Chapter 22

Bushfire Risk

22.0 Bushfire Risk

22.1 Existing Environment

22.1.1 Bushfire hazard mapping

State Planning Policy

The State Planning Policy (SPP) 2017 expresses the state interests in land-use planning and development, including natural hazards, risk and resilience. The SPP includes state wide mapping for bushfire prone areas (mapped as potential fire intensity), which takes into consideration potential fuel load, maximum landscape slope and fire weather severity (Figure 22-1).

A bushfire prone area is defined by the SPP as land that is potentially affected by significant bushfires, including vegetation likely to support a significant bushfire; adjacent land they could be subject to impacts from a significant bushfire; and land that is identified by the SPP and / or a Local Planning Instrument as a bushfire prone area.

The Draft Alignment is predominately mapped as a 'Medium Potential Bushfire Intensity' Bushfire Prone Area under the SPP mapping (DSDMIP, 2018) (Figure 22-2).

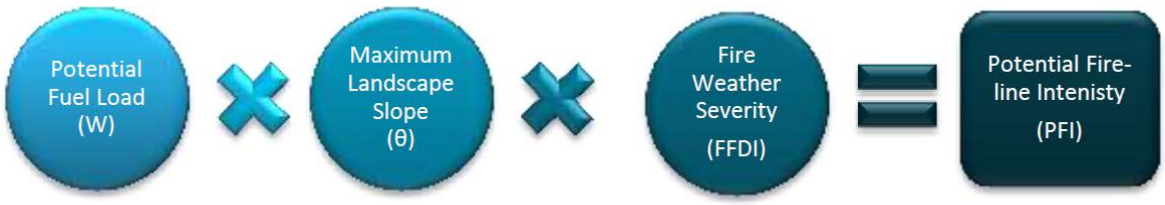


Figure 22-1 Spatial variables used to determine Potential Fire-line Intensity (Leonard, Opie, Newnham, & Blanchi, 2013)

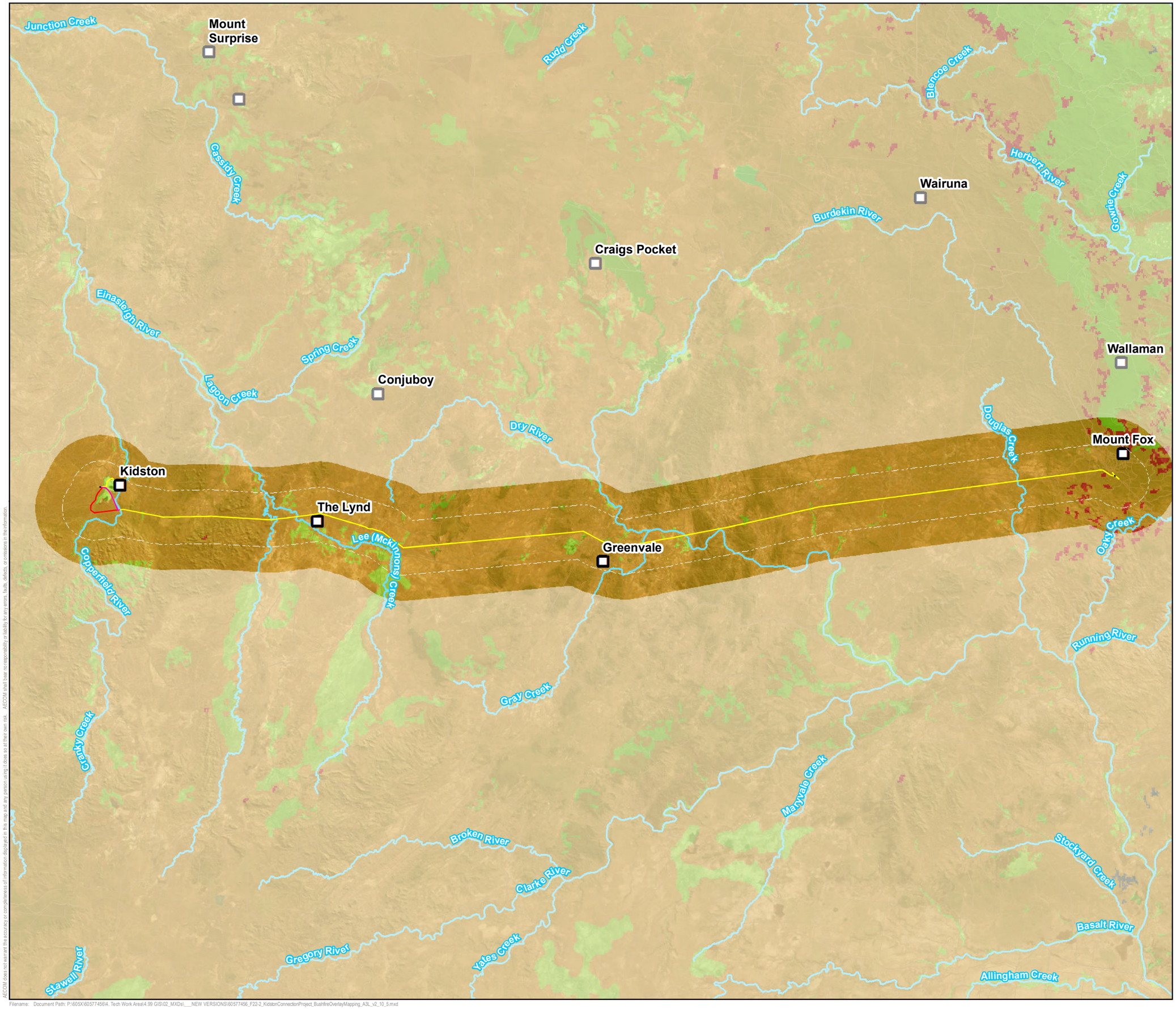
Local Planning Instruments

The local planning instruments applicable to the Draft Alignment include:

- Hinchinbrook Shire Planning Scheme 2017 (Hinchinbrook Shire Council)
- Planning Scheme for Dalrymple Shire 2006 (applies to the section of the Project within Charters Towers Regional Council (Charters Towers Regional Counil, 2006)
- Planning Scheme for the Shire of Etheridge 2005 (Etheridge Shire Council, 2005).

The Minister has identified that the natural hazards, risk and resilience State interest is not reflected within the above Local Planning Instruments, however all schemes include bushfire overlay mapping and assessment benchmarks.

The bushfire overlay mapping in the Hinchinbrook Shire Planning Scheme 2017 identifies the Project area within the LGA as "Medium Risk Area" and "High Risk Area". The Dalrymple Shire Council Planning Scheme and Etheridge Shire Planning Scheme bushfire overlays may the Project area within their respective LGAs as a "Medium Bushfire Hazard".



AECOM
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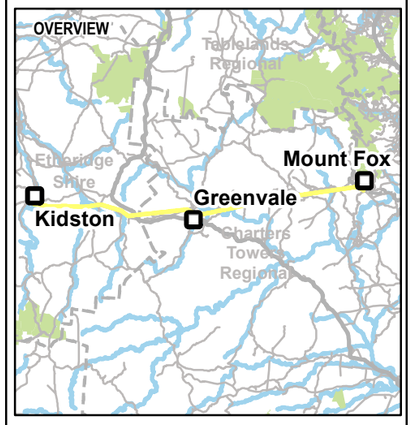
Coordinate System: GDA 94 MGA Zone 55
0 5 10 15 20
Kilometers
1:650,000 (when printed at A3)

Legend

- Places
- Watercourses
- Project 10 km Buffer
- Project 5 km Buffer
- Draft Alignment
- Draft Alignment A
- Draft Alignment B

Bushfire Risk

- Low Risk
- Medium Risk
- High Risk



Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
© SISP Imagery 2017

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Kidston Connection Project

Bushfire Overlay Mapping

PROJECT ID:	60577456
CREATED BY:	JB
LAST MODIFIED:	CFS - 17-Sep-18
VERSION:	1

Figure
F22-2

A3 size

22.1.2 Topography and slope

The Draft Alignment has topography which ranges from flat low lying land to steep slopes. Elevation throughout the Draft Alignment generally ranges from 400-800 m AHD. A number of mountains and ranges are present within the area surrounding and intersecting the Draft Alignment, including:

- Mount Fox (810 m)
- Mount Claro (570 m)
- Mount Jimmy (579 m)
- Pelican Range (450 m intersecting the alignment)
- The Great Dividing Range (590 m intersection the alignment) (Queensland Government, 2018).

22.1.3 Vegetation

Field surveys were undertaken in November 2017, May-June 2018, July 2018 and August 2018. Thirty (30) REs were confirmed during the field surveys. A desktop assessment of the Queensland Herbarium mapping identified a further 26 REs within the remainder of the Project area (Queensland Herbarium, 2016). The REs identified in the field and on Herbarium mapping are provided in Table 22-1.

The methodology for state-wide mapping of bushfire prone areas in Queensland assigns REs to twenty vegetation hazard classes, which are then grouped as either bushfire prone, grassfire prone or low fuel load classes (Leonard, Opie, Newnham, & Blanchi, 2013). The REs across the Project area were all identified as Bushfire Prone vegetation classes (Class 1, Class 2, Class 7 and Class 8), with the potential to support a significant bushfire or the potential to be subject to significant bushfire attack.

Table 22-1 Regional Ecosystems within the Project site Using Both Field Verified Mapping and Supplemented by the Queensland Herbarium Mapping

RE ID	Short Description[1]	Vegetation Hazard Class
Field Verified		
7.8.18	*Corymbia intermedia* and/or *Lophostemon suaveolens* ± *Allocasuarina torulosa* open forest to woodland on basalt	7
7.12.29	*Corymbia intermedia* and/or *Lophostemon suaveolens* open forest to woodland ± areas of *Allocasuarina littoralis* and *Allocasuarina torulosa* on uplands on granite and rhyolite	7
9.3.1	*Eucalyptus camaldulensis* and/or *E. tereticornis* +/- *Melaleuca* spp. +/- *Casuarina cunninghamiana* fringing woodland on channels and levees	7
9.3.3a	Woodland to low open woodland of *Eucalyptus leptophleba* +/- *E. platyphylla* +/- *Corymbia confertiflora* +/- *E. crebra* or *E. cullenii* +/- *C. clarksoniana* on alluvial plains and terraces	7
9.3.5	*Eucalyptus brownii* +/- *Eucalyptus* spp. +/- *Corymbia* spp. Open woodland on alluvial plains	7
9.3.6a	Woodland to open woodland of *Eucalyptus platyphylla* +/- *Corymbia clarksoniana* +/- *C. tessellaris* +/- *E. tereticornis* on alluvial plains.	7
9.3.13	*Melaleuca* spp., *Eucalyptus camaldulensis* and *Casuarina cunninghamiana* fringing open forest on streams and channels	7
9.3.16	*Eucalyptus tereticornis* and/or *E. platyphylla* and/or *Corymbia clarksoniana* woodland on alluvial flats, levees and plains	7

RE ID	Short Description[1]	Vegetation Hazard Class
9.3.20	*Eucalyptus microneura* +/- *Corymbia* spp. +/- *E. leptophleba* woodland on alluvial plains	7
9.3.22a	Open woodland to woodland of *Eucalyptus crebra*, *Corymbia clarksoniana* and/or *C. dallachiana* +/- *E. platyphylla* +/- *E. 308rownie* +/- *Eucalyptus* spp. On levees, terraces and banks of larger rivers and on flat to very gentle slopes associated with drainage lines	7
9.3.25	*Dichanthium* spp., and/or *Astrebla* spp. +/- *Iseilema* spp. Grassland on alluvial deposits derived from basalt soils	7
9.5.3	*Eucalyptus crebra* or *E. drepanophylla* and *Corymbia clarksoniana* woodland on sand plains	7
9.5.11	*Eucalyptus persistens* +/- *E. crebra* woodland on flats on Tertiary remnant plains	7
9.7.1	*Eucalyptus persistens* woodland on lateritised and deeply weathered surfaces on undulating terrain	7
9.7.2	*Acacia shirleyi* low open forest on mesas and lateritised surfaces	8
9.8.1	Open woodland to woodland of *Eucalyptus crebra* +/- *Corymbia erythrophloia* +/- *Corymbia dallachiana* +/- *Corymbia* spp. +/- *Eucalyptus* spp. on basalt plains and rocky basalt plains and hills with varying depths of soil	7
9.8.4	Eucalyptus crebra and/or Eucalyptus tereticornis open woodland on basalt plains.	7
9.8.13	*Iseilema* spp. And/or *Dichanthium* spp. Tussock grassland on basalt plains	7
9.11.1a	Low woodland to low open woodland of *Eucalyptus melanophloia* +/- *E. persistens* +/- *E. crebra* +/- *Corymbia dallachiana* +/- *C. peltata* +/- *E. 308rownie* +/- *Acacia julifera* on skeletal soils of slopes and crests of undulating rises and low hills of folded metasediments and other metamorphic rocks	2
9.11.2a	Woodland to open woodland of *Eucalyptus crebra* +/- *Corymbia dallachiana* +/- *C. erythrophloia* +/- *C. clarksoniana* +/- *Eucalyptus* spp. +/- *Corymbia* spp. On metamorphic hills and rises	2
9.11.5	*Eucalyptus persistens* +/- *E. crebra* woodland on low metamorphic hills	7
9.11.15a	Woodland to low open woodland of *Eucalyptus crebra* or *E. cullenii* +/- *Corymbia erythrophloia* or *C. pocillum* +/- *C. dallachiana* +/- *Erythrophleum chlorostachys* +/- *Eucalyptus microneura* on low hills and rises with moderately deep soils derived from metamorphic geologies	7
9.11.16	*Eucalyptus crebra* +/- *Corymbia erythrophloia* or *C. pocillum* woodland on steep to rolling hills	7

RE ID	Short Description[1]	Vegetation Hazard Class
9.11.23b	Low open woodland to woodland of *Eucalyptus microneura* +/- *E. cullenii* or *E. crebra* on metamorphic hills	7
9.12.1a	Woodland to low open woodland of *Eucalyptus crebra* +/- *Corymbia dallachiana* +/- *C. erythrophloia* +/- *C. clarksoniana* +/- *Corymbia* spp. *E. exilipes* on a variety of landforms from undulating plains to steep hills	7
9.12.10	*Corymbia confertiflora* and *Eucalyptus crebra* +/- *C. clarksoniana* open woodland on rolling igneous hills	7
9.12.12	*Eucalyptus crebra* and *Corymbia erythrophloia* +/- *E. microneura* open woodland on igneous rocks	7
9.12.16	*Eucalyptus crebra* and *Corymbia dallachiana* +/- *Corymbia erythrophloia* open woodland on pre-Cainozoic basalt loams and flats to undulating plains	7
9.12.26	*Eucalyptus moluccana* ± *Eucalyptus crebra and/or Eucalyptus granitica* woodland on igneous rocks	7
9.12.32	*Eucalyptus persistens* woodland on rhyolites and granites	7
Queensland Herbarium		
7.5.2	*Eucalyptus portuensis +/- Corymbia intermedia,* open forest to woodland of uplands on weathered soils of a remnant surface.	7
7.5.4f	*Corymbia intermedia*, *Allocasuarina torulosa*, *Lophostemon suaveolens* open forest and woodland. Deep weathered soils of basalt origin.	7
7.8.18a	*Corymbia intermedia, Eucalyptus tereticornis, E. granitica* open forest to woodland with *Allocasuarina torulosa, A. littoralis, Lophostemon suaveolens, Acacia cincinnata, A. flavescens, Banksia aquilonia* and *Xanthorrhoea johnsonii.* Basalt.	7
9.3.10	*Melaleuca bracteata* low closed forest +/- *Eucalyptus* spp. emergents or vine thicket species on swamps in basalt plains.	1
9.3.10b	Low open forest to open forest of *Melaleuca bracteata* +/- *Lysiphyllum carronii* along creek lines in basalt.	1
9.3.12	River beds and associated waterholes on major rivers and channels.	7
9.3.12a	Sandy river beds sometimes with patches of ephemeral grassland, herbland or sedgeland, which can include *Heteropogon contortus*, *Bothriochloa* spp., and *Ammannia multiflora*	7
9.3.22	*Eucalyptus crebra* or *Eucalyptus cullenii* +/- *Corymbia* spp. open woodland on alluvial levees and terraces.	7
9.3.23	*Acacia tephrina* open forest on alluvial clay plains.	8
9.3.24	*Melaleuca viridiflora* and/or *Melaleuca citrolens* low woodland +/- *Corymbia* spp. emergents on alluvial deposits.	1

RE ID	Short Description[1]	Vegetation Hazard Class
9.3.26	Mixed grassland to open grassland including *Eragrostis* sp., *Aristida* sp., *Enneapogon* sp., *Iseilema* sp., *Chloris* sp., or *Dichanthium* sp. on non-basalt derived alluvial deposits.	7
9.7.1a	Woodland to open woodland of *Eucalyptus persistens* +/- *Eucalyptus crebra* +/- *Corymbia erythrophloia* +/- *Corymbia dallachiana*. Occurs on pediments below scarps of lateritised Tertiary plateaus and on deeply weathered profiles on rolling hills.	7
9.7.1b	Low open forest of *Melaleuca uncinata* +/- emergents of *Eucalyptus persistens* and/or *E. moluccana* and/or *Acacia shirleyi*. Occurs on pediments below scarps of lateritised Tertiary plateaus and on deeply weathered profiles on rolling hills	1
9.7.1c	Woodland to low open woodland of *Eucalyptus persistens* and/or *E. exserta* +/- *E. crebra* +/- *Acacia shirleyi* +/- *Callitris intratropica* on deeply weathered granite hills	7
9.7.3	*Eucalyptus crebra* or *Eucalyptus portuensis* +/- *Corymbia clarksoniana* woodland on lateritised surfaces and edges of Tertiary surfaces.	7
9.7.3c	Woodland to open woodland of *Eucalyptus crebra* +/- *Corymbia erythrophloia* +/- *C. dallachiana* +/-*C. confertiflora* on low rolling hills	7
9.7.5	*Corymbia setosa* and/or *C. peltata* low open woodland on lateritised and deeply weathered surfaces	7
9.8.1a	Open woodland to woodland of *Eucalyptus crebra* +/- *Corymbia erythrophloia* +/- *Corymbia dallachiana* +/- *Corymbia* spp. +/- *Eucalyptus* spp. on basalt plains and rocky basalt plains and hills with varying depths of soil.	7
9.8.1b	Open woodland to woodland of *Eucalyptus leptophleba* +/- *Corymbia erythrophloia* +/- *Corymbia dallachiana* on basalt plains and rocky basalt plains and hills with varying depths of soil.	7
9.8.4a	Woodland to open woodland of *Eucalyptus crebra* or *Eucalyptus granitica* +/- *Corymbia intermedia* +/- *Corymbia dallachiana* +/- *Corymbia tessellaris* on basalt plains and rocky basalt plains and hills with varying depths of soil.	7
9.8.11	*Eucalyptus microneura* +/- *Corymbia* spp. +/- *Terminalia* spp. woodland on basalt plains	7
9.11.4a	Woodland to open woodland of *Eucalyptus crebra* or *E. granitica* +/- *Corymbia intermedia* +/- *C. dallachiana* +/- *C. tessellaris* on basalt plains and rocky basalt plains and hills with varying depths of soil	7
9.11.15	*Eucalyptus crebra* and/or *Eucalyptus cullenii* and/or *Eucalyptus whitei* +/- *Corymbia pocillum* or *Corymbia erythrophloia* woodland on metamorphic hills.	7
9.11.23	*Eucalyptus microneura* +/- *Corymbia erythrophloia* or *Corymbia pocillum* low open woodland on rolling metamorphic hills and rises.	7

RE ID	Short Description[1]	Vegetation Hazard Class
9.12.1	*Eucalyptus crebra* and/or *Eucalyptus xanthoclada* and/or *Eucalyptus drepanophylla* low open woodland on igneous rocks.	7
9.12.2	*Eucalyptus portuensis*, *Corymbia citriodora* subsp. *citriodora*, *E. granitica* or *E. crebra*, *C. intermedia* or *C. clarksoniana* mixed woodland on steep hills and ranges on igneous hills close to Wet Tropics boundary.	7
9.12.4a	Low woodland to occasionally a low open forest of *Eucalyptus shirleyi* and *Corymbia peltata* +/- *E. crebra* +/- *Corymbia* spp. +/- *Acacia leptostachya* predominantly on sandy shallow soils derived from granitic or rhyolite geologies on rolling low hills to hills	2
9.12.6b	Low open woodland to low woodland of *Eucalyptus microneura* +/- *Corymbia clarksoniana* +/- *C. dallachiana* +/- *Terminalia platyptera* on granitic or rhyolite hills	7
9.12.19	*Eucalyptus crebra* or *Eucalyptus granitica* +/- *Corymbia citriodora* subsp. *citriodora* +/- *Eucalyptus portuensis* mixed woodland on igneous hills.	7
9.12.22	*Eucalyptus drepanophylla*, *Corymbia clarksoniana* or *Corymbia intermedia* and *Corymbia dallachiana* woodland on steep rugged igneous ranges.	7

1 Description of REs as contained in the REDD Version 10.0 (Queensland Herbarium, 2016).

22.1.4 Climate

Chapter 5 Climate describes the existing climate within the Project area. Climatic data was obtained from four BoM weather stations being Townsville Aero, Ingham Composite, Charters Towers Airport and Georgetown Post Office. The Project area is considered to experience a warm tropical climate, with distinct wet (summer) and dry (winter) seasons. As of August 2018, the Etheridge Towers and Hinchinbrook LGAs were not drought declared. The southern Charters Towers LGA is drought declared, however this does not include the Project area. The majority of the Project area has been drought declared as recently as March 2017.

Bushfire 'season', as described by Queensland Fire and Emergency Services, normally commences in North Queensland around July. The eastern extent of the Draft Alignment is identified as experiencing a peak in risk during spring while the remainder of the alignment experiences a bushfire season during winter and spring (Figure 22-3) (Bureau of Meteorology, 2009). The threat of bushfires increases with periods of reduced rainfall and increased temperatures, which can increase the amount of dry grass available to burn.

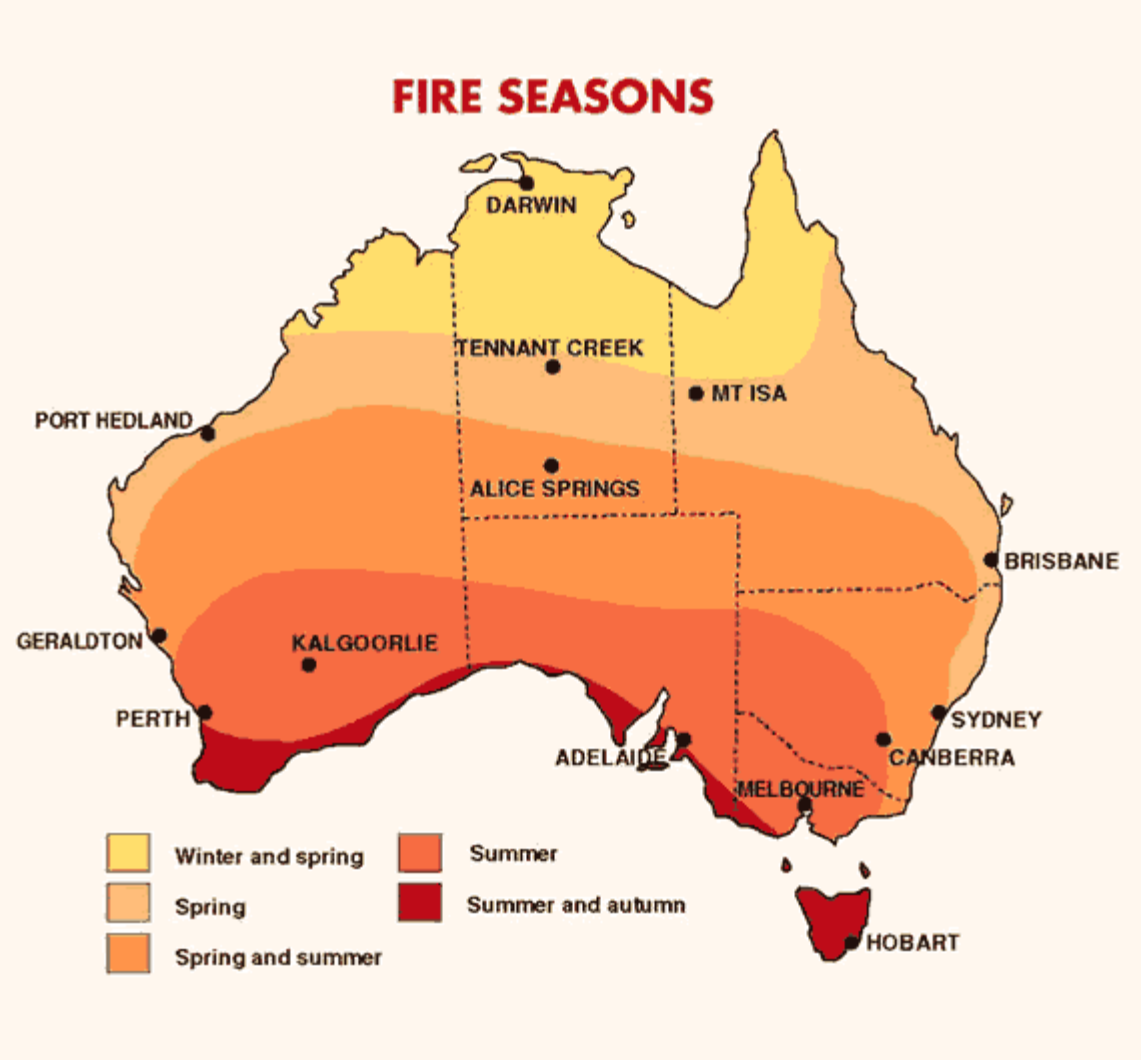

Figure 22-3 Fire seasons

22.1.5 Bushfire frequency

Fire history information is available from the North Australia and Rangelands Fire Information (NAFI) online program run by the Northern Territory Government and Charles Darwin University. Although relatively infrequent, the region has experienced bushfires in recent history (2000-2017) and is a known risk area (Figure 22-4).

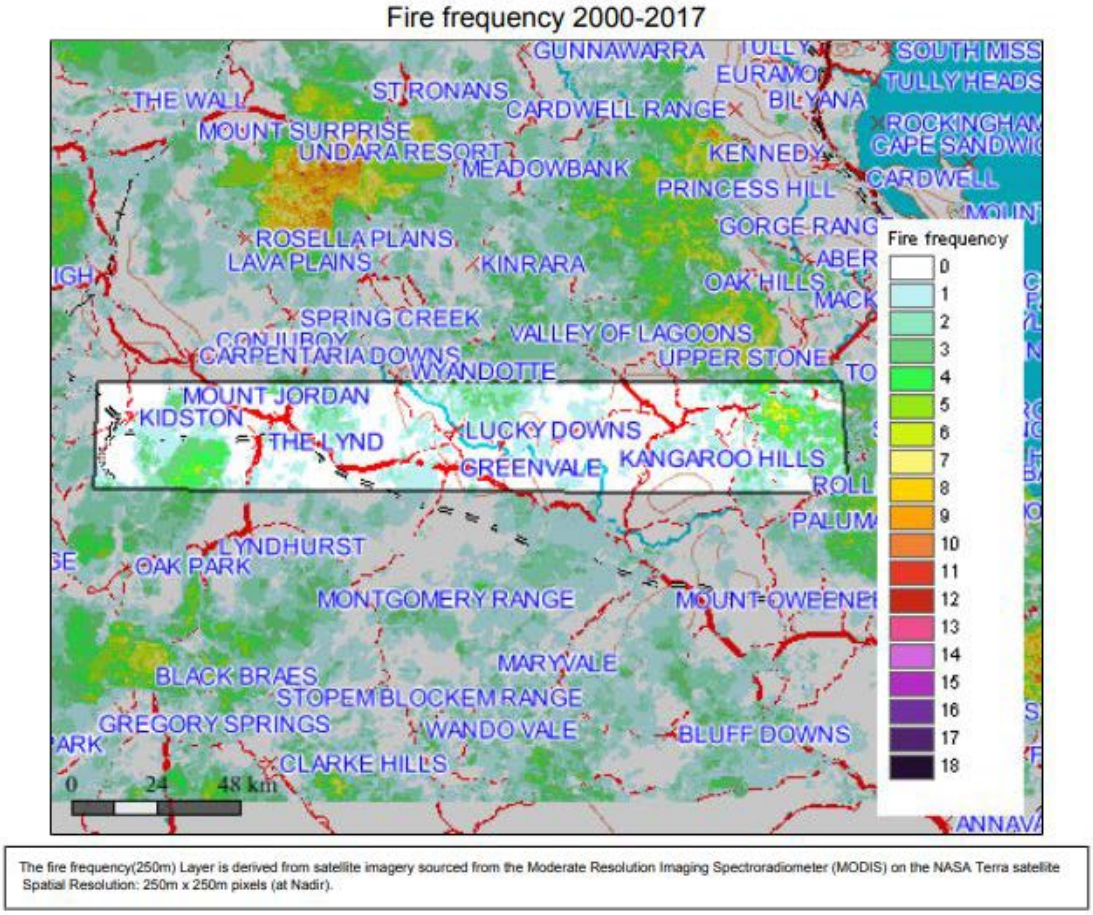

Figure 22-4 Recent fire frequency in the region

22.2 Potential Impacts

Bushfires are potentially harmful to people and property. Potential impacts are addressed below as either a fire hazard from the Project or fire hazard to the Project.

22.2.1 Fire hazard from the Project

Construction

Construction equipment and vehicles have the potential to create a fire risk through the generation of sparks or heat, machinery faults which may ignite dry combustible materials. Other potential sources of ignition may arise from accidental fires from human related activities.

Construction activities will generate combustible material in the form of cardboard, and paper packing material and mulched/chipped vegetation. Potential spills of fuel, oil and flammable liquid may also increase the risk of bushfire, particularly in proximity to dry combustible materials.

Operation and maintenance

Operational fire risk is generally related to external influences, such as climate, surrounding land use, and the proximity and density of surrounding vegetation. Operational faults are rare and do not necessarily result in electrical arc flashover to vegetation. During periods of reduced rainfall and increased temperatures, dry vegetation has the potential although unlikely, to come into contact with the transmission line conductor, potentially resulting in a fire event through power arcing. Due to the height of the structures these events are very rare.

Operational waste, particularly dry combustible waste, is anticipated to be limited (Chapter 23 Waste Management) and will be a negligible contribution to bushfire risk from the Project.

During maintenance of the infrastructure, it is anticipated that vegetation waste will be generated which may present a potential fire risk. Sprayed vegetation is usually left to die back and decompose naturally. Cleared regrowth may be mulched or chipped. The actual disposal method on each property will be determined in consultation with landholders.

Maintenance is also likely to present similar fire risks to construction, on a smaller and more localised scale. These risks include the generation of sparks or heat, machinery faults which may ignite dry combustible materials. Other potential sources of ignition may arise from accidental fire from human related activities.

22.2.2 Fire hazard to the Project

Fires burning adjacent to or under high voltage transmission lines have the potential to:

- create electrical arcs (known as 'flashovers') that can endanger people, animals and objects
- damage or destroy the wires, insulators and supports of the transmission line
- interrupt electricity supply to households and industry.

Further information on safety risks associated with fires burning near transmission lines are provided on Powerlink Queensland's website[3] (Powerlink Queensland, 2015).

Fire events within the vicinity of transmission lines would most likely be the result of environmental conditions, such as climatic conditions, or land use activities. Powerlink Queensland actively reduces vegetation with the easement during maintenance programs, therefore the easement and Project access tracks often act as a firebreak in the event that a fire occurs. Transmission line access tracks may also be used by fire crews in the event of fire. The Project design is unlikely to impose restrictions upon existing bushfire management techniques.

Transmission lines are designed to be compatible with the impacts of potential natural hazards that may occur within the proposed easement and potential fire impacts to the transmission lines are limited. The substations will be surrounded by a large cleared buffer area for protection in the event of a fire.

22.2.3 Assessment against the SPP assessment benchmarks for natural hazards, risk and resilience

The overall intent of the natural hazards, risk and resilience State interest in the SPP is as follows.

> *The risks associated with natural hazards, including the projected impacts of climate change, are avoided or mitigated to protect people and property and enhance the community's resilience to natural hazards.*

The State interest includes a number of assessment benchmarks in relation to bushfire prone areas, which are summarised below.

- Development avoids bushfire prone areas, and where avoidance is not possible, development mitigates the risk to people and property to an acceptable or tolerable level.
- Development supports and does not hinder disaster management response or recovery capacity and capabilities.
- Development avoids increasing the severity of bushfires and the potential resulting impacts.
- Risks to public safety as a result of storage and use of hazardous materials are avoided.

Avoidance of bushfire prone areas is not feasible due to the nature of the Project. Management and mitigation measures will be implemented during all stages of the Project lifecycle to minimise risks to people and property in the immediate area (refer to Section 22.3).

The Project area is located within a rural area which contains difficult to access sites. The Project will involve the clearing of vegetation to facilitate construction and operation of the transmission line which

[3] https://www.powerlink.com.au/sites/default/files/2017-12/Fire%20and%20High%20Voltage%20Transmission%20Line%20Safety.pdf

will improve access to the site and can be utilised by disaster management response teams if required. The cleared easement will also act as a firebreak which will both protect the transmission line from nearby fire and adjoining properties in the event an outbreak occurs near the alignment.

Storage and use of hazardous materials are discussed below.

22.3 Mitigation and Management Measures

The assessment of potential impacts indicates that fire risk may potentially increase as a result the Project, particularly during the construction stage. External environmental conditions within surrounding areas, such as the proximity and density of surrounding vegetation, climatic conditions and land use activities, may also contribute to an increased fire risk. The following measures are proposed to mitigation the potential impacts of bushfire from or to the Project.

Design

- Queensland has adopted the Australian Standard for the Construction of Buildings in Bushfire Prone Areas - AS3959 – 2009. AS3959 sets out the requirements for the construction of buildings in bushfire prone areas in order to improve their safety when they are subjected to burning debris, radiant heat or flame contact generated from a bushfire. Project buildings constructed will be consistent with the Standard.
- Allow additional tower height clearances in areas with high fuel loads, where practicable.
- The transmission line design will include all current design principles and safeguards to avoid arcing and line breakage.

Construction

- A Bushfire Management Plan will be developed for the Project.
- Fire hazard warnings associated with weather patterns and fire risk are issued by the Bureau of Meteorology and the Queensland Rural Fire Service. Daily checking of fire hazard warnings will be undertaken and construction crews made aware of the fire warnings (e.g. through pre-starts).
- Project construction will be conducted in line with Powerlink's Fire Prevention Procedure.
- Flammable and combustible liquids (i.e. fuel) will be stored within facilities designed to AS1940–2004 'The Storage and Handling of Flammable and Combustible Liquids.'
- Procedures guiding the response to emergency and fire situations, and requests from emergency management authorities, will be documented and communicated where applicable to project location.
- Firefighting equipment must be kept on site when hot works are being undertaken. Personnel must be trained in the use of the equipment.
- All machinery must have a tested and tagged fire extinguisher available.
- Burning of vegetation is prohibited, unless a permit is obtained by a local fire authority and Powerlink Queensland, prior to burning.
- Designated smoking areas are to be identified with cigarette butt bins for safe disposal.
- Where a landholder requests no smoking on their property, this must be adhered to.

Operation and maintenance

- Flammable and combustible liquids (i.e. fuel) will be stored within facilities designed to AS1940–2004 'The Storage and Handling of Flammable and Combustible Liquids'.
- Powerlink Queensland maintains its easement through routine vegetation maintenance to ensure vegetation remains outside of untrained exclusion zones and incompatible species do not interfere with the safe operation of the transmission line.
- Cleared vegetation will not be placed in a location which may increase any fire hazard and impact on the Project in the event of a fire.

- Burning of vegetation is prohibited, unless a permit is obtained by a local fire authority and Powerlink Queensland.
- Powerlink Queensland adopts an asset risk management approach that considers potential fire starts from network components (e.g. insulator and instrument failures). High consequence areas and the likelihood of failures are assessed to determine the optimal investment in the network.