Powerlink – Land Asset Methodology – Framework

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1. Introduction

For the purposes of this document, land assets exist to facilitate the safe, reliable, responsible and efficient delivery of electricity transmission services.

1.1 Purpose

In order to implement the organisation's Asset Management Strategy, specific asset methodologies must be developed for each major asset group within Powerlink.

This document sets out the whole of life management philosophy for Powerlink's land assets, provides a planning tool for activities throughout the asset life cycle and acts as a reference for the development of asset life, management, maintenance and project plans.

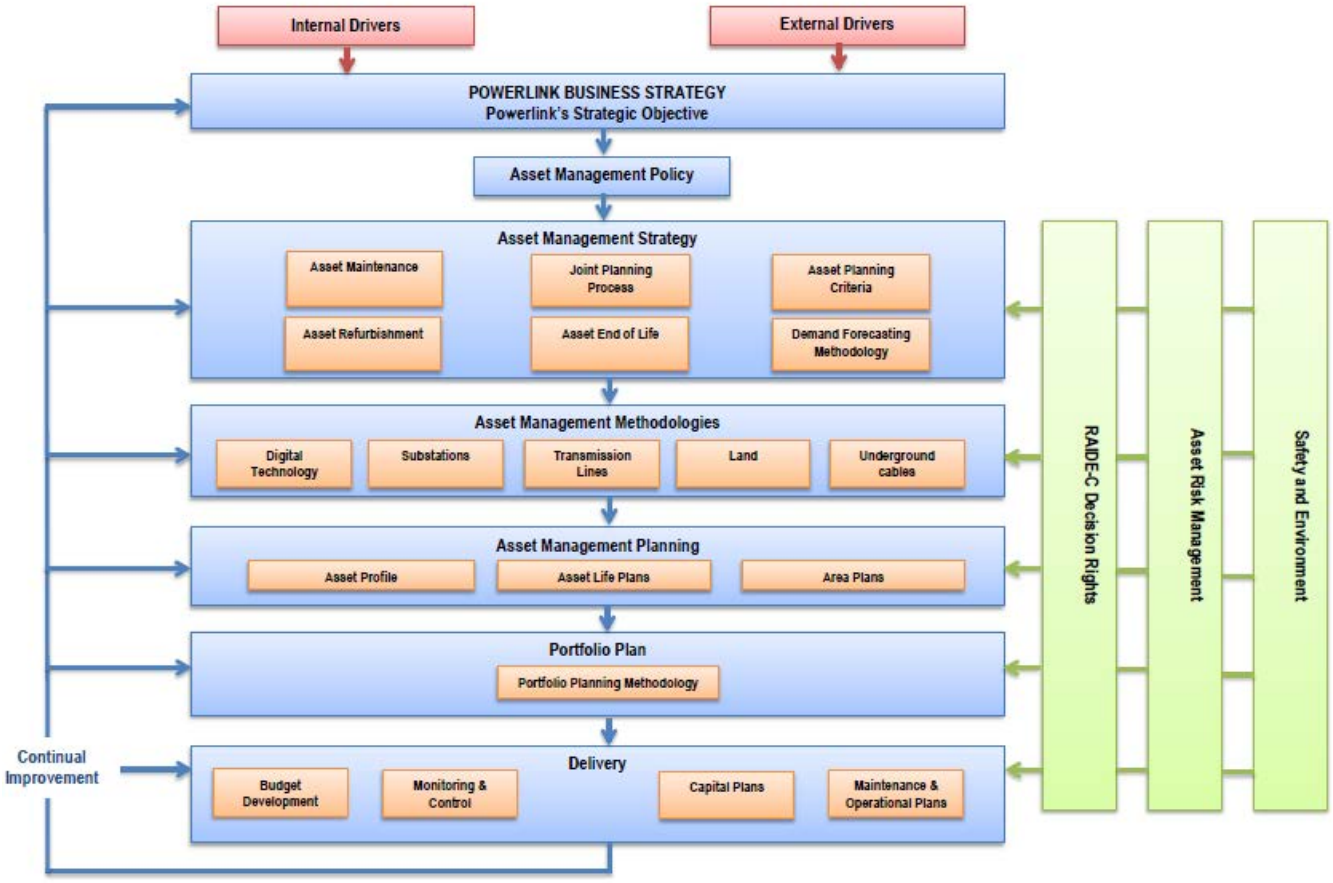
1.2 Scope

This document covers the asset management methodologies applied to the life cycle of land assets linked to electrical infrastructure. The document also considers associated network land assets for future use.

1.3 Objectives

Land assets form part of Powerlink's asset management system with the following key elements:

Figure 1-1 - Asset Management Framework



Powerlink's asset management strategy ensures the organisation's assets are managed in a manner consistent with its overall corporate vision objectives to responsibly deliver electricity transmission services that are valued by shareholders, consumers, customers and the market in a safe, commercial and performance focused way.

The Land Asset Methodology sets out how the following key performance areas are to be addressed:

1. Levels of Service
2. Lifecycle Management
3. Asset Management Drivers
4. Asset Management Activities
5. Environmental and Safety Compliance

1.4 References

Reference	Document title
Acquisition of Land Act	Acquisition of Land Act 1967 (Qld)
Biosecurity Act	Biosecurity Act *2014* (Qld)
Maintenance of Electricity Corridors in Parks and Forests	Code of Practice for Maintenance of Electricity Corridors in Queensland's Parks and Forests *2007* (Qld)
Electricity Works on Protected Areas	Deed of Agreement for Electricity Works on Protected Areas *2010* (Qld)
Electrical Safety Act	Electrical Safety Act *2002* (Qld)
Fisheries Act	Fisheries Act *1994* (Qld)
Nature Conservation Act	Nature Conservation Act *1992* (Qld)
Line Asset Methodology	Powerlink (2018) Line Asset Methodology Framework
Substation Asset Methodology	Powerlink (2018) Substation Asset Methodology Framework
H-1567602-001-2	Powerlink (2018) Vegetation Management General Arrangement
H-154843-001-4	Powerlink (2018) Washdown Standard Drawings
Sustainable Planning Act	Sustainable Planning Act *2009* (Qld)
Work Health and Safety Act	Work Health and Safety Act *2011* (Qld)

1.5 Defined terms

Terms	Definition
Clearing Areas	Clearing areas that are established at the time of construction, considering permits, approvals and landholder requirements. Within these areas, there may be constraints that are documented in PQMaps.
Clearing Widths	Clearing widths that are established at the time of construction and may not extend to the edge of the easements.
Constraints	Restrictions that can impact on achieving desired outcomes in an efficient manner.

Terms	Definition
Co-use	Activities on easements are considered co-use. Some activities are permitted, while other activities may require specific assessment. Powerlink has a public process for determining if co-use is permitted, primarily based on safety, access, future works and operational considerations.
Hazardous Marginal Trees	Trees that are outside of the cleared easement or land parcels that Powerlink actively maintains, have a risk of falling on network assets and have been assessed as being unhealthy.
INDJI	A system that assesses natural hazards, including fires.
ITOMS	International Transmission Operations & Maintenance Study that performs voluntary benchmarking, including information on land assets associated with networks.
Lidar	Light Detection and Ranging, used for measuring vegetation distances from conductors, density and height above ground.
Nominal Easement Widths	Easements widths that are recommended for associated built assets: • Fibre cables buried: 3m either side (6m total) • Fibre cables overhead: 5m either side of structures (10m total) • <132kV overhead: 15m either side of centre line (30m total) • <132kV underground: 5m either side (10m total) • 132kV overhead: 20m either side of centre line (40m total) • 132kV underground: 6m either side (12m total) • 275kV overhead: 30m either side of the centre line (60m total) • 275kV underground: 10m either side (20m total) • 330kV overhead: 35m either side of the centre line (70m total) • 330kV underground: 12m either side (24m total) Actual easement widths may vary depending on specific circumstances.
PQConnect	A database used by Powerlink to record interactions with stakeholders.
PQMaps	An in-house spatial solution that provides visual renditions of assets and landscape features, including land assets.
RINS	Regulatory Information Notices that can be requested for the Australian Energy Regulator, including information on land assets associated with networks.
SAP	An enterprise software solution used for asset management and financial purposes at Powerlink, including the management of land assets.
Washdown	A facility used to wash vehicles as a partially effective control measure to mitigate the spread of biosecurity threats.

1.6 Monitoring and compliance

Annual audits will be performed to determine compliance with the requirements outlined in this document. Annual reporting is also required for stakeholders, which relies on the implementation of these requirements (e.g. AER and Annual Report).

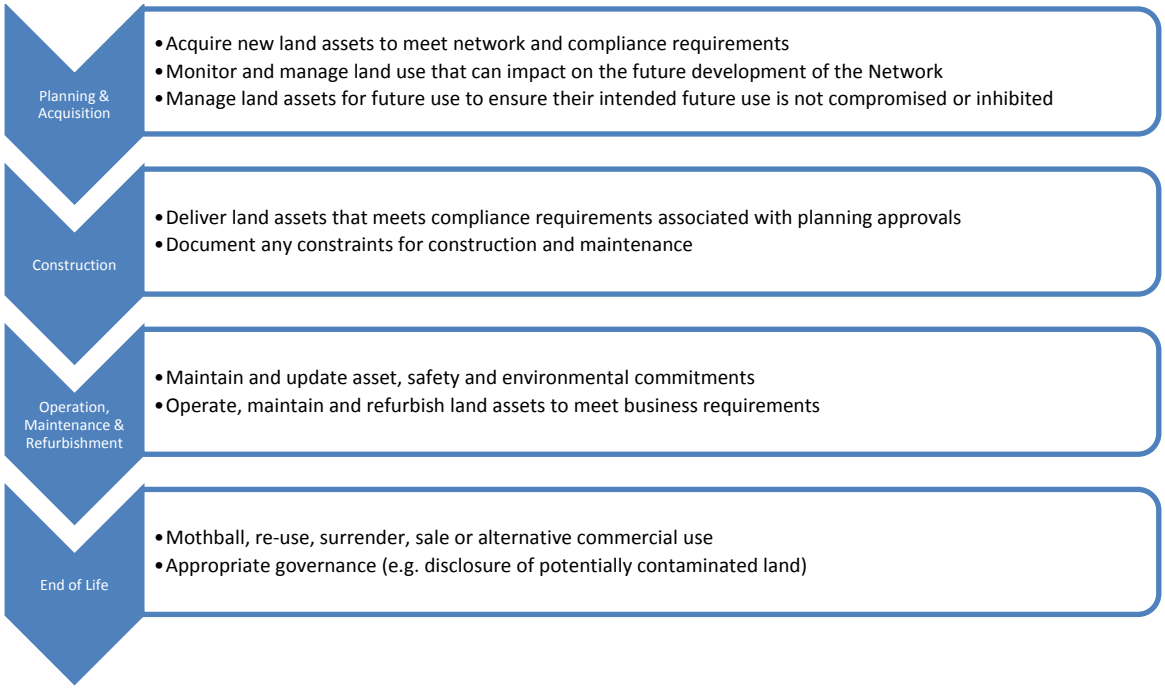
1.7 Risk management

Land assets should be managed in a manner consistent with asset management principles and compliance requirements. A risk management approach is taken to prioritise work where constraints or conflicts arise. This

must be documented and recorded in corporate systems so that others understand the rationale behind the approach.

2. Framework

The following framework outlines the key elements of Powerlink's Land Asset Methodology. The GM Technology & Planning is accountable for setting, monitoring and reviewing the framework.



The following accountabilities align with the framework:

- Planning and Acquisition – GM Community & Delivery Services
- Construction – GM Infrastructure Delivery
- Maintenance & Refurbishment – GM Service & Supply Partners
- Operation – GM Network Operations
- End of Life – GM Community & Delivery Services

Overall accountability for ensuring Powerlink's framework for land assets is fit for purpose rests with the Executive Manager Delivery & Technical Solutions.

3. Requirements

Land assets can be associated with Transmission lines (Easements), Sites (Substations, Communications and Washdowns) or network land for future use such as vacant easements and future substation sites. Asset lifecycle management practices differ, depending largely on the type of land asset and the surrounding land use.

Land assets associated with Powerlink's commercial buildings (e.g. Virginia complex, Narangba complex and Construction Site Offices) are not covered by this strategy. These assets are managed by other parts of the business, applying different methodologies.

The management of land assets is fundamentally linked to network assets and adopts the familiar nomenclature of the associated network asset.

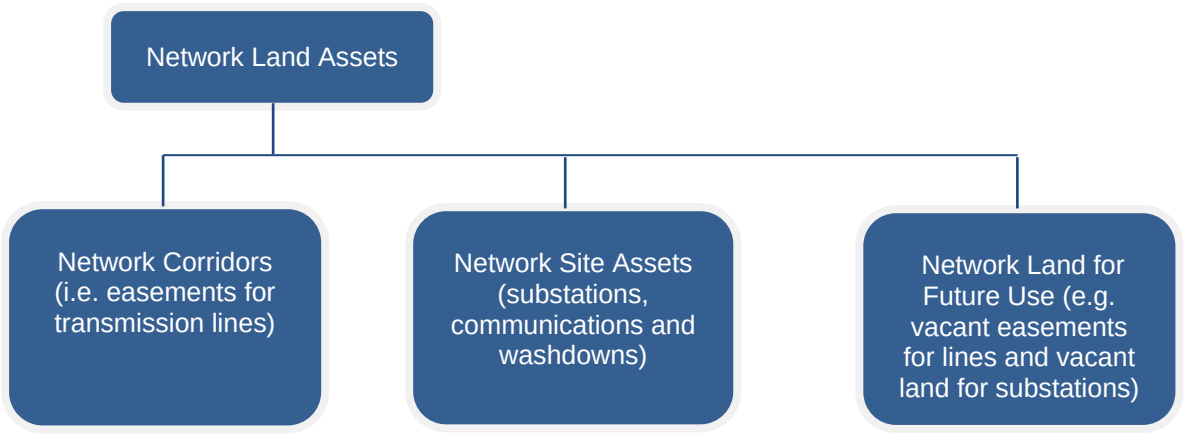
- For a transmission line corridor, the basic management units used are Built Sections and Ground Spans;
- For a substation the network site name; and
- For a communications site, the site name.

There are other land management considerations relating to the land parcel. For example, land within a substation is managed as part of the substation plant methodology and only land outside the substation fence is classified as the land asset for the purposes of this methodology. This recognises the need for different management within the network site and the different skill set required to maintain the land surrounding or adjacent to the electrical asset. Management of vacant land that has been allocated for future network development also needs to be considered.

Network land assets for future use will be managed on a case by case basis and dependant on lease arrangements, managed by GM Community & Delivery Services.

The land assets managed under this methodology are summarised in Figure 3-1 below:

Figure 3-1 - Breakdown of Network Land Assets



3.1 Network Corridors

Network corridors support transmission lines. As for the management of transmission lines, the corridors are broken into Built Sections to align with the life cycle approach to planning, investment, operations, maintenance, refurbishment and end of life. Each Built Section represents an asset and has the asset value attached to it. Multiple Built sections can exist within a network corridor. At the most fundamental level, a Built Section will

represent a homogenous asset with management practices applied to the whole. The length of Built Sections varies from 10 metres to over 300 kilometres.

Built Sections are further broken into spans. A ground span is the land between two adjacent towers/poles and there are almost 25,000 ground spans in Powerlink's network, with lengths varying from a few meters to over one kilometre and widths between 20 and 80 metres per span. This includes associated access tracks maintained by Powerlink, which are often positioned off easement and sometimes on land parcels with no physical assets.

3.2 Network Sites

Sites in this category are parcels of land containing network infrastructure such as substations, communications facilities, washdowns and helipads. Washdowns standard drawings are available (H-154843-001-4).

Land within the security fence and to a distance of up to five metres outside the fence, will be managed as part of the Substation Asset Methodology Framework. Consequently, there is no consideration of land strategy in this document where infrastructure covers the entire land parcel it occupies.

Partially occupied sites contain additional land, not directly associated with the network asset. Different management techniques to those within the facility fence are required to protect HV assets, including access and vegetation management. This includes the buffer zone areas. A preference will be to allow other compatible land use to occur with written agreements (e.g. agistment licenses) in consultation with the Property Team. However, if no licence or written agreement exists with a third party over the buffer zone areas, the Property Team has no involvement in the management of the land assets. Maintenance Service providers will ensure the land assets associated with network sites remain fit for purpose at all times, including safety and environmental compliance matters.

The installation of an appropriate property boundary fence, considering the surrounding land use, is recommended.

3.3 Network Land for Future Use

Planning for future development of network assets can require the strategic acquisition of land some time before the construction of the network. There are two separate issues associated with this land that require managing:

- Land use over time can change, which can impact on the future development of the network.
- Land assets can also exist adjacent to existing network infrastructure (e.g. land purchased as part of the easement acquisition process).

These assets are managed by the Property Team who ensure that their intended future use is not compromised or inhibited, while realising commercial opportunities where appropriate.

3.4 Asset Information & Data

Powerlink's holistic approach to land assets is predicated on the interaction of two complimentary systems, SAP and PQMaps.

SAP is used as an asset register and financial control system with PQMaps providing positioning and mapping functions. SAP is responsible for providing as-built asset and Built Section configuration information and is considered the master system in the SAP/PQMaps relationship where "as-built" data is concerned. SAP is subordinate in all matters pertaining to geo-spatial data and information. PQMaps is subordinate in all other matters.

PQMaps data includes the spatial rendition of land assets, such as boundary data, land area, easements condition reporting, access tracks and constraints.

The leveraging of the two systems as a unified management tool provides a detailed view of land assets.

3.5 Levels of Service

Powerlink has a large number of stakeholders and their requirements are defined though various documents, including state and federal laws and regulations, electricity market rules, connection agreements, procurement agreements, service level agreements, landholder agreements and broader community expectations.

3.5.1 Technical Requirements

In response to stakeholder requirements, Powerlink has established service levels for land assets, including:

- Vegetation Management
- Physical Access to Assets
- Land Management
- Land Asset Condition Assessment
- Vegetation Management General Arrangement
- Washdown Drawings

3.5.2 Safety & Environment

To ensure the network is operated in a way that is electrically safe, Powerlink has considered electrical and workplace safety requirements associated with land assets, including Powerlink's Electrical Safety Management System.

Maintenance measures include:

- Routine and condition based preventative maintenance programs
- Corrective maintenance as required
- Land inspections and other asset condition monitoring
- Monitoring of the forced outage data that could be linked to vegetation or fire
- Audits, including safety

Notifications of electrical safety incidents are investigated and where necessary reported as part of normal safety management system requirements.

Powerlink's internal standards and contract conditions ensure that high levels of safety compliance are met and consider all aspects of work including safe ground access where this is required. Service providers maintain documented safe systems of work, demonstrating a coordinated and systematic approach to managing health and safety risks. The systems used need to demonstrate the integration of Work Health and Safety (WHS) and Electrical Safety requirements within the normal procedures and practices, including the preparation of Safety Management Plans and Pre-work Risk Assessments.

All routine maintenance work on land assets is conducted outside the untrained exclusion zone and qualifications and training requirements are commensurate with this working environment. Other work is performed based on asset condition and recorded in SAP with various codes and characteristics to identify risk and priority. Notifications of electrical safety incidents are investigated and hazards reported as part of normal contract requirements. Safety audits of work associated with the land assets are carried out as part of broader annual auditing programs.

Powerlink Queensland is committed to responsible environmental management as an integral part of our business activities. Powerlink aims to meet all of its environmental obligations while working efficiently and safely. Powerlink maintains an Environmental Management System (EMS), which includes compliance with Environmental Management Plans (EMP) and Environmental Work Plans (EWP).

These systems of work meet the "general environmental duty of care" and include items such as:

- Documented policy or statement of commitment

- Responsibility and authority of individuals
- Emergency preparedness and incident investigation and reporting
- Audit provisions and environmental risk assessment
- Training requirements

The Manager HSE Services (PCS) or their representative will be contacted for support and advice relating to safety and environmental matters relevant to land maintenance activities.

3.5.3 Reliability of Supply

Powerlink has reliability of supply obligations that are supported by the management of land assets under this methodology. Control of vegetation around transmission lines is a key to reliability with standards documented in the Vegetation Management Specification.

Powerlink is focused on proactively managing risks associated with vegetation. Investigations into any vegetation infringements are conducted to support the continual improvement of vegetation monitoring and maintenance practices.

There is also a requirement to ensure levels of access are maintained for maintenance and emergency access for efficient restoration of the system in the event of network outages or loss of supply events.

3.5.4 Landholder & Community Expectations

Powerlink has a strong principle of working closely and co-operatively with landholders, particularly where we have joint interests in managing easements and other aspects. This approach aims to achieve a level of joint management of land assets and maximise the understanding of all parties to ensure compliance with access protocols, safety and co-use matters.

Joint management of matters is essential for successful management of land assets, particularly when it comes to biosecurity matters. Powerlink recognises that in managing its linear infrastructure, reasonable and practicable steps need to be taken to ensure vehicle movements do not facilitate the spread of biosecurity threats. Powerlink has established systems for managing biosecurity risks and working closely with stakeholders to develop effective risk management strategies.

Community expectations over large geographical areas differ greatly with different levels of interaction and also depend on the life cycle stage of the assets. This is sometimes challenging and Powerlink:

- Continually monitors media coverage as an indicator of issues being raised;
- Thoroughly investigates and records all complaints; and
- Centrally records and maintains constraints on land use, access and other matters raised by landholders/stakeholders in PQConnect.

The Land Strategist should be advised of joint management issues that are not aligned with Powerlink's land asset requirements.

3.6 Lifecycle Management

To achieve the best outcome for its stakeholders, Powerlink takes a whole of life cycle approach to managing its assets. Optimising the costs and benefits while being cognisant of the risks is the basis of this approach and includes 3 main stages:

1. Planning, Design and Construction
    - Optimisation of the concept and the design process, including the consideration of the asset's construction and likely operating life
2. Operation, Maintenance and Refurbishment
    - The effective management of the asset's lifecycle through targeted maintenance, refurbishment and life extension

3. End of Life
    - The mothballing, reuse, replacement or rehabilitation and disposal activities

3.6.1 Planning, Design and Construction

During Planning and Design, the characteristics and constraints of the land asset are considered as part of the route or site selection processes and need to take into account:

- Fit for purpose requirements for the land to meet business standards, including construction;
- Optimisation of total lifecycle costs, including impacts on construction and maintenance; and
- Compliance with statutory and other planning requirements.

Construction needs to comply with planning and design requirements, noting constraints for construction and future maintenance activities.

Subsequent to construction, the following elements need to be "handed over" prior to the operational and maintenance of land assets:

- Shape files of assets (e.g. towers, clearing areas, constraints, access tracks and gates)
- Areas for ground spans
- Route length
- Length of access tracks maintained or shared
- Land asset measuring points (e.g. fuel loads, vegetation risk, vegetation height, vegetation density and tower leg condition)
- Completion of Land Inspection Checklist for every span (results at handover)

3.6.2 Operation, Maintenance and Refurbishment

During the Operation, Maintenance and Refurbishment stage, asset standards are implemented to ensure land assets are maintained and operated within technical parameters and perform as per business requirements.

Condition and performance have to be monitored and relevant activities undertaken to ensure optimum performance. Activities may include:

- routine preventative maintenance;
- condition based preventative maintenance;
- corrective maintenance;
- maintenance support; and
- refurbishment.

3.6.3 End of Life

End of Life may involve mothballing assets during periods of uncertainty. Alternatively, the land assets may facilitate the replacement of network assets. If the land is no longer required, the timing for rehabilitation of land and the surrender of easements or sale of land assets will be considered, depending on a review of future network requirements and other commercial opportunities. Appropriate governance requirements need to be considered as part of this process (e.g. disclosure of potentially contaminated land and other due diligence).

3.7 Asset Management Drivers

Land assets represent an integral component of Powerlink's network. It is critical to manage these assets in such a way as to achieve not only the optimum operating life (depending on environmental and other conditions), but to do so while achieving optimal lifecycle costs. This can only be achieved by setting the asset management strategy correctly at the beginning of the asset lifecycle, incorporating timely responses to the range of internal and external factors, including:

Internal

- Condition Assessment Activities
- Fault Statistical Data and Analysis
- Data Modelling and Reporting
- Technical Investigations and Research

External

- Innovation and Technology
- Emerging Issues

The Land Strategist is accountable for monitoring these drivers and putting forward strategies that enable Powerlink to adapt, while minimising impacts on available resources.

3.7.1 Condition Assessment Activities

Condition assessment provides an indication of the level of compliance to the established standards. Data is captured by various means, including Land Inspections and Lidar surveys.

The condition data will provide information relating to the known land condition. This currently includes the following measuring points in SAP:

- Span vegetation risk;
- Span bushfire risk;
- Vegetation height;
- Vegetation density; and
- Tower leg condition.

Additional asset condition data is recorded as span characteristics and notifications, including actions associated with vegetation, access tracks and biosecurity risks.

3.7.2 Fault Statistical Data and Analysis

Powerlink maintains a database of all network events (faults). Faults that are attributed to Land Assets (e.g. vegetation and fire) are reviewed and analysed at land maintenance forums. Longer term trends are analysed by the Land Strategist to assist in determining the effectiveness of control measures and processes. These trends are communicated to maintenance service providers to assist them with understanding the reasons for any changes in processes or investments.

3.7.3 Data Modelling and Reporting

The SAP maintenance system model for land assets forms a part of the condition reporting process between maintenance service providers and the Land Strategist. This data is audited on an annual basis, focussing on a review of maintenance costs, alignment with standards, value for money and root causes of land asset defects. Maintenance service providers supply updates on land maintenance activities to the Land Strategist, which includes:

- Progress of the works program, including any delays and budget v actuals;
- Potential refurbishment projects;
- Training and competencies;
- Progress on implementing improvements identified from audits;
- Data entry into SAP (measuring points entered within 1 month of inspections being completed);
- Land management activities;

- Stakeholder engagement, including attending public meetings on behalf of Powerlink and landholder complaints; and
- Faults that are attributed to land assets (e.g. vegetation and fire).

Based on these and other inputs the overall land maintenance strategy is delivered.

3.7.4 Technical Investigations and Research

To support the land asset strategies, technical specialists are engaged from time to time to assist with the investigation and resolution of site, technical and asset performance issues. Investigations can be initiated by a task request for internal specialists or commercial arrangement with a subcontractor or industry specialist. These activities include research into erosion, fire management, weed management and innovative ways of using new technology.

The Land Strategist will initiate technical investigations and research projects as required.

3.7.5 Emerging Issues

The Land Strategist will scan the external environment to determine if there are any emerging issues that may need to be considered as part of prudent long term management of land assets.

3.7.5.1 Climate Change Adaptation

Since the middle of the 20th century, Australian temperatures have on average, risen by about 1°C with an increase in the frequency of heatwaves and a decrease in the numbers of frosts and cold days. Rainfall patterns have also changed with the northwest experiencing increases in rainfall over the last 50 years, while much of eastern Australia and the far southwest have experienced a decline. Changes in temperature and rainfall patterns will directly impact vegetation growth rates, curing of fuel loads, erosion of access and subsequent management. The current strategy is to monitor and investigate changes on the land assets and develop systems that will allow adaption to the changing climate, including potential issues associated with increasing frequency and intensity of extreme weather events.

3.7.5.2 Fire Management

While Powerlink already considers fire management as part of its management of land assets, significant fire events in southern Australia and internationally, indicate that fire management may increase in importance depending on land use and climatic conditions. The Land Strategist will review and develop strategies to ensure credible hazards associated with land assets are managed appropriately. This includes monitoring industry and research developments.

3.7.5.3 Changes in Compliance Requirements

Powerlink is continually monitoring changes in compliance requirements. This includes an environmental reference register, which the General Manager Health, Safety and Environment, maintains. Some significant changes in recent times that have impacted land asset methodology include:

- The review and update of the Code of Practice associated with maintenance work within Protected Areas;
- Reforms to the Nature Conservation Act; and
- The introduction of the Biosecurity Act in 2014.

The introduction of the “Deed of Agreement for Electricity Works on Protected Areas” in March 2010 has led to a number of additional requirements for assets in parks and forests as described in the associated Code of Practice for “Maintenance of Electricity Corridors in Queensland’s parks and Forests”. These include:

- Progressive roll-out of Environmental Work Plans for all “parks and forests”;
- Additional record keeping for herbicide use; and
- Changes to reporting and notifications.

Reforms to the Nature Conservation Act have impacted our ability to clear protected plants for new assets and adds the requirement for a permit system for protected plants in a 'buffer zone' of 100 metres either side of a new infrastructure corridor. The application of these reforms has added a secondary approval process to clearing corridors for new projects.

Changes associated with the Biosecurity Act 2014 and associated regulations are being reviewed and strategies developed to meet any changes to Powerlink's requirements for land assets, including risk mitigation measures and investment strategies to cost effectively manage the risks associated with the spread of biosecurity threats.

Powerlink is also changing its approach to safety, which is resulting in a sharper focus on community, staff and contractor safety. Some matters that may be legacy issues (e.g. incompatible co-use or cane burning near transmission lines) are being reviewed and managed by applying risk-based approaches.

3.7.5.4 Changes in Vegetation Management Systems

Energy network providers have increasingly made investments to improve their confidence in vegetation management outcomes associated with maintenance. Throughout Australia, the majority of vegetation management work is performed by external contractors who are engaged through various arrangements.

Energy network providers have increased their sophistication in vegetation management systems, particularly in distribution networks, in an attempt to drive greater accountability and performance of their contractors. Increasingly this includes the use of Lidar (light detection and ranging), remote sensing and spectral analysis. Primarily data is collected through aerial surveys to determine the presence of vegetation and the distance from conductors, but spectral analysis has potential to provide some forecasting of vegetation health and growth.

Powerlink is introducing these changes where improvements in its vegetation management systems are identified and business benefits are proven, including increasing its use of Lidar for these purposes.

3.7.5.5 Changes Relating to Access to Assets

The introduction of self-assessable codes in September 2010 under the Sustainable Planning Act 2009 (SPA) and Fisheries Act 1994 relating to fish passage required changes to standard practices.

Under this code, normal "bed level crossings" on access tracks are classed as "operational works" and assessable under the code as they are deemed to impact on fish passages. Changes to standard designs in these areas are continuing on a risk based approach to ensure the crossings comply.

Related to this issue is the need to classify crossings associated with network assets to ensure the right areas are applied to the existing laws. Reports from field staff outline the difficulties of identifying water courses under the Fisheries Act, Water Act and Marine Acts. Associated constraints are to be recorded in appropriate corporate systems.

Changes to transmission line maintenance practices are making use of larger equipment to improve safety for personnel working at height and lifting loads to heights. These changes are driving requirements for improving the standard dry weather 4WD access tracks and ground platforms for transmission line towers leading to a higher standard in construction and maintenance of access tracks and gully crossings.

Landholder access requirements are also changing, highlighted through network expansion in the Surat Basin in association with coal seam gas projects. Landholders are increasingly placing constraints prior to entering their properties for various reasons. Powerlink is proactively working to improve engagement with landholders to ensure that business impacts are minimised, including the management of land assets.

3.8 Asset Management Drivers

Electricity transmission assets have a relatively long expected operating life and this extends to the land requirement. Activities during the three key stages of the asset lifecycle are discussed below.

3.8.1 Planning, Design and Construction

The need for land associated with corridors or sites is identified as part of the network investment planning processes and can involve members from Technology & Planning, Business Development, Community & Delivery Services and other groups.

Approval of Powerlink's site and corridor acquisition is predominantly governed by the Acquisition of Land Act 1967 and the Sustainable Planning Act 2009. However, Powerlink needs to demonstrate adequate consideration of a number of other statutory and policy instruments to gain approval, as well as choosing sites and corridors that balance costs, social and environmental considerations. Balancing these constraints should provide the best available site or corridor for acquisition.

In most cases, substation sites are owned by Powerlink but communication sites are a mixture of owned and leased sites, depending on the land availability and site criticality. For corridors, internal processes linked with the designation guidelines determine the route selection, site selection and acquisition of new corridors. Typically, easements are secured for transmission line assets.

The construction of built assets needs to consider planning, design and community requirements. The aim should be to achieve clearing in accordance with H-156762-002 on easements and H-156762-001 at sites. Removal of species that are incompatible should be the aim, selectively applying registered herbicides with landholder consent. Constraints to construction and maintenance need to be recorded in corporate systems (e.g. vehicle washdown requirements).

3.8.2 Operation, Maintenance and Refurbishment

Land assets are primarily linked to the operational phase through monitoring of faults on and threats to the network. Network Operations engages with other parts of the business to assist them with managing these aspects, including data gathering, investigations, analysis and reporting.

Maintenance is performed based on condition, reliability centred maintenance and value based maintenance principles.

Refurbishment is typically undertaken when routine inspection activities identify the land asset is in a state that is not consistent with normal functional requirements and requires a level of work that exceeds the scope of normal maintenance activities. Examples of refurbishment work include:

- Rectification of major access track erosion
- Reduction of fire risk
- Removal of large tracts of hazardous marginal trees
- The installation of a washdown facility.

To meet the stakeholder's expectations and comply with the Electricity Safety Act and other applicable regulations and standards, the land needs to be inspected and maintained at regular intervals as part of Powerlink's maintenance activities. The network has been divided into three zones (see the map below) relating to climate, vegetation and land use and each asset is assigned to an indicative zone. The zones drive the frequency of asset condition assessment (urban = annual, tropical = 2 years and rural = 3 years). Maintenance is performed based on condition, priorities, risk and value. The objective for vegetation is to always maintain >6m clearance from the high voltage electrical network, selectively removing incompatible species and by applying herbicides. This should result in the lowest overall cost, while also being safe.

Figure 3-2 - Vegetation Maintenance Zones

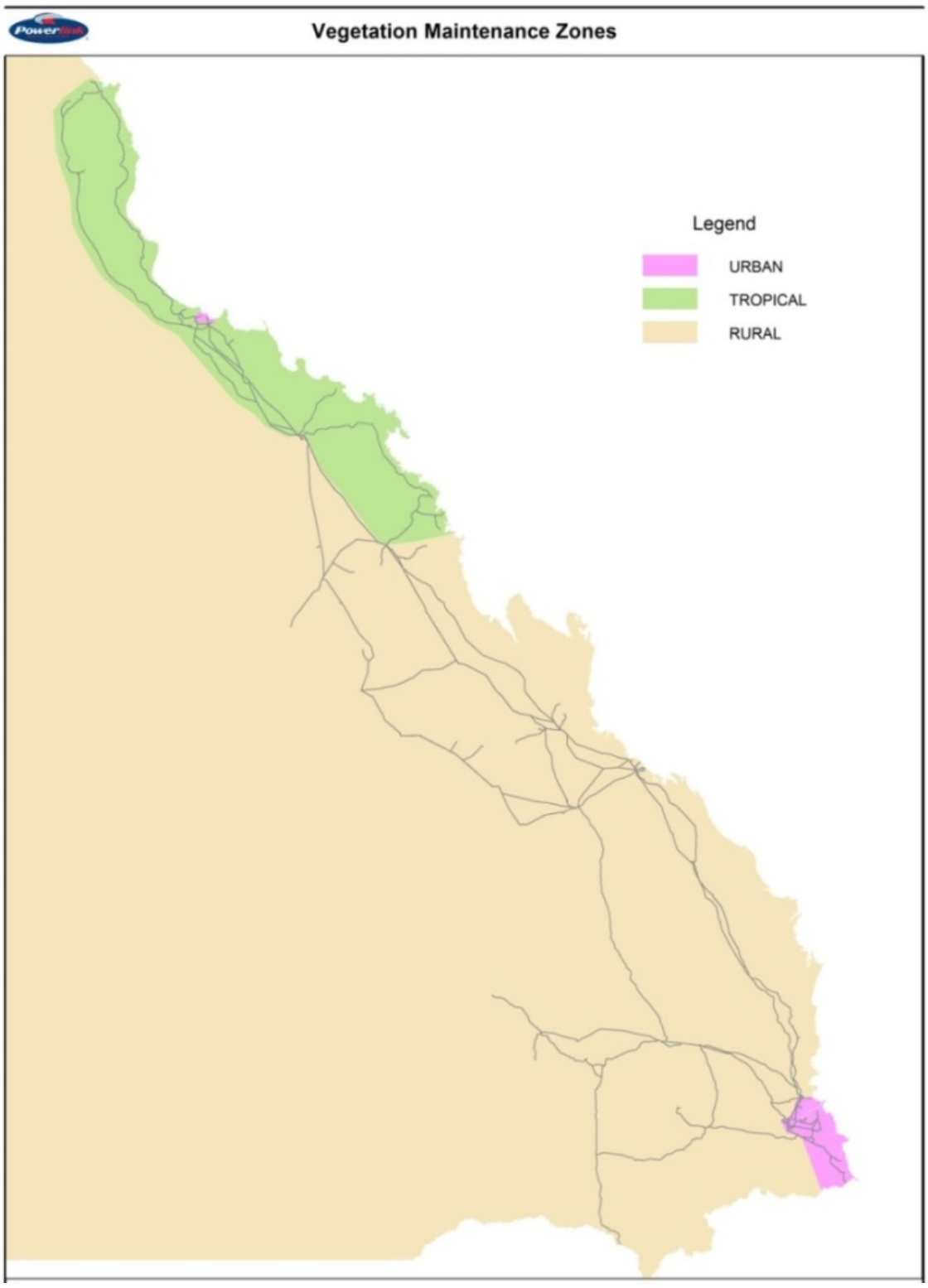


Table 3-1 - Land Asset Maintenance Types and Frequency

Maintenance Type		Activity	Frequency
Preventative Maintenance	Routine Preventative Maintenance (MR)	Land Inspections	Aligned with vegetation management cycles for zones and maybe supplemented by other land asset condition assessments (e.g. Lidar, Civil Inspections, Aerial Inspections and Ground Inspections).
	Condition Based Preventative Maintenance (MB)	Vegetation Management	As required, based on risk
		Land Management	As required, based on risk
		Access to Assets	As required, based on risk
		Fuel Load Reduction	As required, based on risk
Corrective Maintenance	Emergency Corrective (ME)	Immediate work that must be performed to prevent danger to personnel, equipment or system performance.	Initiated through Network Operations, land inspections or other land asset condition assessments.
	Deferred Corrective (MA)	All work, including subsequent investigations and report, associated with rectifying an unacceptable plant condition to an acceptable state that is not an emergency in nature.	Land inspection triggered projects or other land asset condition assessments.

3.8.2.1 Maintenance Support (MS)

In addition to the activities outlined in Table 3-1, maintenance support tasks are undertaken, which are those not directly related to the maintenance of the land asset, including:

- Land Maintenance Audits – carried out annually to determine alignment with land asset requirements.
- Attending public meetings – Powerlink may be required to attend public meetings to ensure its maintenance programs coordinate with broader activities (e.g. biosecurity and fire management).

3.8.3 End of Life

Disposal of land assets should occur only after extensive investigation of future needs. In particular, easements may have future uses outside the current asset's requirements. Communication across the organisation in this regard is vital. The same would apply to decisions for disposal of land used or intended for use as future substation and communications sites.

Once the decision to dispose of land assets has been made, Powerlink will review its routine maintenance programs to align with appropriate investment strategies. Cost savings may be realised, but must always maintain compliance with Powerlink's Electrical Safety Management System.

Powerlink will also consider constraints on future use and manage potential liabilities, approvals and agreements that may be in place. These constraints may place restrictions on the future use of the land (e.g. contamination may not allow residential development to occur), which should be disclosed to potential buyers.

If the land assets are easements, then the easement may simply be surrendered in consultation with the landholder.

3.9 Emergency Response and Network Security

Vegetation that encroaches within the untrained exclusion zones for the HV assets will be treated as deferred corrective maintenance (MA). Vegetation within trained exclusion zones will be removed as soon as is practical by suitably qualified personnel using appropriate control measures and treated as emergency corrective work (ME).

Fires near HV assets have the potential to reduce the insulating properties of air sufficiently to cause an outage. Fire behaviour is a combination of the physical aspects of the site and the weather conditions at the time of the fire. Among other things, prevailing weather conditions can mean the difference between a low intensity fire burning quietly across an easement (for instance on a cool night with no wind) or a crown fire engulfing a line (for instance a 30^{o}C afternoon, with 30% relative humidity and a 30 km/hr wind).

An early warning system to identify fires close to the HV assets (INDJI) and procedures for notification internal and external parties in the event of a fire are managed by the Network Operations Group. Powerlink also provides an information sheet (Fire and High Voltage Transmission Line Safety) on its website and it is communicated to stakeholders.

Emergency response work associated with land assets may be performed as part of natural disasters (e.g. cyclones and floods). This needs to be identifiable in related SAP notifications to allow for separate reporting (e.g. inclusion of "cyclone" in the short text).

The most appropriate way to access HV assets in an emergency event also needs to be considered. If access to HV assets needs to be restored or upgraded as part of an emergency event, the Manager HSE Services shall be consulted for advice and support.

3.10 Forward Planning

A 5 year forward plan shall be updated on a regular basis for each region (southern, central and northern), which aligns with this and other land asset strategies. It should include an up to date asset population for the region, scheduled maintenance and condition assessments. This has been translated into SAP maintenance plans for land inspections. The integration of innovations (e.g. Lidar) will be considered by the Land Strategist, who will review and set forward planning requirements for land assets, particularly in the maintenance phase.

3.11 Risk Assessment

To successfully manage Powerlink's land assets, it is necessary to identify and manage a range of hazards and risks, including those not directly related to the performance of the asset. Land asset risks are often managed as part of the associated built asset risks as part of asset management plans.

The following table summarises the identified hazards (and indicative ratings) associated with land assets. It also includes risk controls that are currently in place to mitigate the risk.

Table 3-2 - Identified Hazards, Risks and Treatments

Technical Issues Related Hazards	Risk	Risk Controls (minimum requirements)
Vegetation related outage (Regrowth, Marginal Tree)	Significant	• Documented processes; • Land inspections; • Condition assessments (e.g. Lidar); • Notifications raised in SAP; • Condition based maintenance; and • Land asset audits.
A catastrophic fire event is caused by arcing from HV assets to vegetation	Significant	• Network Operations processes; • Monitoring fire weather conditions; • Engaging and communicating with stakeholders; and • Condition based maintenance.
Ground access not available to transmission line or site	Moderate	• Documented processes; • Land asset audits; • Land inspections; • Exception reporting; and • Condition based maintenance.
Spread of biosecurity threats through Powerlink's activities	Significant	• Documented processes; • Investments in joint control measures and washdown facilities; • Land asset audits; • Actively engaged with biosecurity management stakeholders; • Land inspections; • Condition based maintenance; • Vehicle hygiene practices; and • Exception reporting.
High fire fuel load accumulation on corridor, resulting in a network event (e.g. double circuit outage caused by fire)	Moderate	• Documented processes; • Investments in joint control measures; • Actively engaged with fire risk management stakeholders; • Monitoring active fires; • Land inspections; and • Mapping of known risk areas.
Erosion effecting electrical infrastructure or access	Moderate	• Documented processes; • Land asset audits; • Land inspections; • Condition based maintenance; and • Exception reporting.
Performance Related Hazard	**Risk**	**Risk Controls (minimum requirements)**
Property owner withholds access to land asset	Moderate	• Documented processes, including land access protocols; and • Exception reporting

Maintenance service provider does not correctly complete maintenance	Significant	• Documented processes; • Land asset audits; • Condition assessments (e.g. Lidar); • Monitoring network events relating to fire and vegetation; and • Investigations.
Maintenance service provider does not comply with relevant legislation or direction of statutory authority	Moderate	• Documented processes; • Compliance week; • Maintenance forums; and • Audit programs
Constraints are not documented into corporate systems, resulting in non-conformance or lock out	Moderate	• Documented processes, including land access protocols; and • Exception reporting
Associated Hazards	**Risk**	**Risk Controls (minimum requirements)**
Bushfire started by operational works associated with land maintenance	Moderate	• Documented processes; • Monitor fire weather conditions; • Control measures placed in contracts; and • Assess risks associated with activities and site conditions (pre-work risk assessments).
Damage to Electrical infrastructure from machinery owned by a landholder or contractor	Moderate	• Documented processes; • Easement agreements; and • Contract terms and conditions.
Illegal access to corridors by third party	Moderate	• Documented processes; • Easement agreements; and • Contract terms and conditions.

3.12 Technical Investigations

Technical investigations may be warranted or triggered based on the performance of land assets and service providers. These may be initiated by various parts of the business, but in all cases involving land assets, the Land Strategist should take a lead role in overseeing these investigations.

3.13 Condition Assessments & Asset Performance

Land assets need to align with asset strategies and serve their intended purpose (i.e. safe, cost effective, reliable and responsible delivery of transmission services). Condition assessments should evaluate land assets against established performance criteria as outlined in relevant processes. Land asset performance will be monitored and reported on a regular basis on the following:

- The number of network events resulting from vegetation and fire
- The number of fire starts associated with land assets
- The level of entry of measuring point data sets into SAP within 1 month of scheduled land inspections, including:
    - Span vegetation risk
    - Span bushfire risk
    - Vegetation height
    - Vegetation density
- The number of notifications raised to indicate defects in the condition of the assets

- Management of assets based on risk/priority
- Provision of services within budget, including delivery of refurbishment projects
- The number of instances of inappropriate access to assets, (exception reporting of what access doesn't meet required standards)
- The absence of any significant stakeholder interactions recorded in corporate systems

3.14 Reporting, Auditing & Benchmarking

Land maintenance service providers should provide the Land Strategist with regular feedback about performance issues associated with land assets. Significant issues, future challenges and trends will be discussed at maintenance forums.

Land assets will be audited annually with a sample of assets from each region included in the scope of the audits. These should form part of broader asset auditing programs with results linked to service provider bonus schemes where appropriate. Service providers will be accountable for managing improvements identified and for reporting progress.

Internal and external benchmarking of land asset performance will be coordinated by the Land Strategist. An internal review of land assets generally occurs annually and external benchmarking should be aligned with other business requirements (e.g. ITOMS and RINS).

3.15 Supporting Activities

A number of additional supporting activities are required as part of managing land assets, including the following activities.

3.15.1 Project Handovers

Project handover processes provide the conduit for transferring design and construction information between the Designers, Construction Contractors and the Maintenance Service Providers. Handovers provide an opportunity for the project team and stakeholders to document and communicate challenges in meeting land asset standards, which can contribute towards identifying opportunities for improvements in process.

3.15.2 Human Resource Training

The Land Strategist provides input to training requirements for staff and contractors involved in managing land assets. The Land Strategist also provides communications to reinforce key concepts and strategies with service providers. It is important to communicate changes that have been implemented based on audits, condition assessments, investigations and condition assessments.

Training will be the decision of line managers with input and support from the Land Strategist. Communications will primarily occur through land maintenance forums.

3.15.3 Strategic Linkages

The Land Strategist will identify and manage key stakeholders as a member of the Asset Strategies team. The position forms part of the Assets Strategies team due to its links with asset management and to ensure land assets remain fit for purpose.

3.15.4 Stakeholder Management

As part of managing land assets, Powerlink recognises the most effective and efficient manner to achieve positive outcomes is often by engaging and coordinating with stakeholders. Where appropriate, Powerlink will proactively engage with stakeholders to achieve mutually positive outcomes.