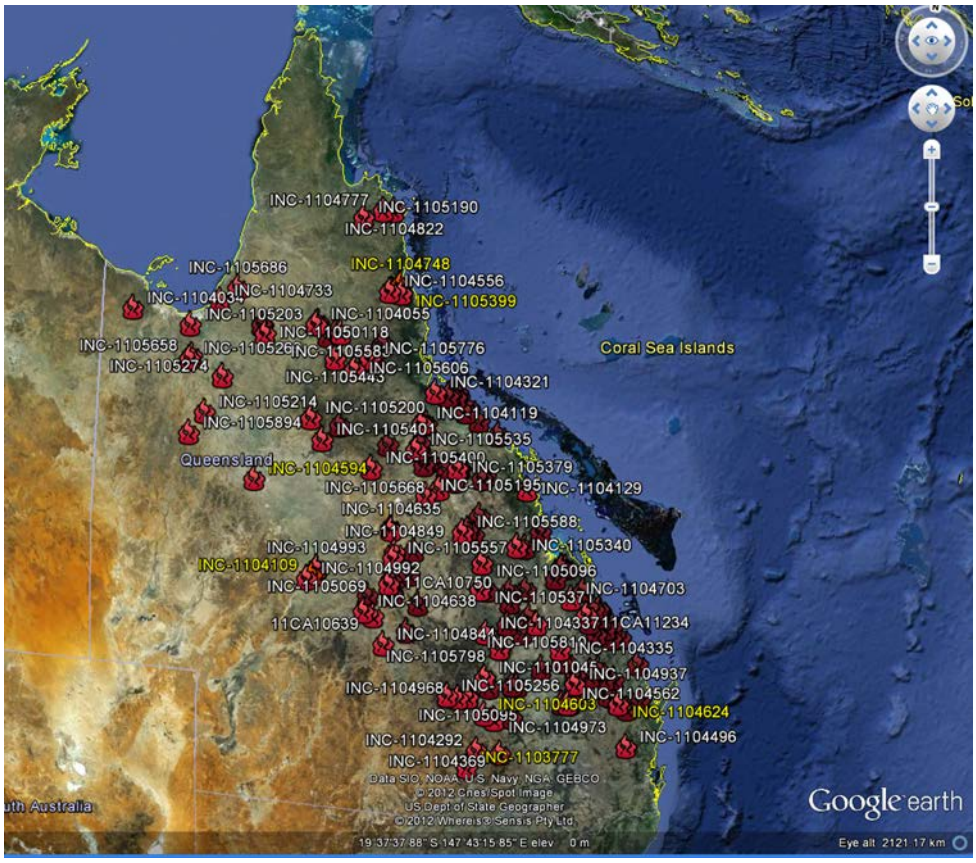

Figure 6 Example image of historical fire related eSafe incidents available in KML format

9.9 Reliability

9.9.1 Outages in Context

Dangerous Electrical Events (DEE) are recorded whenever an asset failure or assisted asset failure occurs and creates a dangerous incident. Vegetation related DEEs are considered 'assisted' failures in that the failure was triggered by a cause external to the network.

When vegetation related DEEs and non-DEE outages are compared to other causal categories, vegetation is only attributable to a small percentage of incidents.

While vegetation may not directly contribute to a large percentage of the total outages experienced by the Ergon Energy network, it does represent one of the few external or 'assisted' outage trigger types (including lightning, vehicle impact, birds and other animals) which can be directly managed.

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9.9.2 Trends in Vegetation Outages

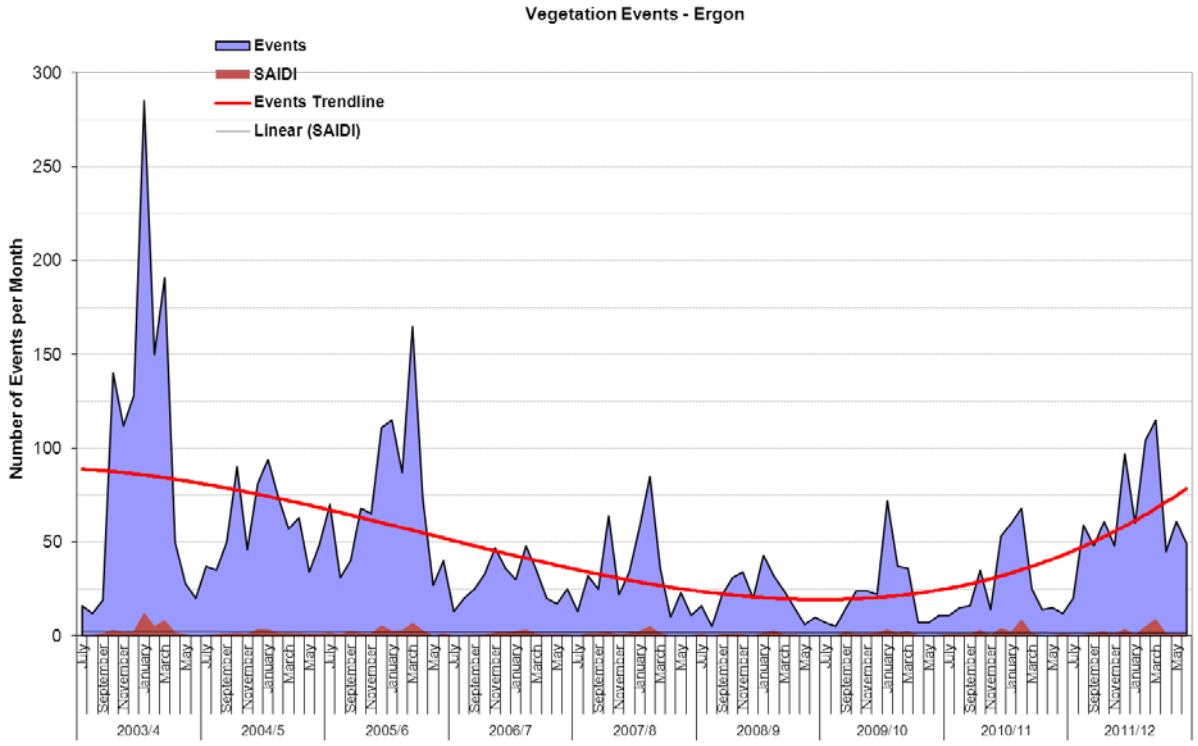

Figure 7 Summary of unplanned outages caused by vegetation incidents

Figure 7 indicates that until 2011, there had been a downward trend in unplanned vegetation incidents, generally attributed to the maturity of the vegetation program and increased control over vegetation in proximity to the network. The increasing trend for 2011-12 can be attributed to the wet season and an above average number of incidents in caused by severe wet and windy weather and trees impacting from outside of clearance corridors.

9.9.3 Vegetation Related Outages by Origin

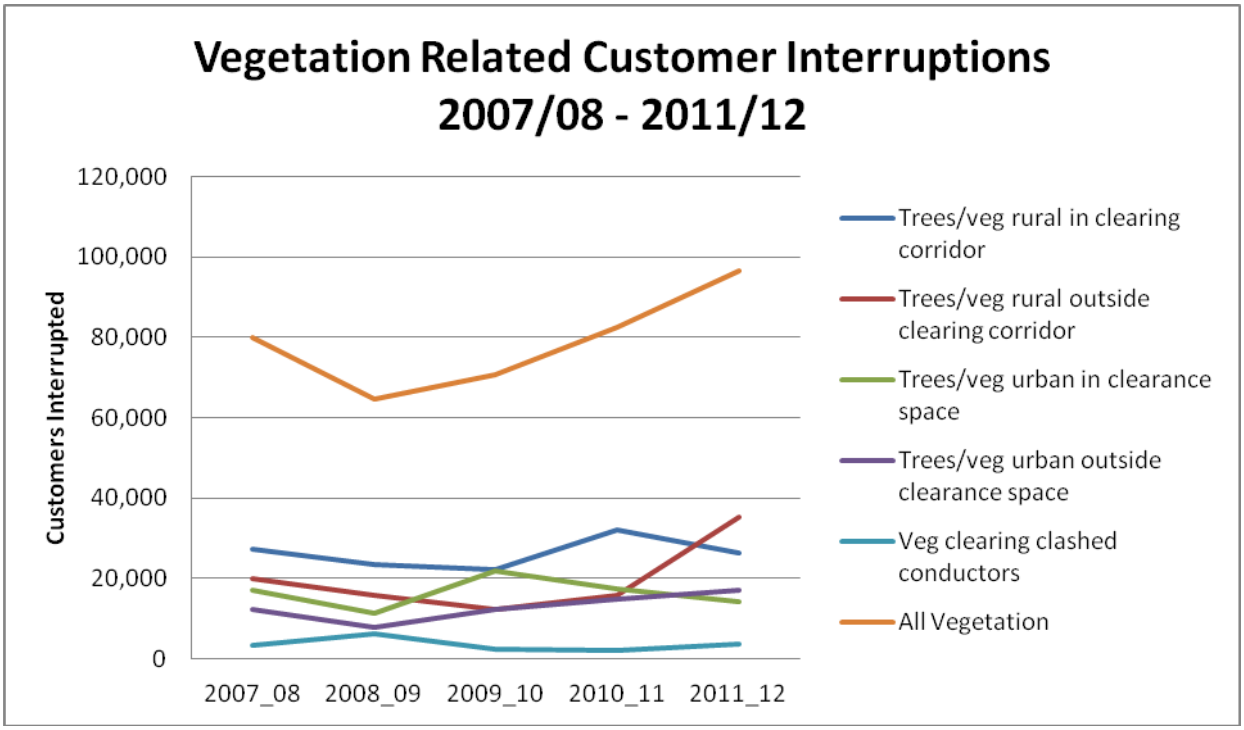

Figure 8 Vegetation Related Customer Interruptions by Category (Source FeederStat Dec 2012)

Increasing numbers of customer interruptions and associated customer minutes since 2008-09 have originated from outside the clearance zone or corridor. This could suggest that while adequate clearances are being maintained around conductors, the identification, and management of hazardous or dangerous trees outside the clearance space and corridor needs improvement or greater emphasis.

9.9.4 Vegetation related outages by district

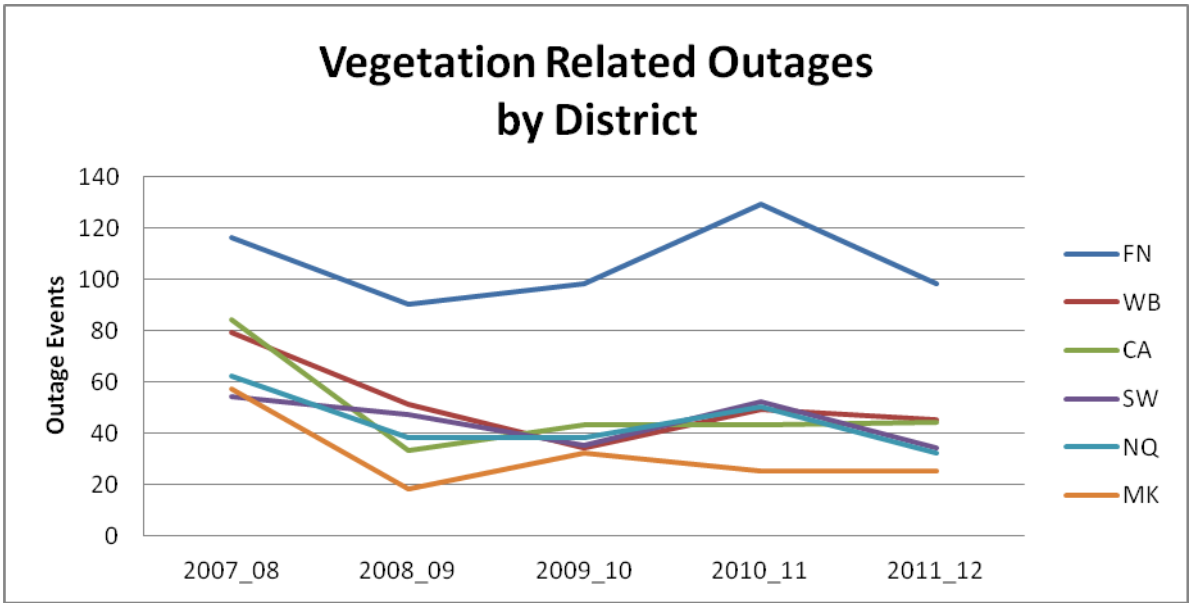

Figure 9 Vegetation Related Outages by District (Source FeederStat Dec 2012)

Comparison of outages caused by vegetation across Districts shows that all Districts exhibit the same general trend in outages indicating that the causality of the outages is constant across the network. However, Far North (FN) is clearly worse performing than other Districts.

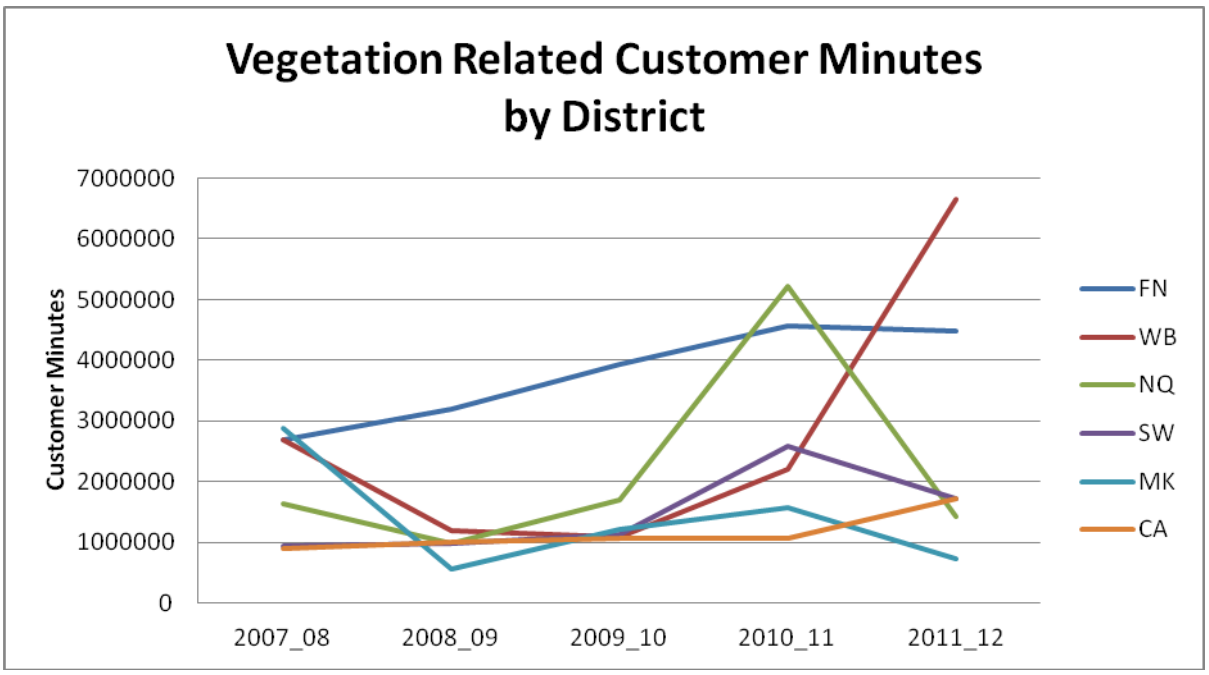

Figure 10 Vegetation related customer minutes by district

Analysis Figure 10 shows that the increase in lost customer minutes since 2008-09 has mainly occurred in Far North (FN) and Wide Bay (WB).

The isolated spike in Customer Minutes lost in North Queensland in 2010-11 is attributable to outages that occurred because of Cyclone Yasi. The ongoing increase in lost minutes in Far North District is in contrast to trends experienced in other Districts, while Wide Bay District experienced a dramatic increase in minutes lost during 2010-11 and 2011-12. Ergon Energy is overcoming vegetation issues specific to the Far North region with tailored management initiatives. Severe weather events across the Wide Bay region during 2011-12, affected the region unfavourably.

9.9.5 Correlation of vegetation related outages with weather and climate

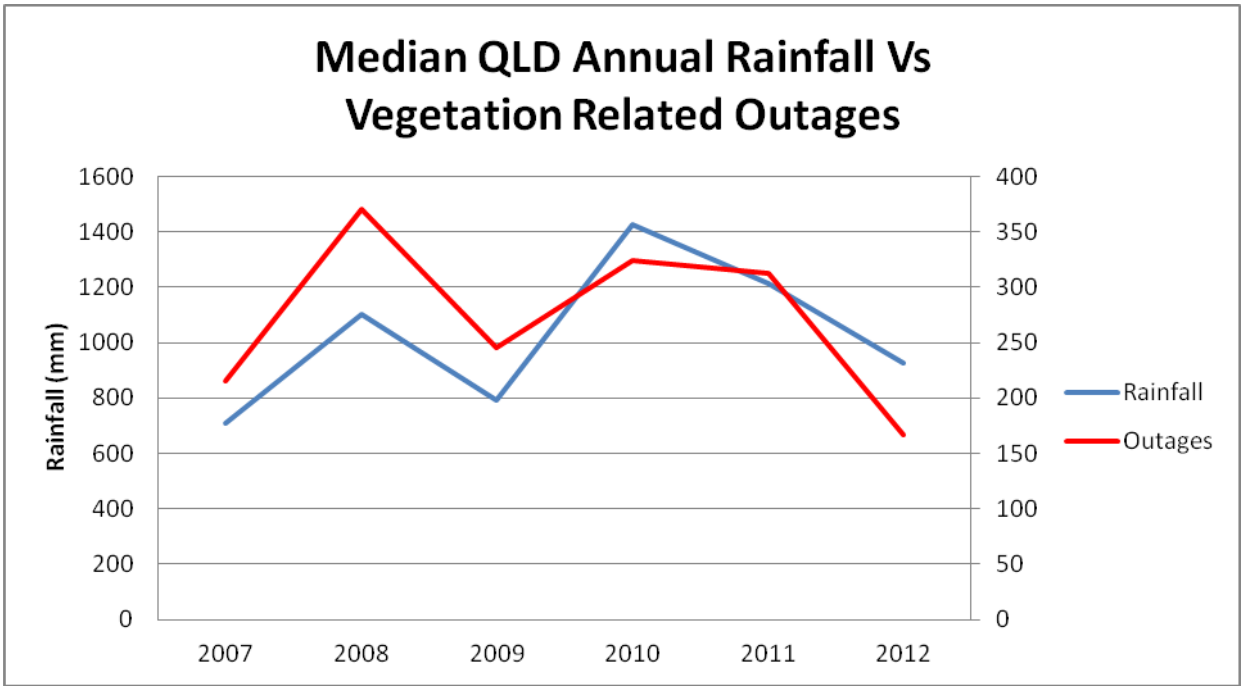

Figure 11 Comparison of trend in annual rainfall against trend in vegetation related outages

NOTE: This trend in outages in this chart is visibly different to the Total Outage Events Chart due to categorisation into Calendar years to align with rainfall observations format.

When frequency of vegetation related outages and changes in rainfall across Queensland are compared year on year, a moderate positive correlation is observed. While correlation does not necessarily allude to causality, when the impact of rainfall on soil saturation and strength is considered and the association of strong winds with storms, Figure 11 illustrates the safe assumption that periods of above average numbers of vegetation related outages will coincide with above average rainfall.

9.9.6 Correlation of vegetation-related outages with vegetation condition

Further research must be conducted into risk exposure of poor performing line location to vegetation condition to detect if exposure to higher than average numbers of ‘danger’ trees or other vegetation forms influence vegetation related outages in these locations.

In some locations, such as Kuranda in Far North District, whole-tree failure of ‘danger’ trees occurring outside the clearance profile has been recorded as a significant cause of outages. This is typical of such high density vegetation found in mature rainforest areas. The origin of these tree failures, from outside the corridor, is supported by incident analysis undertaken.

When comparing vegetation density information captured from Queensland Statewide Landcover and Trees (SLATS) across Ergon Energy Districts, it is evident that the poor performing Far North and Wide Bay districts have higher than average proportions of moderate to heavy density surrounding the network.

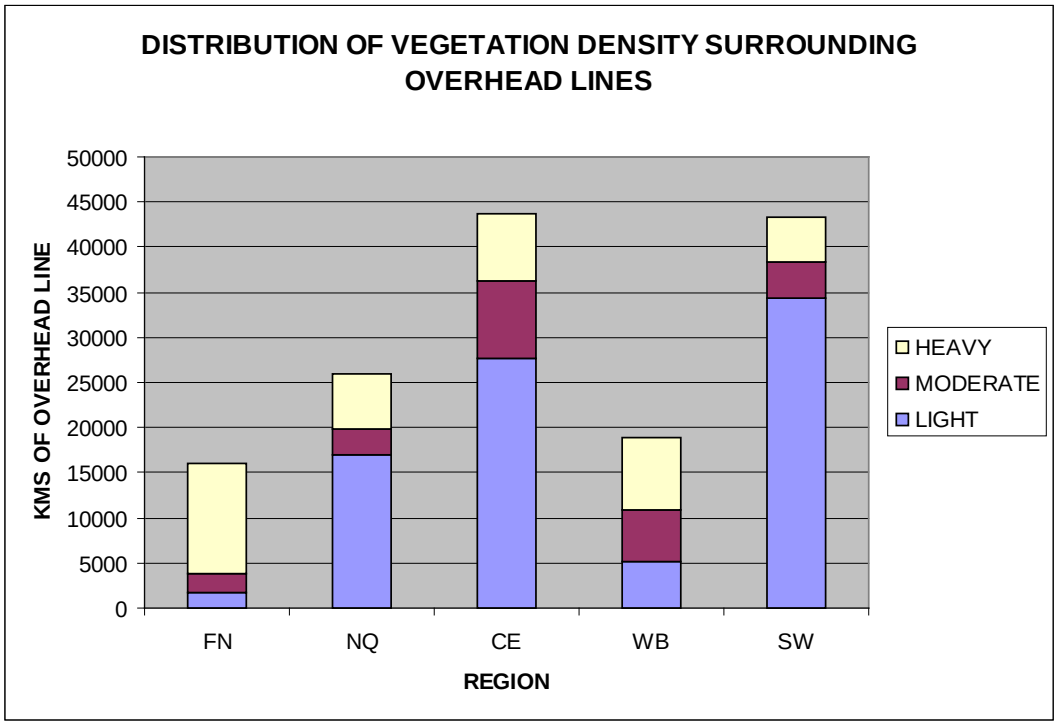

Figure 12 Distribution of vegetation density surrounding overhead lines

ROAMES will provide similar information in terms of relative exposure to trees capable of contacting the line upon tree failure, as well as total vegetation within clearance, and will be used to map risk exposure.

9.10 Legislation and other legal requirements

The main legal responsibilities applying to the safe management of vegetation are contained within the *Electrical Safety Act 2002,* the *Electrical Safety Regulation 2002*, and the *Electricity Act 1994*. The safety of workers engaged on vegetation management work is also covered by the *Work Health and Safety Act 2011* and the *Work Health and Safety Regulation 2011*. Actions related to the removal of vegetation are responsible to the *Environmental Protection Act 1994*, *Nature Conservation Act 1994*, *Vegetation Management Act 1999*, and the *Commonwealth Environmental Protection Biodiversity Conservation Act 1999*.

9.10.1 Clearance requirements

Ergon Energy is required to maintain a safe and reliable network, however no specific clearance distance requirements between vegetation and the network currently exist in legislation or regulation. The legal requirement under *section 148 of the Electrical Safety Regulation 2002* to maintain safe clearances between vegetation and power lines:

'An electricity entity must ensure that trees and other vegetation are trimmed, and other measures taken, to prevent contact with an overhead electric line forming part of its works that is likely to cause injury from electric shock to any person, or, damage to property.'

9.10.2 Declared plant (weed) management

Under current legislation relating to declared plant (weed) management 'Land Protection (Pest and Stock Route Management) Act 2002' and the associated Regulation (2003), Ergon Energy's obligations vary in extent dependant on whether or not Ergon Energy owns the land on which the power line is built or only has rights of access under a way-leave. Ownership of the land infers more responsibility on Ergon Energy, and increases declared plant management costs. However, costs are also escalating in relation to land not owned by Ergon Energy through increased awareness of landowners requesting machinery wash downs when entering properties and financial assistance for outbreaks claimed to have been started or exacerbated by Ergon Energy Staff or Contractors passing through the property.

Management of risks associated with declared plant management is detailed within Ergon Energy's 'Weed Management Strategy' (SGMM001) and Ergon Energy's 'Management of Declared Plants Guideline' (ES000904R120).

9.10.3 EVNT species management

In Queensland, all native plants and most native animals are protected under the Nature Conservation Act 1992. The Act classifies and defines protected species into the following categories, depending on the population size and distribution and the impact of threatening processes:

- Extinct in the Wild (X)
- Endangered (E)
- Vulnerable (V)
- Near threatened (NT)
- Least Concern (LC).

Protected species are also classified under Commonwealth legislation; principally, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Ergon Energy has an exemption under *Section 41(1)(a)(ii) of the Nature Conservation (Protected Plants) Conservation Plan 2004,* however this exemption expires in June 2013 and it is understood that the Conservation Plan will be rescinded. Negotiations have commenced with the Queensland Parks and Wildlife Service to ensure that power line maintenance operations can continue without undue restrictions where EVNT species occur.

Ergon Energy conducts surveys for EVNT plant species on its easements through the Plant Smart program. No additional EVNT species have been reported in searches during recent years, and resources have been produced to assist contractors in recognising these species in known locations.

Ergon Energy is currently developing EVNT Species Management Guidelines to be introduced prior to 2015. The Guidelines are being developed in collaboration with Greening Australia as part of the Plant Smart program, and will incorporate general prescriptions, risk mitigation measures, and spatial overlays to be used in Geographic Information System (GIS) software and Google Earth for viewing likely locations of EVNT species.

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9.10.4 Environmental management plans

Normally power lines are not constructed in protected areas such as National Parks however through changes in land tenure increasing the area of the protected estate, there are now a number of lines passing through National Parks and State Forests.

Table 9 Line and cable length (km) within protected areas

	Northern Region	Central Region	Southern Region	Grand Total
Conservation Park	6.29	15.78	10.16	**32.22**
Forest Reserve	9.70	13.39	1.80	**24.89**
National Park	309.87	128.60	216.93	**655.41**
Resources Reserve	4.84	13.06		**17.90**
State Forest	26.68	203.81	548.56	**779.06**
Timber Reserve	4.44			**4.44**
Other Reserves	9.56	14.13	14.13	**31.66**
Grand Total	**371.39**	**388.77**	**785.41**	**1545.57**

The maintenance of electricity corridors has the potential to impact on these protected areas in a number of ways. These can potentially include: habitat loss, habitat fragmentation, reductions in populations of threatened plant and animal species, creation of edge effects and linear barriers, ongoing vegetation control, weed establishment, visual amenity impacts, erosion and sedimentation of watercourses stemming from access requirements and are a potential source of wildfire.

These impacts can be managed and mitigated by adopting a number of best practice strategies and standards. The Queensland Electrical Supply Industry (QESI) has made a commitment to ensure that environmental management of electricity infrastructure in Queensland's parks and forests achieves best practice standards through the implementation of a Code of Practice and the production of Environmental Management Plans for the areas where power lines pass through these areas.

Ergon Energy currently has approximately 270 EMPs in place with land managers to ensure Ergon Energy practices meet land managers expectations in sensitive areas (such as reserves). Ergon Energy is committed to meeting obligations under these EMPs, however this can be at considerable cost to expenditure due to frequency and type of treatment required.

9.11 Expenditure

Ergon Energy's direct expenditure on the vegetation management program has fluctuated over the previous 10-year period. Inclusion and completion of the backlog and the continued focus of efforts to use vegetation treatment methods that ensure decreased ongoing maintenance costs has resulted in successful decrease in overall expenditure.

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9.12 Impacts on Expenditure

Beyond direct control over treatment methods, clearance profile and contract management, other influences can affect expenditure on the vegetation management program. Instances of poor quality initial vegetation clearing for new line construction is causing escalated costs at first maintenance cycle. These costs can sometimes be quite significant to establish secure line corridors and actions are in progress to ensure implementation of vegetation management standards to all new line construction. The style and commitments under contractual agreements with service providers, such as vegetation management contractors and spatial information also impacts on expenditure with improvements in both areas producing positive results.

Hourly rate style contracts have inherent efficiency issues in managing workforce productivity and lump sum style contracts can prevent flexibility of work schedules and reduced ability to further drive down costs. The provision of spatial information from third parties (e.g. ROAMES) and the timeliness and accuracy of its delivery can either improve or hinder any efficiencies found in vegetation management contracts. Hindrance of this form can occur as information is provided either too early or too late from planned treatments, is too inaccurate or is in a format which requires too much interpretation or is not compatible with existing technology or processes.

10 Future state

10.1 Inspection

10.1.1 Urban

While the current Urban Inspection process is heavily reliant on manual assessment by a 'scoper' driving around all streets within each Vegetation Zone, the future state of this process will involve limited manual 'scoping', with almost all inspection using ROAMES or other remote sensing technology. While the 'scoper' undertakes negotiation for removal of unsuitable trees under the current process prior to the treatment, it is envisaged that in the future state, the treatment crew will identify unsuitable trees for removal in the next treatment cycle. Communication with owners of trees identified for removal will need to be automated as much as possible to ensure efficiencies are gained while customers are aware of the need for removal and are as understanding as can be expected.

Bulk mailing of letters and educational material to all properties containing trees requiring trimming will be considered, along with the creation of an online system where customers can enter a unique code or PIN and understand which tree(s) must be removed or what work must be done on their property. In this option, customers would have the ability to leave feedback, negotiate management options or request additional communication.

10.1.2 Rural

As with the Urban Inspection process, Rural Vegetation Zones are currently 'scoped' through labour-intensive methods, representing around 10% of the total cost of vegetation management. The Future State will be characterised by greater automation of the Inspection process, with 'scoping' being completed utilising ROAMES or similar remote sensing technology.

In the interim, where automation of the Inspection process is not possible due to immaturity of the ROAMES technology, visual imagery and basic data capture will be used to more efficiently guide 'scopers' to vegetation requiring attention and to volumes of work required.

10.2 Treatment

10.2.1 Treatment methods

Methods of treatment in both urban and rural areas will continue to be chosen on principles of Integrated Vegetation Management (IVM). A principle of IVM is to select the most appropriate treatment methodology to ensure a cost effective long-term sustainable management program. Choice of vegetation treatment methods shall be based on what is the best way of achieving this goal, and as such should be approached as a long-term solution and not just an immediate fix. Selective herbicide treatments will continue to be the treatment method of preference.

10.2.2 Treatment cycle length optimisation

In order to achieve the maximum return on investment in the vegetation management program, treatment cycle lengths will be adjusted to the point before which any further extension would result in an increase in treatment costs over the whole cycle length. While this may require that the treatment cycle length is shortened in some locations, it is expected that most Vegetation Zones which have not already been extended in recent times can have their cycle lengths extended.

While electricity supply reliability requirements will impact on the minimum level of vegetation management required, the clearance dimensions specified in the *Standard for Vegetation Clearance Profile (STNW0602)* will continue to be used to manage vegetation related risk exposure.

In locations where vegetation related risk exposure is deemed to be unacceptable in terms of reliability by Ergon Energy or a Regulator, Ergon Energy will source all available information to identify which aspect is causing the unacceptable risk impact. Once a non-compliant impact on reliability is identified, Ergon Energy will implement changes to the affected Vegetation Zone(s) clearance profile and/or cycle length to return reliability to acceptable levels.

Through the use of ROAMES provided data, Ergon Energy will be able to identify which Vegetation Zones have significantly higher than average exposure to vegetation related risk aspects such as overhanging branches, ‘danger trees’, and non-conforming clearances between trees and power lines. Once identified, Vegetation Zones with significantly higher than average amounts of overhanging branches or trees capable of impacting on the network due to stem failure (i.e. ‘Danger trees’) will require a review of previously applied treatment methods and clearance profile for possible causal factors and action.

This review of previous treatment methods and clearance profiles as a result of increased available information on risk exposure of the network could lead to development of new treatment cycle styles, with inter-cycle treatments, ground crew only treatments, or targeted removal of identified factors otherwise restricting cycle lengths and realisation of further savings, reliability or safety. Further optimisation reflects better management of risk factors and should result in decreased expenditure in the long term.

Ergon Energy has not been recalculated the original basis of the variable treatment cycle length program, the Normalised Difference Vegetation Index (NDVI) for Vegetation Zones since its first use in 2009. Ergon Energy will review any changes in the long-term average NDVI for the areas covered by its network and assess any anomalies for possible impact on treatment cycle lengths. This process of NDVI revision will be documented in a standard in an effort to record methodologies used and promote frequent revision of any anomalies in vegetation greenness, which could represent a significant change in growth rates and a need for change in treatment cycle lengths or methods.

Consideration will be given to the development of a software-based treatment cycle length optimisation tool. Such a tool will take in all quantifiable values related to inspection and treatment costs, vegetation growth rates, clearance profile dimensions, physical restrictions on treatment methods, outage costs and more. From these values, the tool will assist Ergon Energy to determine the optimum treatment cycle length for each Vegetation Zone, and the subsequent format of the delivery of treatment works. A business case will be prepared for an exploratory feasibility study for the possibility and value of such a tool.

10.2.3 Clearance profile design

In the future state, where ongoing reliability is deemed to be unacceptable, options will be explored to change the design of the standard rural corridor clearance profile. This includes possible review of clearance dimensions and design. Greater understanding of the overall exposure to risk from tree and branch failure (and other factors), and more accurate reporting of outage incident causes, will allow for tailoring of clearance profiles in specific locations where needed to address a known unacceptable risk.

The display and interpretation of the Clearance Profile will likely also change as ROAMES is further integrated into Ergon Energy processes, with the Clearance Profile diagrams and language set to change.

In order to ensure long-term cost effectiveness, Ergon Energy favours the extension of treatment cycle lengths rather than reduction in clearance profile as the preferred means of cost management. In this manner, maximum clearance space is maintained for minimum cost.

10.2.4 Non-chemical treatment methods

Increased pressure from land management agencies to reduce chemical use in sensitive areas and growing apprehension of elements of the public to herbicide use is a significant risk to the cost effectiveness of the vegetation management program. Current non-chemical alternatives are often either comparatively too expensive to herbicide application methods, or are not long term solutions which facilitate ongoing reduction in expenditure. As such, Ergon Energy is committed to investigating and adopting alternative non-chemical treatment techniques where cost effectiveness and long term sustainability are able to be demonstrated. Where new chemical herbicides are introduced which further reduce environmental exposure to chemicals, such options will also be explored.

10.2.5 Clearance of new or upgraded lines

The ‘Specification for Clearing and Access Works for Overhead Powerlines’ (RSC04) and the *Access Track Construction Standards and Specifications (NA000403R376)* apply to all new access track construction associated with Capital works projects.

Land Management staff will have oversight of new line construction processes related to vegetation and access tracks. Land Management staff will take the role of the ‘Liaison Person’ as described within ‘RSC04’. If the extent of this role subsequently changes, ‘RSC04’ will undergo revision.

The future state for new line clearing sees adequate supervision of all vegetation management works, resulting in a reduction in ongoing maintenance costs, improved safety, and reliability maintained.

10.3 Auditing

Auditing of the vegetation management program continues to be carried out as per the Ergon Energy 'Vegetation Management Auditing Guidelines' (NA000403R384). Ergon Energy will have developed a functional non-conformance management system that facilitates an improvement in accuracy and occurrence of non-conformance reporting. The successful development and integration of ROAMES into the business has allowed increasingly for audits to be completed from the office and facilitates a greater percentage of work being accurately audited.

ROAMES will be used on a regular basis to capture information only on those spans that were treated within the preceding three to 11 months, to form the basis of a warranty audit. VMOs will still be required to conduct occasional warranty audits on herbicide kill rates, but Contractors will be encouraged to undertake a thorough job through ensuring contract periods extend for multiple cycle lengths and rates of payment would be fixed for the entire period, thereby making it counterintuitive to leave more work for the next treatment.

10.4 Contract Management

Vegetation management contracts are due to expire in the 2015 to 2020 regulatory control period. Ergon Energy will ensure that agreed rates for any new contract will be negotiated to realise expenditure savings. Any increase in contract costs will be countered by driving further program delivery efficiencies to ensure that any marginal increase in total vegetation program is restricted to Consumer Price Index (CPI), minus 1%. This means an ongoing reduction in real term expenditure relative to labour and resource costs. This is considered the minimum acceptable reduction in expenditure, with Ergon Energy committed to reducing expenditure on the vegetation management program to the lowest sustainable level possible.

Significant investment across the network has resulted in the majority of easements readily positioned to become 'mature' and exhibit decreasing or stable vegetation maintenance costs and risk liability. With the completion of all out-of-cycle 'backlog' work during 2012, all areas of the network are now incorporated into a regular vegetation maintenance cycle. While labour costs may increase over time, Ergon Energy believes that better choices of vegetation treatment methods combined with new technologies allowing more efficient scheduling and use of resources will result in decreasing operational expenditure during the regulatory control period 2015-20.

10.4.1 Contract style

All treatment methods used must ensure ongoing maintenance costs will not escalate, and contract styles used will be chosen based on ability to reduce future maintenance costs in that location wherever feasible. Preference for future contract style is for Ergon Energy to pursue a 'span rate' style contract.

All contract styles have their advantages and disadvantages in terms of management required and delivery efficiency. Lump Sum style contracts drive efficiency in delivery, but management oversight and auditing must focus on quality of work and typically tenders are priced at market rate and the style allows for very little flexibility on Ergon Energy's behalf. Hourly style contracts potentially have the opposite effect with a large degree of flexibility, with management and auditing emphasis needing to be placed on ensuring what is being delivered is only that which was required and nothing extra.

As stated, Ergon Energy's preference for future contract style is a 'span rate' style, in which a contractor is paid a set unit rate for completing required work occurring between two overhead network poles. The set unit rate ($ per span) is a flat rate and either reflects work location or volume or a combination. This contract style allows the contractor to have a high level of confidence in the type and standard of work required to be done while also promoting efficiency to complete spans in a consistent fashion to meet schedule requirements, as well as to better self-manage resource requirements. The contractor would typically attempt to complete more work with less staff thereby reducing costs. Ergon Energy benefits from the Span Rate style through controlling how often a span is treated and how many spans are completed during a year, and therefore control how much money is to be spent on vegetation management per year.

10.4.2 Contract payment

Where the current state system of contract payment is reliant on completion of vegetation zones and acceptance of treatment invoices before final payment is processed, the future state contract payments will be based on average proportion of spans completed per month. This will dramatically reduce delays and complications experienced in processing contractor payments, and ensure regular income for the contractor(s), thereby reducing any risk built in to tendered prices. Where work is not completed by the end of the financial year, or other designated time period, monies paid to the contractor for work not completed will be managed through a Key Performance Indicator (KPI) regime and rebates.

10.4.3 Tender process

Through using ROAMES to capture the state of vegetation across the network on a regular basis, potential tenderers will be able to see the total exposure of the network to vegetation and more accurately estimate their potential operating costs, and therefore are more able to submit a competitive tender. This will result in a greater number of tenderers with competitive tender prices, and will drive down costs to Ergon Energy.

Future contract tenders will be required to provide a tendered price for a 'span rate' as well as an hourly rate for works to be conducted outside of designated treatment periods and standards.

For the 2015-20 regulatory control period, Ergon Energy will be seeking one or more companies to deliver its vegetation management program in a way that helps meet the objectives and targets specified in this Strategy. The successful tenderer(s) will need to demonstrate that they understand Ergon Energy's vegetation management philosophy, and specify:

- its own vegetation management philosophy
- any challenges it sees in implementing Ergon Energy's philosophy
- how its technology and processes will dovetail with Ergon Energy's technology and processes;
- any suggestions on how Ergon Energy can optimise vegetation related expenditure.

10.5 Program management

10.5.1 Scheduling

Ergon Energy will continue to encourage contractors to adopt more efficient ways of operating and to have skilled and appropriate staff in strategic locations to carry out work effectively. This will occur through better scheduling of the vegetation management program to reduce fluctuations and uncertainty in workload volumes. Scheduled treatment dates will be aligned to occur at the most efficient timing and will re-trigger at appropriate times to ensure realised efficiencies are secured into the future. This will allow Ergon Energy and its Contractors to structure labour and plant resources to meet workload needs with the understanding that the required labour and plant resources should not need to change too drastically over the coming years.

10.5.2 Program visibility

Performance of the vegetation management program will be available for all internal stakeholders to view and contribute towards. Key Regional stakeholders, such as the RAM Group, will be actively engaged in management of the program, facilitating efficiency through awareness of scheduled vegetation management work in their Region and aligning other maintenance programs or Access work wherever possible.

10.5.3 Vegetation management database

Increased volumes and complexity of data being captured through the integration of ROAMES into existing inspection, treatment, and audit processes requires a vegetation management database with enhanced capabilities over the existing capacity of the Oracle-based Tree Management Database (TMD). Automated links between the database and other related systems such as Ellipse, ROAMES and contractor databases will allow efficient and accurate capture and transfer of information and facilitates prompt reporting and accountability. An element of the annual Vegetation Program Performance Report covers the user-friendliness of such systems and discusses any impedance to business performance. The ideal future state includes a vegetation management database, which does not impede business and facilitates accurate reporting.

Under commitments made within future ROAMES development during the regulatory control period 2015-20, there are commitments to develop or purchase a system to replace the Vegetation Management Database also known as the Tree Management Database (TMD) and achieve these objectives.

It is assumed that the program will continue to be generated out of Ellipse with costs tracking and reporting from Ellipse. The TMD, or its successor, will be the detailed repository for all work scoped and treated and may contain ROAMES data as well as conventionally collected vegetation data. Ideally it will contain the details of all treatment data to enable analysis down to the span level and ultimately individual tree level. To do this it will need to be linked to Ellipse and ROAMES data.

10.6 Communication

10.6.1 External communication

Following review, the Plant Smart program will not continue in its current form into the regulatory control period 2015-20. The vegetation management program does however represent a significant ongoing operation for Ergon Energy, and for many customers the staff and contractors involved in the vegetation program can be the only face-to-face contact with the company in a given year. As such, the program can have a significant impact on the customer's perception of Ergon Energy, and this perception should be positive. Inclusion of the stakeholder communication objectives of the vegetation management program into the Ergon Energy customer engagement and marketing strategies is important for engaging and effectively communicating with customers. Similarly, conveyance of the messages contained in the Ergon Energy customer engagement and marketing strategy to the customer through contractors and staff will result in better understanding by customers and less complaints being submitted regarding the vegetation management program.

Customers and stakeholders will become aware of the goals of the program and the need for regular vegetation maintenance. Preventative education messages regarding which trees not to plant near power lines, previously undertaken by Plant Smart, will be included in core Ergon Energy communications and customer engagement strategies, as well as being communicated directly from plant nurseries through agreements with the Nursery and Garden Industry Australia (NGIA) association and the Utility Arborists Association Australia (UAAA). This will prove more effective as well as less labour intensive (on Ergon Energy's part) and less expensive than the current Plant Smart partnership.

Notification cards will undergo periodic revision to ensure they are effective in notifying and engaging the customer. New notification and communication techniques may be considered upon advice from Corporate Communications or Community Engagement staff.

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Communication between the vegetation management industry, Ergon Energy and the public will be encouraged through corporate membership of the UAAA for appropriate staff, as well as provision of financial support for efforts that facilitate efficient communication and improved professional standards. Corporate membership to the UAAA will expose Ergon Energy staff to education and professional development, while allowing Ergon Energy staff better understanding of issues affecting vegetation management contractors, thereby improving communication and contract management. Provision of financial support to the UAAA will help promote the interests of Ergon Energy through:

- increased professionalism and safety of contractor workforce through facilitation of adequate training and a conduit of safety incident trend analysis
- research into vegetation conductivity and possible reduction in clearance requirements resulting in decreased expenditure needs
- partnerships with the NGIA and other relevant industry bodies for the promotion of awareness of vegetation around power lines for the reduction in required vegetation management expenditure, and improvement in public safety
- benchmarking between Ergon Energy and other DNSPs to identify areas of poor performance relating to the vegetation management program relative to other DNSPs
- communication of alternative vegetation management strategies which foster long term expenditure reductions.

10.6.2 Internal communications

All activities related to the planning, management and delivery of the vegetation management program are covered comprehensively by existing policies, standards, and procedures that are concise and practical. Feedback mechanisms are in place and used to ensure documentation remains accurate and relevant. Oversight of expenditure, and the performance of the vegetation management program, will be made possible through effective working relationships with operational staff and through access to accurate management reporting from ERP systems This oversight allows analysis of issues and trends as they develop to generate new strategies to ensure the program continues to be as cost effective as possible.

Analysis of emerging trends in network performance relating to reliability and safety will be made possible through improved accuracy in incident reporting and categorisation in the Operational Control Centre when incident reports are lodged by the public or Ergon Energy staff members. Issues surrounding poor incident categorisation will be resolved through improved control centre operator training and education. The appropriateness of available reporting categories will also be reviewed when required.

Effective communication between vegetation management staff in different Regions facilitates sharing of ideas and methodologies and assists in delivery of standards and strategies in a consistent format. These benefits will be pursued through regular meetings (both remotely and face to face) and facilitation of travel between Regions for knowledge sharing and professional support.

Staff involved in creating EMPs, EWPs, standards, and relevant business cases will understand the potential ongoing implications and costs associated with the decisions that they make, and they will know the appropriate position or standard.

10.6.3 Customer complaints

Customer complaints relating to the vegetation program should decrease from current levels of an average of 32 complaints per month (Whole of Business) by 25% to an average of 24 complaints per month and remain at this level for the duration of the regulatory control period 2015-20. This will be achieved through successfully targeting elements and locations of the program which lead to complaints with appropriate education and changes in processes and standards where required to better serve the customer.

10.7 Additional activities

10.7.1 ROAMES

ROAMES will be supported and relied upon as one of many tools used for vegetation management, with outputs and required inputs, and feedback mechanisms in place to ensure realisation of all possible financial and resource savings. The agreed services and products provided by ROAMES will be fully integrated into the vegetation program and will be used to provide improved precision in respect to asset information, improve data quality and to improve our vegetation management program. The main benefit from ROAMES will come from reduced scoping costs and timely data on vegetation condition.

Once sufficient and reliable data has been captured and modelled using ROAMES, it is envisaged that greater reliance will be placed on ROAMES for risk management and scheduling of vegetation treatment and providing an improved auditing capability.

Full integration of ROAMES into the vegetation management program will occur once information on the extent and location of tree species, hazardous trees, growth rates and other supporting information such as access track location is provided to Ergon Energy in an accurate and practical format. Agreements between Ergon Energy and ROAMES will outline how this will occur. This additional information will help drive the vegetation management program to become more of a risk-based and optimised program.

10.7.2 New line route design

Regular communication of the implications of new line route selection on recurrent vegetation management cost with relevant staff will occur. Through this communication process, it is intended that preference will be given to selecting corridors away from heavily vegetated areas wherever possible.

10.7.3 Engineering solutions in high vegetative growth areas

Through extending the height of the line, or changing to insulated conductor materials, reductions in required vegetation management work, and extensions of cycle lengths can be achieved. In locations where engineering solutions are proven to be more cost effective over the lifecycle of that section of the network, or where a solution is needed to ensure adequate safety, engineering solutions will continue to be pursued in collaboration with Regional Asset Management staff.

10.7.4 Ellipse database management

Planning, scheduling and tracking of the vegetation zones that must be inspected and treated within each financial year is carried out using the Ellipse system. Ellipse will be solely relied upon to guide the vegetation program by assessing expenditure and work completion, and when guided successfully, 100% of the program will be completed on time and to budget. This is assisted through an accurate work plan being developed at the annual and five-year level.

The Ellipse database will be accurately aligned with Smallworld, the TMD and ROAMES. However, improved accuracy of input information from the TMD and Smallworld is required. Within Smallworld, the cadastre, pole locations and Vegetation Zones will be realigned to their accurate location. The TMD will be replaced or upgraded and will have better data capture and transfer properties. Information on direct costs, methods used, areas treated, areas requiring no treatment, and social or contact information will all be captured properly for future use by Ergon Energy. These improvements in data capture and alignment will allow for better budgeting, program scheduling, transparency, and ultimately better informed decisions.

10.8 Safety and Reliability

With the completion of the backlog program returning vegetation management to a maintenance state, Ergon Energy reports a downward trend in the contribution by vegetation to DEE and outage conditions. Ergon Energy's focus is on further reducing DEE conditions relating to vegetation and maintaining currently levels of reliability.

This will be achieved through integration of better risk management into the program through feeder performance monitoring, outage incident investigation and increased importance being placed on feeders and their associated Vegetation Zones which have high customer numbers and unacceptable risk exposure due to vegetation characteristics and line design (such as radial construction).

Reducing vehicle incidents is dependent on track condition, operator competence, and awareness of hazards. Monitoring track conditions through regular inspections and by recording track features, on spatial systems will provide better awareness of track conditions and limitations. The introduction of field mobile computing provides an improved scope for operators to view track data and to update condition data as they traverse the tracks leading to Ergon Energy assets. Having adequate data on track condition will be dependent on the availability of resources to transfer field data to the spatial system.

Where track conditions pose vehicle operation limitations due to steep slopes or poor location, outside of existing construction standards, users should record, and prioritise these for repair or relocation. Where there is an identified safety issue, users should label the track section as impassable while in the field, and on the spatial system until there are resources available to repair or relocate the track section.

Ergon Energy should continue to ensure that field staff members are competent in driving vehicles in adverse conditions, by making training courses in off road vehicle operation and vehicle recovery available as required. Operators should be kept aware of vehicle limitations on access tracks, and of driving in accordance with track conditions, particularly when operating all terrain heavy vehicles such as borer lifters and elevating work platforms, through discussions and presentations at tool-box meetings and team briefs. To ensure maintained awareness of access track hazards, it may from time to time be necessary to issue Operational Updates or other communications to staff. Annex A shows an example of such communication.

10.9 Legislation

It is assumed that for the period covered by this Strategy (2015-20) that there will be no major changes to legislation directly related to the vegetation management program that will require significant changes in practice and or expenditure. Ergon Energy will continue to endeavour to be involved in any review of legislation, which may affect its ability to maintain vegetation related network safety and reliability using cost effective methods.

10.9.1 Non-compliance reporting

The Ergon Energy vegetation management program operates in a legally compliant manner at all times, with appropriate Environmental Planning for Work practices in place and followed. In the future state, the vegetation management database audit non-conformance reporting function is a valuable tool for tracking and improving compliance to both internal standards and external legislative requirements. The contractors and staff of Ergon Energy are openly encouraged to report incidents as well as to identify potential risks to be addressed to prevent non-conformances reoccurring. The excellent performance of the vegetation program demonstrates to regulators and the public that no additional legislative controls are required.

10.9.2 Clearance requirements

Through the continued success of the vegetation program, due to effective treatment types and cycle lengths funded by sufficient available budgets, Ergon Energy will maintain adequate clearances between the network and vegetation in accordance with legal requirements. Locations with known difficulties in maintaining adequate clearances will have techniques and management directions reviewed for appropriateness. This includes locations with impractical EMP conditions and urban Vegetation Zones where engineering solutions could address inabilities to maintain clearances.

10.9.3 Environmental management plans

Requirements documented within future Environmental Management Plans (EMPs), including future revisions will be realistic in terms of Ergon Energy's ability to maintain adequate vegetation clearances around our network. Any clearance distances specified in EMPs will align to the *Standard for Vegetation Clearance Profile (STNW0602)* or will be combined with line engineering designs which enable a treatment cycle length of at least 24 months in rural areas or 12 months in Urban areas. Ergon Energy representatives involved in the creation or revision of EMPs will consult with vegetation management subject matter experts and relevant Vegetation Management Officers before agreeing to requirements relating to clearance practices or clearance distances.

10.9.4 Declared plant (weed) management

Ergon Energy will work with Regulators and relevant Government departments to ensure that any new Legislative requirements affecting the Ergon Energy vegetation management program are proportional to the level of biosecurity risk posed by Ergon Energy's vegetation management practices and recognise risk management measures already in place.

In the vegetation management program's future state, the full financial impact of weed management on the vegetation management program's budget will be known through use of work orders for the purposes of capturing direct and overhead costs associated with management of existing infestations and prevention of the spread and establishment of future weed infestations. Capture of this information will enable Ergon Energy to ensure sufficient funds and resources are available, and assist in future funding requests to Regulators.

10.9.5 EVNT and low growing species management

For the regulatory control period 2015-20, it is assumed that Legislative requirements relating to the management and preservation of EVNT species will remain under the Commonwealth *Environmental Preservation and Biodiversity Conservation Act 1999* (EPBC) and the Queensland *Nature Conservation Act 1992*. It is also assumed that the obligations required of Ergon Energy under *Queensland Electricity Act 1994* and *Electrical Safety Act 2002* will continue to override any requirement contained in EVNT related Legislation provided sound evidence of appropriate management of EVNT species and vegetation populations can be demonstrated.

Ergon Energy will continue to assess and mitigate the impact of the vegetation management program on EVNT plant species and plant communities. Ergon Energy will manage any known or discovered EVNT species as per Ergon Energy's EVNT Species Management Guidelines that are to be developed and introduced prior to 2015.

The Ergon Energy vegetation management program will also use the retention of low growing species on power line easements to respond to climate change where possible and establish a system of monitoring to assess changes in vegetation condition on power line corridors.

Work previously undertaken through the Plant Smart program to monitor and mitigate the impact of the vegetation management program on EVNT and Low Growing species will be replaced by a less expensive vegetation condition monitoring program which will utilise ROAMES remote sensing information, historical treatment data and previous reports compiled under the Plant Smart program. This proposed vegetation condition monitoring program will provide Ergon Energy with meaningful interpretation of the impact of the vegetation management program on vegetation composition on Ergon Energy power line easements, not only year to year, but also giving an historical perspective using historical information. This interpretation will allow Ergon Energy to demonstrate that our vegetation management practices mitigate impacts on plant communities and vegetation condition, as well as to refine practices in an effort to foster stable communities of low-growing species and thereby reduce ongoing vegetation management costs.

10.9.6 Future regulatory environment

DNSPs are increasingly being requested to provide greater evidence of cost effectiveness and budget requirements during regulatory budget determinations. State and Commonwealth Government initiatives could also influence available budgets. It is expected that pressures from the public and Government to reduce electricity costs to customers will impact the regulatory environment relating to budget determination for DNSPs such as Ergon Energy in the regulatory control period 2015 to 2020.

Comprehensive knowledge of the network and the condition of vegetation surrounding the network will allow Ergon Energy to state definitively how much work is required, and therefore anticipate budgetary needs. This capability is to be provided through ROAMES, and the information will be combined with the capture and storage of current and historical management costs in Ellipse and the TMD (or its successor) to enable Ergon Energy to demonstrate efficiency and effectiveness of delivery of the vegetation management program. This demonstrated efficiency and effectiveness can be compared to other DNSPs by Regulators to demonstrate that the Ergon Energy vegetation management program represents cost effective value.

10.10 Expenditure

10.10.1 Vegetation Program

A key element of the vegetation management philosophy of Ergon Energy is continued commitment to realising opportunities for improvement expenditure. Significant investment has been made across the network with the majority of easements readily positioned to become 'mature' and exhibit decreasing or stable vegetation maintenance costs and risk liability. With the completion of all out-of-cycle 'backlog' work during 2012, all areas of the network are now incorporated into a regular vegetation maintenance cycle. While labour costs may increase over time, Ergon Energy believes that better choices of vegetation treatment methods combined with new technologies allowing more efficient scheduling and use of resources should result in decreasing operational expenditure during the regulatory control period 2015-20.

Maintenance of low cost management through appropriate choices of treatment methods and uptake of new technology is only possible with allocation of sufficient and stable budgets. The significant investment made across the network in vegetation management, and the ability to maintain low maintenance costs as a result, will be lost if established easement widths and clearances are not maintained properly. In order to ensure long-term cost effectiveness, Ergon Energy favours the extension of treatment cycle lengths rather than reduction in clearance profile.

10.10.2 Access Track Program

The Access Track Maintenance Plan will direct expenditure for future access track maintenance, with the preventive budget funding access tracks inspection, and the corrective budget covering remediation of track structure. Where possible, the proposed Access Track Maintenance Plan will align with the asset inspection plan. However, variable inspection cycles will be the basis for the plan using a combination of rainfall erosivity and feeder criticality. Planning will use historical costs to assist in predicting the future cost estimates for inspection and remediation. Expectation is that by collecting more data on work quantities at each location, and recording this data on work orders, it will facilitate future analysis and further refine cost estimate forecasting.

11 Gap analysis

11.1 Inspection

Continued development of ROAMES capability to improve the current Inspection process with a remote user solution is required to realise future savings and the intent of this Vegetation Strategy. Once ROAMES begins replacing or improving current labour-intensive processes, associated Standards and Procedures must be updated.

New communication methods and materials will need to be developed, requiring the replacement or review of existing material. To pursue the development of an online customer notification interface, a business case and subsequent funding and project management will be required. Any issues regarding legal communication and privacy requirements will need to be investigated and resolved.

11.2 Treatment

11.2.1 Treatment Methods

Where electricity supply reliability performance is unacceptable to the business and vegetation is flagged as a probable cause, treatment methods will be reviewed for their effectiveness.

11.2.2 Vegetation zone treatment cycle optimisation

The ability to accurately determine the most appropriate treatment cycle length for a vegetation zone requires a balance between reliability, risk, and cost.

It will also require ROAMES to provide the following information, which are to be developed and are currently unavailable:

- Accurate network information and location (poles, lines and polygon boundaries)
- Plant growth rate calculation
- Plant species identification
- Surrounding vegetation density
- System feedback mechanism to allow compilation of ‘safe’ intrusions (slow growing species, etc.)

Further information is needed in terms of:

- Changes in long term average NDVI, rainfall and vegetation density
- Annual NDVI anomalies
- Forecast weather trends
- Tree mortality rates

Once the procedure for utilising ROAMES provided data and other information sources for determining optimum treatment cycle lengths is determined, this process will need to be formally documented to ensure the methodology can be assessed and repeated at regular intervals.

11.2.3 Clearance profile design

Potential change to the design of the clearance profile in rural corridors, requires understanding of how successful such a change might be and how to implement the change needs to improve. Project methodology, including likely costs and measurements to determine success, needs to be developed.

11.2.4 Non-chemical treatment methods

Gains made in reducing expenditure on vegetation management in recent years have been primarily attributable to widespread use of both residual and selective chemical herbicide application in rural areas, leading to reductions in ongoing treatment requirements. Current non-chemical herbicide alternatives available for vegetation control on power line easements are either more expensive or less effective over the long term, when compared to efficient chemical herbicide treatments.

If social pressure or legislative changes require Ergon Energy to stop using certain types of herbicides in its vegetation management program, maintenance costs would dramatically escalate unless suitable alternatives were found, or developed. Ergon Energy must monitor the development of new technologies and treatment methods that reduce or replace chemical herbicide usage, and support innovation wherever necessary to realise cost effective chemical herbicide alternatives.

11.3 Contract management

Transition to greater efficiencies in contract management through reliance on LiDAR may require a change in contract delivery style. ROAMES will be required to provide the following information as base data to help define categories of vegetation density and work required:

- Average number of intrusions or volume of work per span
- Accurate pole/span numbers

Ergon Energy vegetation management staff will conduct less frequent warranty audits on herbicide kill rates, with Contractors will be encouraged under contract conditions to manage effectiveness of chemical application. Contract style

In order to move towards new forms of vegetation management contracts, network data accuracy needs to be improved. Current accuracy of network data, such as pole numbers, location, Vegetation Zone polygon boundaries, is not suitable for managing contracts based on number of spans to be completed or length of network. ROAMES has the capability to provide more accurate pole location information than currently available in Smallworld.

11.3.1 Tender process

Ergon Energy's ability to further reduce vegetation management costs into the future will rely on reductions in Contractor engagement costs. This will occur through the tender process fostering strong competition between prospective vegetation management contract tenderers, as well as a perception among prospective tenderers that Ergon Energy and its vegetation management program is stable, efficient and quantifiable. For this perception to occur, Ergon Energy must further develop ROAMES as a product that is readily useable by Contractors and is seen as accurate and reliable. Furthermore, any procedures or Standards relating to ROAMES must be easily understood and transferred into the field by contractors. This will likely require additional training and communication.

11.4 Program management

11.4.1 Scheduling

Fluctuations in workload volumes occurs due to variable treatment cycle lengths of Vegetation Zones preventing consistency in number of Vegetation Zones requiring treatment, and the differing sizes of those zones resulting in some years having much more work to complete than others.

Network data accuracy relating to pole volumes and span count (measurements from which workload volumes are calculated) is currently insufficient for accurate long term scheduling without significant manual input to correct information extracted from Smallworld. Specifically this is related to issues surrounding shifts in cadastre or changes to maintenance polygons resulting in parts of the network falling into incorrect spatial polygons.

Uncertainty in workload volumes can occur due to uncertainty in available budget or through changing vegetation zone treatment cycle lengths. A clear long term Strategy is needed from Ergon Energy to ensure future workload volumes and appropriate budget expenditure is properly planned and delivered.

Treatment cycle lengths and planned treatment dates need to be revised based on accurate ROAMES-based information. For this to occur, a system needs to be developed to interpret ROAMES information (such as clearance from conductor and average vegetation growth rate) and make informed decisions on treatment cycle lengths.

11.4.2 Program visibility

Performance of the vegetation management program will be available for all internal stakeholders to view and contribute towards. Key Regional stakeholders will need to become more actively engaged in management of the program, facilitating efficiency through awareness of scheduled vegetation management work in their Region and aligning other maintenance programs or Access work wherever possible.

11.4.3 Vegetation management database

Increased volumes and complexity of data being captured through the integration of ROAMES into existing inspection, treatment and audit processes requires a vegetation management database with enhanced capabilities over the existing capacity of the Oracle-based Tree Management Database (TMD). Automated links between the database and other related systems such as Ellipse, ROAMES and contractor databases will allow efficient and accurate capture and transfer of information and facilitates prompt reporting and accountability. An element of the annual Vegetation Program Performance Report covers the user-friendliness of such systems and discusses any impedance to business performance. The ideal future state includes a vegetation management database which does not impede business and facilitates accurate reporting.

Under future development planned for ROAMES integration during the regulatory control period 2015-20, there are commitments to develop or purchase a system to replace the Vegetation Management Database (a.k.a. the Tree Management Database or TMD) and achieve these objectives.

It is assumed that the annual maintenance programs will continue to be generated out of Ellipse with costs tracking and reporting from Ellipse. The TMD (or its successor) will be the detailed repository for all work scoped and treated and may contain ROAMES data as well as conventionally collected vegetation data. Ideally, it will contain the details of all treatment data to enable analysis down to the span level and ultimately individual tree level. To do this it will need to be linked to Ellipse and ROAMES data.

11.4.4 Vegetation zones

Vegetation zones, specifically vegetation zone spatial polygons in Smallworld, need more accurate design and management. While a number of groups within Ergon Energy have vested interests in the accuracy of vegetation zone polygon accuracy, no group currently takes full ownership of this issue. Ergon Energy staff within the Network Data Group need to take better control of the vegetation zone polygon layer(s) within Smallworld to ensure that accuracy of the layer(s) is maintained and thereby ensure any data used by Ellipse is as accurate as required (this will likely require additional or re-allocated resources). The Network Optimisation Group will need to provide a formal guideline or expected standard of network data quality to the Network Data Group and any other vegetation-related Smallworld users.

11.5 Communication

Gaps between the current and future state in relation to the vegetation management program's external communication mainly surround the planned review of the Plant Smart program.

Community engagement relating to the vegetation program has been undertaken since 2002 through the Plant Smart program. An external contractor has provided Plant Smart during this time, which has likely contributed to the isolation of the vegetation program from the communication efforts of the core business. Efforts will need to be undertaken to reverse this isolation and integrate the communication needs of the vegetation program into those of the core business.

Plant Smart currently undertakes the following initiatives, which Ergon Energy will need to retain any benefits gained from, and continue in some format:

- Public awareness of safety around vegetation and power lines
- Advice to the public on which trees to plant near power lines
- Engagement with non-government industry and environmental groups
- Scientific research into new technologies
- EVNT plant species searches

Due to inability to place direct financial savings values on many of the Plant Smart program's activities, the relative success of Plant Smart as the external communications method for the vegetation program is unknown. An effective feedback loop from both internal and external stakeholders, as to perceptions of the vegetation management program and its successes and failures, is required. A method of assessing attitudes of stakeholders and the public towards the program requires implementation to understand any long-term trends in customer complaints, environmental risks and social values and behaviours relative to vegetation management techniques.

Corporate membership of the UAAA and Queensland Arborists Association (QAA) will require identification of suitable recipients of UAAA information and membership benefits, which will likely be VMOs and their Support Officers. Sponsorship of the UAAA and QAA will require the organisations to present Ergon Energy with a fully detailed sponsorship proposal with designated benefits and deliverables. Approval and ongoing support for these organisations will require senior management endorsement and approval within Ergon Energy.

In terms of expenditure for substitute communication initiatives, Ergon Energy will maintain its relationship and contribution into the Plant Smart program. This has proven to be the most cost effective manner in which to engage widely across community and related groups.

11.6 Additional Activities

11.6.1 ROAMES Integration

Ergon Energy is investing in the integration of ROAMES into business process through a formal project management methodology. This ensures the benefits from ROAMES are realised to the greatest value for Ergon Energy. The partnering arrangement with ROAMES also ensures that any development ROAMES invests in is returned in value to Ergon Energy.

Ergon Energy's decision to divest ROAMES has allowed ROAMES to pursue business interests and capital investment from their parent and associated companies, returning benefits to Ergon Energy. ROAMES delivers services to an agreed schedule, budget and

The further development of treatment cycle lengths and treatment program format to become more risk-based will require the compilation of successive years of captured data and ability to compare data between years, as well as between Vegetation Zones, Bioregions and Regions.

Ergon Energy and ROAMES have an agreed development roadmap which ensures continued and ongoing development of products and services to Ergon Energy. These products and services will provide business benefits in vegetation management and other asset related programs and processes. New line route design

The communication process needed to ensure Line Design Staff are aware of the imperatives of the vegetation management program does not currently occur. Furthermore, no consideration for vegetation management implications is explicitly requested within the current online Business Case Development Tool used by Ergon Energy staff when considering and developing new line constructions and other business ideas. These factors can lead to a distinct lack of lifecycle optimisation approach, which is in conflict with the Ergon Energy 'Asset Management Asset Strategy' (SGNW0004).

11.6.2 Ellipse database management

Improved accuracy of the information contained within, and reported by, Ellipse is directly influenced by the accuracy of information within Smallworld. Ergon Energy uses ROAMES as one means to improve accuracy of ERP systems for the benefit of vegetation management and other programs.

Ergon Energy is committed to management of vegetation via ERP systems and has made significant advances in recent years. Vegetation management is adopting management practices and processes proven effective in other program delivery to make best use of the advantages of Ergon Energy's ERP systems.

11.6.3 Reliability

Trends will continue to be monitored and incidents analysed more closely to determine if changes to policies and standards are required to minimise the number of incidents. Future analysis of trends and identifying risk control actions requires better data capture and reporting than currently exists.

Understanding and controlling risk from vegetation to reliability requires knowledge of the proximity of vegetation to the network in terms of clearance, overhang, slope, and aspect. Ergon Energy also needs to know the amount of vegetation possible of contacting the network upon failure, and which locations and which seasonal weather patterns contribute more to poor reliability from vegetation than others.

While traditional reliability indicators such as SAIDI and SAIFI will continue to be used to monitor performance of the network and related maintenance programs, Ergon Energy will increasingly use ROAMES to quantify the apparent risk of vegetation to the reliability of the network. A risk analysis tool will be required for ROAMES to realise this capability and guide management decisions aimed at ensuring adequate reliability.

11.7 Legislation

11.7.1 Clearance requirements

The actual conductivity of vegetation when in contact or arcing distance with a conductor has important implications for reliability and safety risk. There is currently very little information on the conductivity of common Australian native and street trees for distribution voltage lines, yet our *Standard for Vegetation Clearance Profile (STNW0602)* specifies set clearance requirements. Knowing the conductivity of a branch in contact with a conductor could have important implications for changing clearance space requirements and thus the amount of vegetation that must be removed to ensure compliance with safety legislation.

11.7.2 Environmental management plans (EMPs)

Better communication between writers of EMPs, vegetation management subject matter experts and operational works delivery staff is needed to ensure realistic vegetation clearances and treatment practices are allowed within EMPs. A related standard or guideline needs to be created in partnership between all Ergon Energy stakeholders to ensure this communication occurs and decisions made in relation to vegetation management are well informed and complement the Vegetation Strategy.

11.7.3 Declared plant (weed) management

Current expenditure on declared plant management is not captured fully in any central location. Efforts undertaken by depot staff, environmental operations staff, access track operations, and vegetation management operations, are all costed to different work orders and hidden inside other costs. A set of unique work orders will be created for staff to accurately report costs relating to declared plant management.

11.7.4 EVNT and low growing species management

Following the completion of the current Plant Smart Contract on 30th June 2015, Ergon Energy will no longer have a method of assessing the impact of the vegetation management program on EVNT and low growing plant species and communities. Ergon Energy will need to employ a new vegetation condition-monitoring program, which provides meaningful information for regulatory reporting as well as for further development of Ergon Energy practices. The new program will need to be cost effective and will be developed to include ROAMES information, historical treatment data and build on work previously undertaken through Plant Smart.

11.7.5 Expenditure

Assumption is that adequate funds will continue to be available for us to maintain to existing plan and standards.

If future expenditure budgets are reduced too far, the vegetation management program will become reactive and increased costs will occur in the future.

12 Strategy evaluation and review

Continual improvement of vegetation and Access Track Program management will see the introduction of new technologies and processes during the regulatory control period 2015-20. As this improvement occurs, or as drivers of program priority change, this management strategy document will be evaluated for relevance and revised as required.

13 Communication and implementation plan

All persons and groups listed in the identified actions for this strategy will be engaged during the consultation process prior to document publication. As such, all parties will be aware of their responsibilities and will commit to actioning their relevant items.

Annex A Lines Maintenance Vegetation Management Document Hierarchy

The following diagram illustrates the hierarchy and linkages between internal documentation related to the vegetation management program. Note that where other documents detail aspects of the program, the Vegetation and Access Track Management Strategy 2015-20 will only reference these documents and not replicate content.

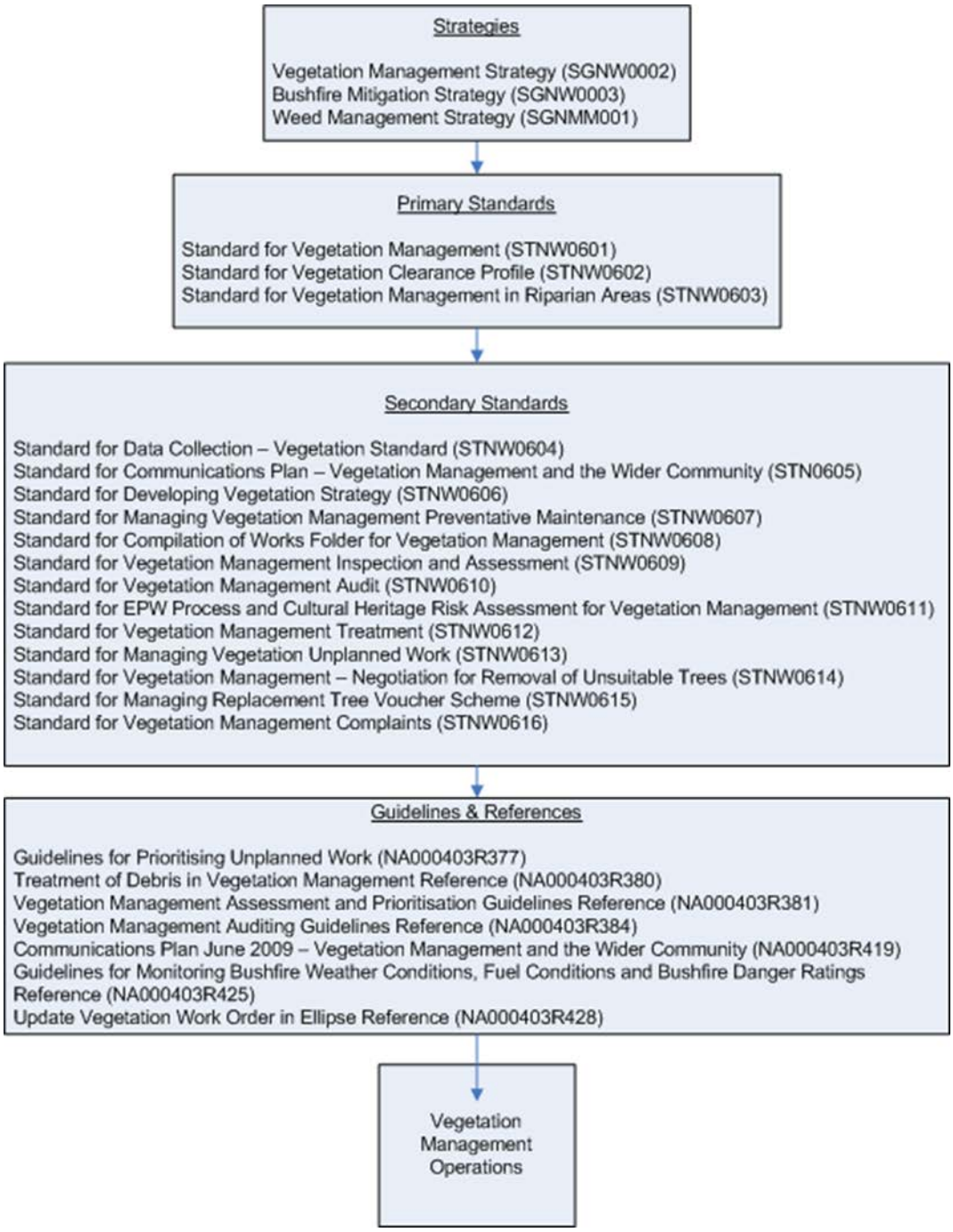

Figure 13 Ergon Energy vegetation management related document hierarchy