KUR-World

Site Description

Chapter 3.0

Environmental Impact Statement

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Abbreviations used in this chapter are as follows:

Abbreviation	Meaning
AHD	Australian Height Datum
NCA	Nature Conservation Act 1992
PASS	Potential Acid Sulfate Soils
RUSLE	Revised Universal Soil Loss Equation
SILO	Database of about 125 years of continuous daily weather records for Australia
SPP	State Planning Policy
TC	Tropical Cyclone

3.0 SITE DESCRIPTION

3.1 Location and context

The proposed project site is located at 112 Barnwell Road, Kuranda and is approximately three kilometres west of the township of Kuranda. The site is located within a local area commonly referred to as ‘Myola’, which is centred on a small township area on Myola Road, approximately one kilometre north of the site. Myola is located on the western periphery of the township of Kuranda and comprises a combination of rural residential, rural and conservation land uses. The Kuranda locality is characterised by a defined township and surrounding areas of rural residential land use to the north, west and south.

Kuranda is situated at the north-eastern edge of the Atherton Tablelands, a hinterland area to the west of a number of coastal settlements; most notably the City of Cairns. The Cairns city centre is approximately 21 kilometres south-east of the site (approximately 34 kilometres by road). The urban area of Cairns extends to the north and south of the Cairns city centre along the coast, with the northern beaches area, anchored by the suburb of Smithfield, located approximately 12 kilometres north-west of the Cairns city centre and approximately 10 kilometres east of the site.

Kuranda is separated from Cairns and other coastal development by the Macalister Range, which forms part of the Great Dividing Range. The range comprises a predominant natural rainforest character protected by the Barron Gorge National Park, Dinden National Park and Kuranda National Park. This rainforest character is continued into Kuranda, which is commonly described as “The Village in the Rainforest”.

Mareeba is a primary centre for the northern part of the Atherton Tablelands, located approximately 28 kilometres south-west of the site. Mareeba, Kuranda and Cairns are connected by the Kennedy Highway/Captain Cook Highway.

Further detail in relation to the site’s location is shown in Figure 3-1 and Figure 3-2.

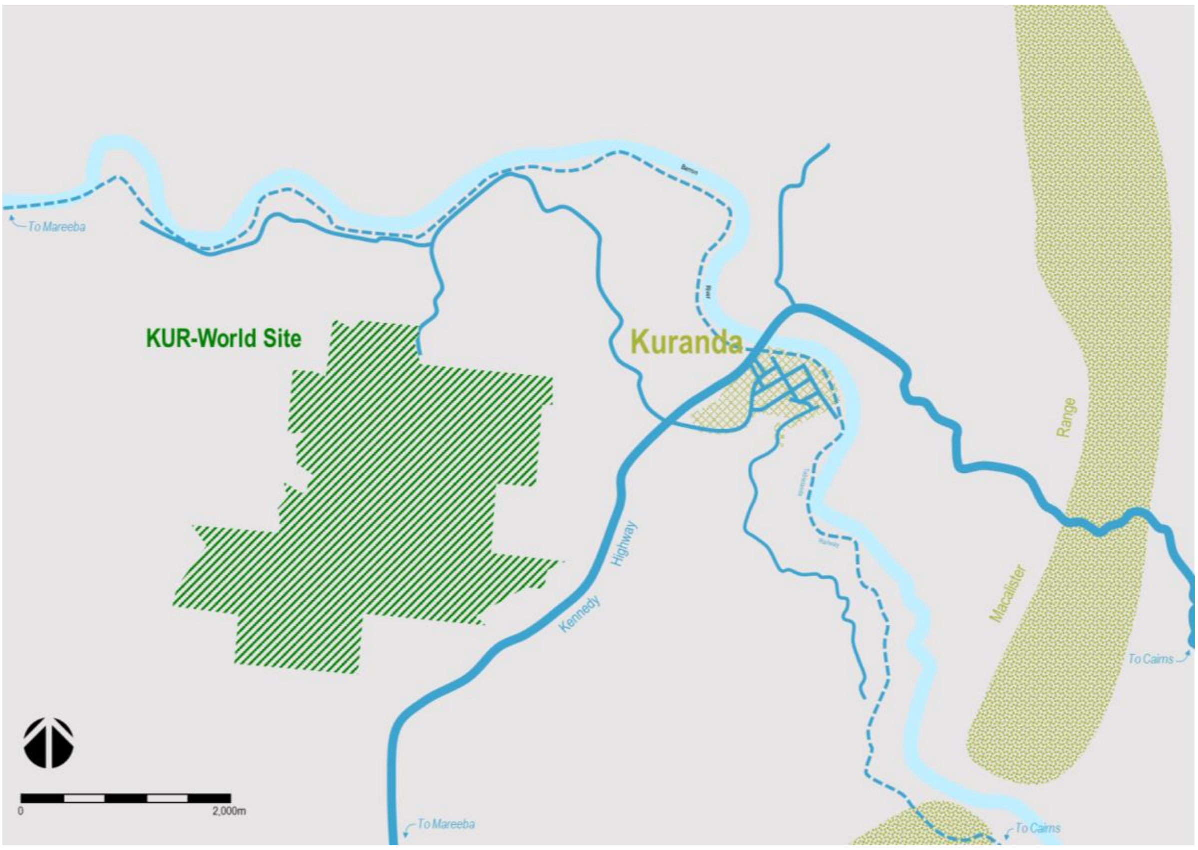


Figure 3-1: Local Context

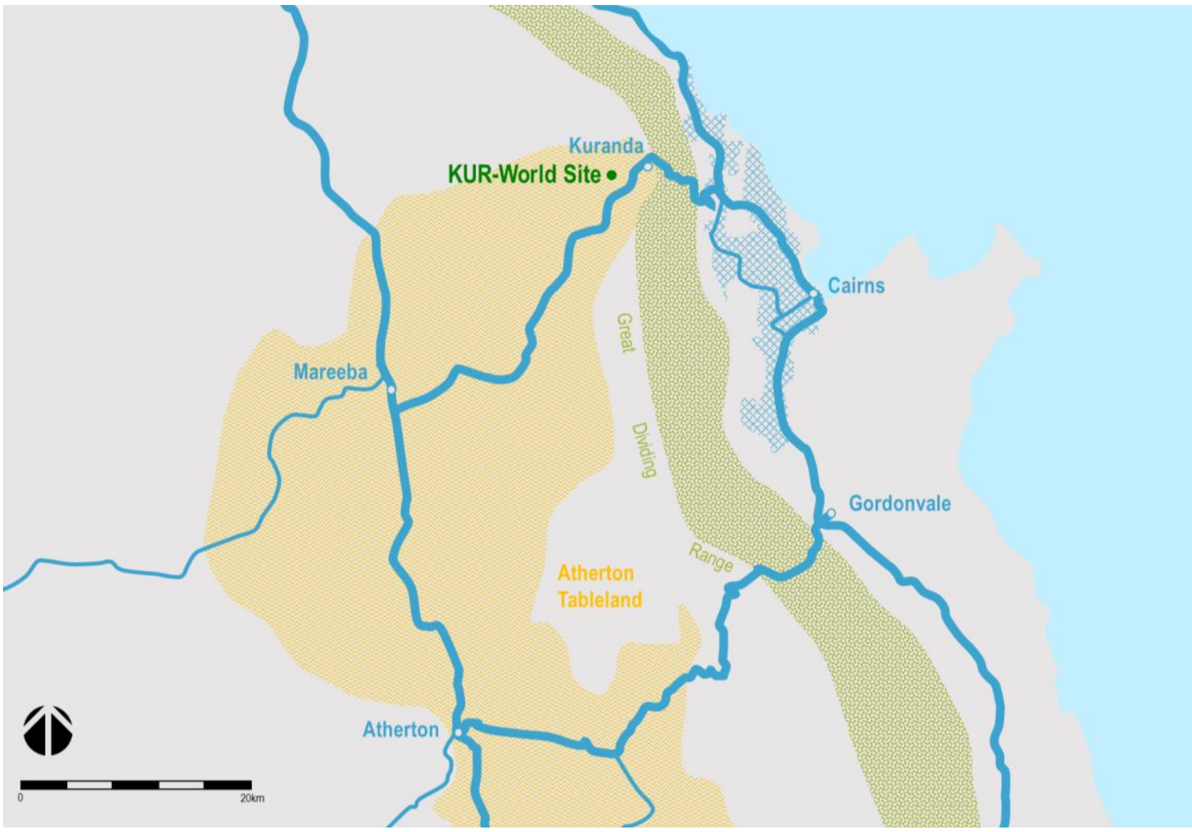


Figure 3-2: Regional Context

3.1.1 Tenure

The site comprises 10 freehold allotments and a total land area of 648.3 hectares. The site is not subject to any other tenure. Most land adjoining the site is also freehold, with the exception of:

- a small parcel of reserve land, identified as Lot 291 on NR6631, adjoining the site (Lots 19 and 95 on N157452) to the east; and
- land adjoining the site (Lot 131 on N157491 and Lot 290 on N157480) to the south/south-west described as Lot 1 on AP19245, which is State Forest, being the Formartine State Forest, which extends along the Kennedy Highway comprising a land area of 1,710 hectares.

The land tenure of the site and the surrounding area is further outlined in Figure 3-3.

For the purposes of KUR-World, the site has been divided into a northern area and a southern area, which are described in Table 3-1 and incorporates former road reserves which have been recently closed.

The land, specifically Lot 43 on N157359, is partly subject to a lease to the Royal Flying Doctor Service of Australia (Queensland Section). The lease commenced on 1 June 1972 and has a term of 99 years. The lease relates to a communications installation located on the land, which no longer services the communication needs of the Royal Flying Doctor Service. The site is not subject to any other leases.

Native title has been extinguished over the project site. (Refer to Appendix 3D Native Title Tenure Assessment).

The site does not benefit from and is not burdened by any easements.

The lot descriptions and land areas presented in Table 3-1 relate to the current description of the site. Since commencing work in relation to the project, the Proponent has closed roads adjoining the lots that form the site, through road closure applications with the Department of Natural Resources and Mines. The road closures undertaken are reflected in the areas (in hectares) identified in Table 3-1.

Table 3-1: Lots forming the site

Northern Area		Southern Area	
Lot 22 on SP296830[1]	107.3000 hectares	Lot 20 on N157423	70.6180 hectares
Lot 17 on SP296830[2]	63.1200 hectares	Lot 43 on N157359	64.5140 hectares
Lot 18 on SP296830[3]	69.8141 hectares	Lot 95 on N157452	34.0492 hectares
Lot 19 on SP296830[4]	43.4993 hectares	Lot 129 on NR456	65.8900 hectares
Total	**283.7334 hectares**	Lot 131 on N157491	64.7500 hectares
		Lot 290 on N157480	64.7500 hectares
		Total	**364.5712 hectares**

[1] Lot 22 on SP296830 includes land formerly described as Lot 22 on N157227 and Lots 1 and Lot 2 on RP703984 and closed road reserves
[2] Lot 17 on SP296830 includes land formerly described as Lot 17 on N157227 and closed road reserves
[3] Lot 18 on SP296830 includes land formerly described as Lot 18 on N157227 and closed road reserves
[4] Lot 19 on SP296830 includes land formerly described as Lot 19 on N157452 and closed road reserves

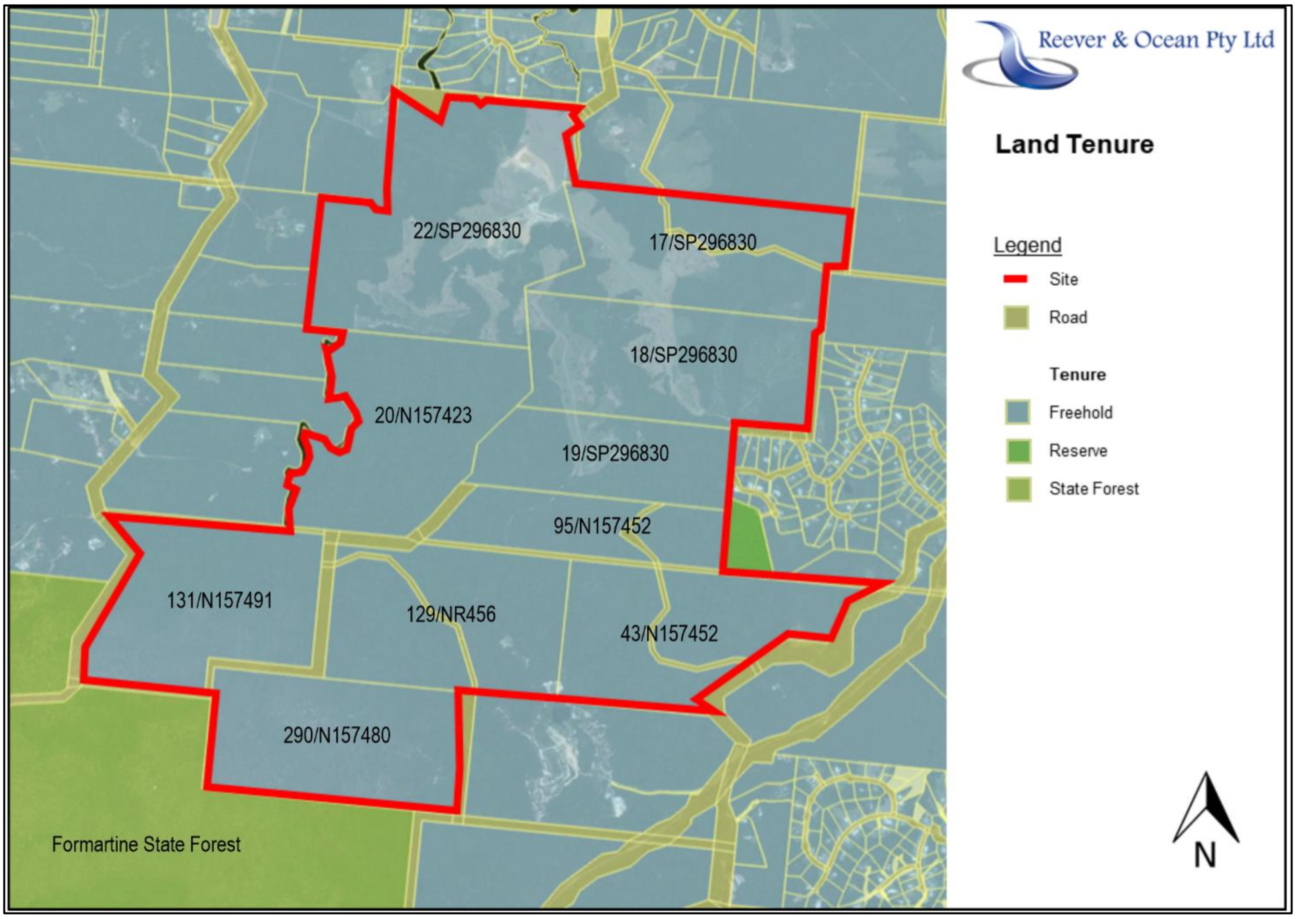


Figure 3-3: Site Tenure

3.2 Protected areas

3.2.1 Nature Conservation Act 1992

Section 14 of the *Nature Conservation Act 1992* ('the NCA') defines nine classes of protected areas, namely:

- National Parks (scientific);
- National Parks;
- National Parks (Aboriginal land);
- National Parks (Torres Strait Islander land);
- National Parks (Cape York Peninsula Aboriginal land);
- Conservation Parks;
- Resources Reserves;
- Nature Refuges; and
- Coordinated Conservation Areas.

The site is not identified as a protected area under the NCA. Table 3-2 describes the designated protected areas proximate to the site.

Table 3-2: Protected Areas

Categories/Description	Location
Barron Gorge National Park	Approximately 2 kilometres east of the site

Categories/Description	Location
Kuranda National Park	Approximately 2 kilometres north of the site
Jumrum Creek Conservation Park	Approximately 2 kilometres east of the site
Smithfield Conservation Park	Approximately 6.5 kilometres north-east of the site

3.2.2 World Heritage Areas and National Heritage Places

The site is not located in the Wet Tropics of Queensland World Heritage Area / National Heritage Place or the Great Barrier Reef World Heritage Area / National Heritage Place. The location of these areas/places relative to the site is outlined in Figure 3-4.

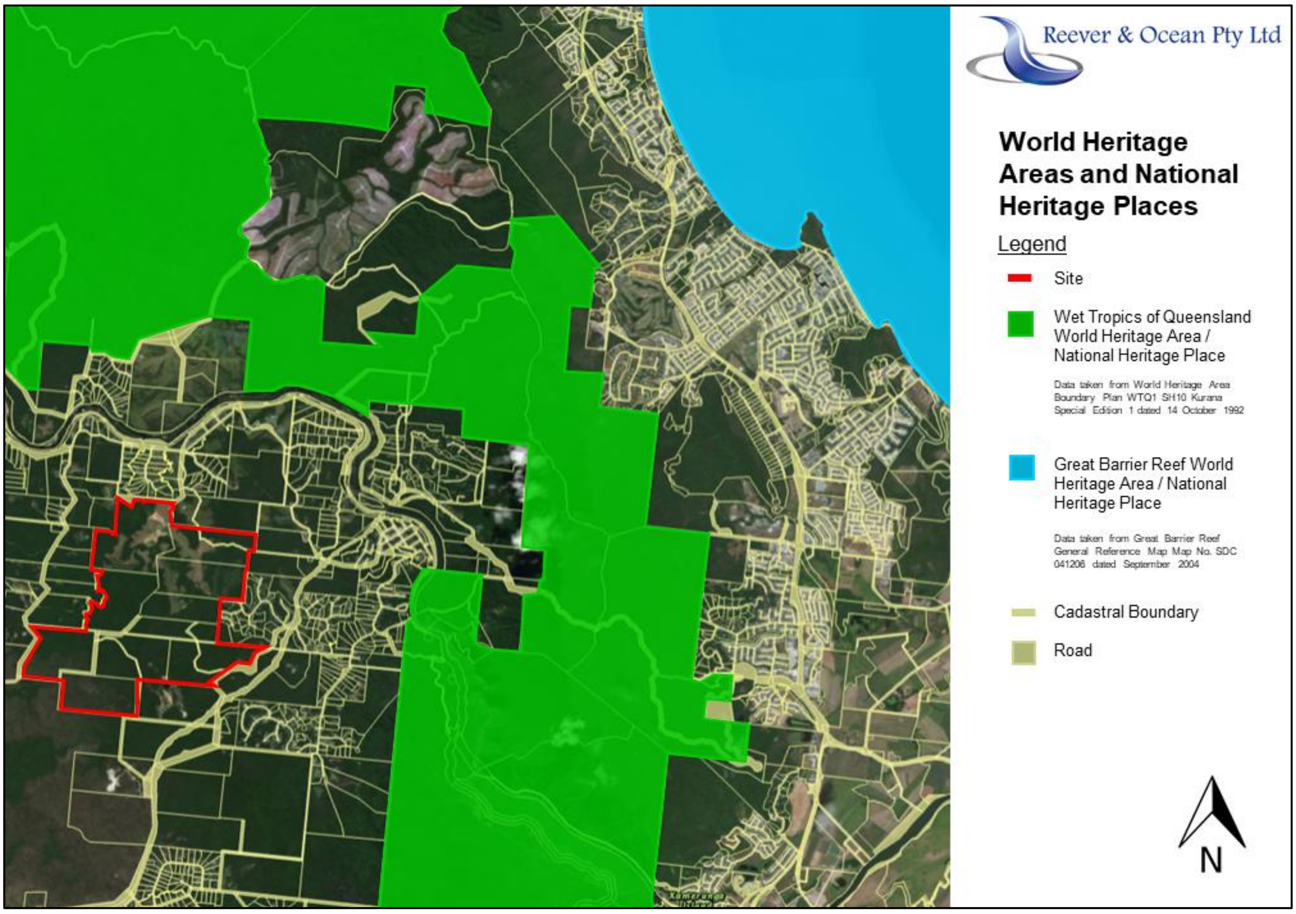


Figure 3-4: World Heritage Areas and National Heritage Places.

3.2.3 Environment Protection and Biodiversity Conservation Act 1999

The project site is located two kilometres west of the Wet Tropics World Heritage Area and 8.5 kilometres west of the Great Barrier Reef World Heritage Area. In addition to being World Heritage Areas, both areas are also National Heritage Places and are protected by the provisions of the *Environment Protection and Biodiversity Conservation Act 1999*.

The environmental impact of the project on these Areas and Places will be assessed in Chapter 19 Matters of National Environmental Significance.

3.3 Geology

Geological units in the Kuranda region are primarily of metamorphic origin (Nagel and others 1996). The KUR-World project area is predominantly located on a geological formation known as the Barron River Metamorphics, which is a lithological correlative of the Hodgkinson Formation. Minor Quaternary Alluvium units associated with the Barron River occur north of the site (**Figure 3-5**). No major geological structures were identified in proximity to the project area at the current mapping scale (1:100,000) (DNRM 2011). The main aquifer in the project area comprises fractured rock within the Barron River Metamorphics overlain by up to 10 metres of clayey hillwash sediments that form a reasonably effective aquitard (RLA 2017). The groundwater is characterised by acidic water, elevated nutrients (forms of nitrogen and phosphorus) and metals and metalloids when compared to the relevant water quality objectives (NRA 2017b). A census revealed that the majority of the neighbouring bores are used for domestic purposes (RLA 2017). A total sustainable groundwater yield of 6.25L/s in any 24-hour day has been assessed for KUR-World (RLA 2017).

The Hodgkinson Formation is contained in the Hodgkinson Province (Mossman Orogen). The age of the formation is estimated to be early Carboniferous (360 million years old) to late Silurian (420 million years old) (Geoscience Australia 2017). The Barron River Metamorphics are composed of low-grade metamorphic rocks including micaceous schist, phyllite and slate. These rocks tend to be steeply dipping, strongly folded, and often overturned with prominent cleavage (Willmott and others 1988).

Despite local variation noted in the 1:100,000 Cairns 8064 series map sheet (DNRM 1989), current digital spatial data (DNRM 2011) describes the Hodgkinson Formation as mainly dark grey, thin-bedded mudstone, subordinate thin to thick-bedded arenite with minor chert and basalt units (**Figure 3-5** and Figure 3-6). Figure 3-6 is a diagrammatic cross-section (A – B) from west to east that shows the interpretation of the geology of the KUR-World project area. The cross-section has been derived from data from groundwater investigation bores, which are shown in the cross-section, together with the depths of water strikes and the Static Water Level (SWL) in September 2017. The water table is at least 5 metres below the ground surface in low elevation streams and generally approximately 10 metres below surface levels in stream levels at higher elevation (Rob Lait and Associates, 2017).

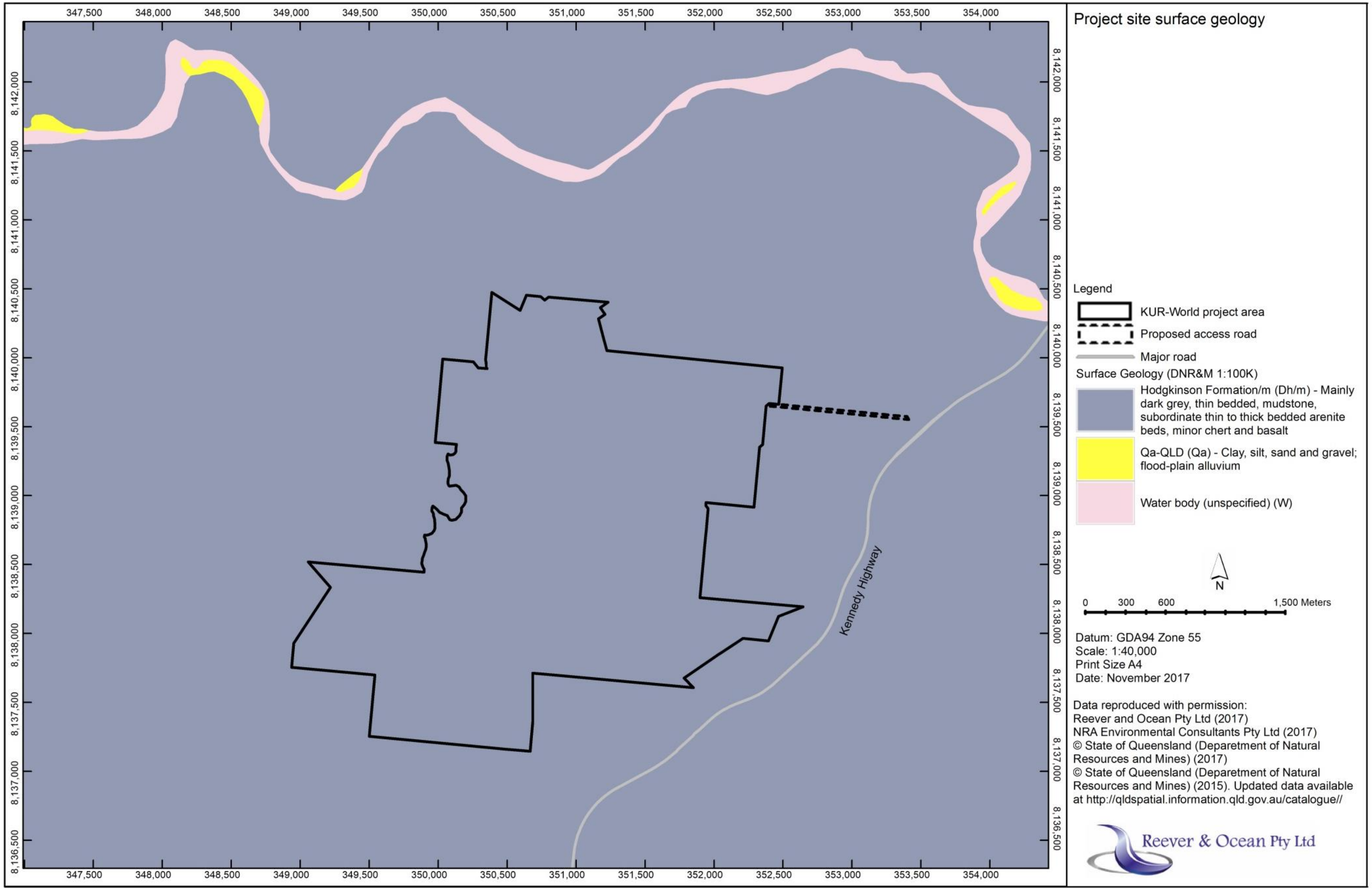
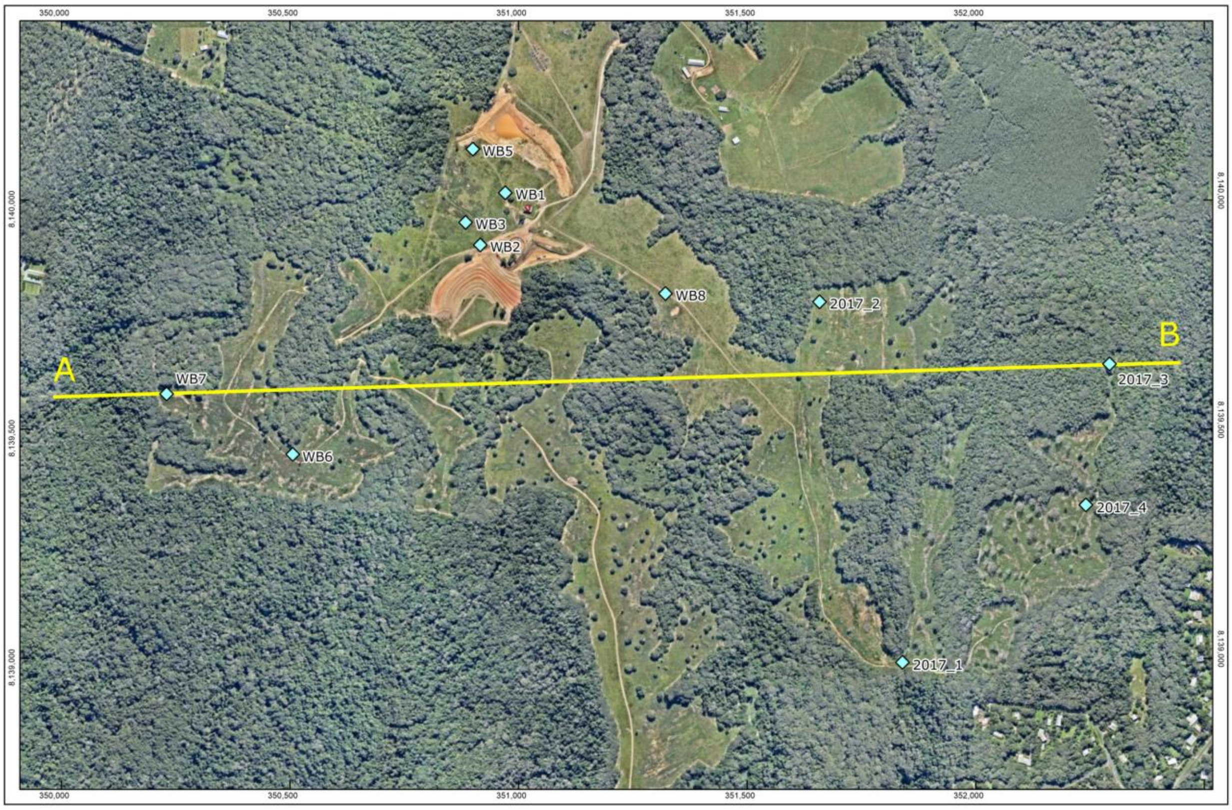
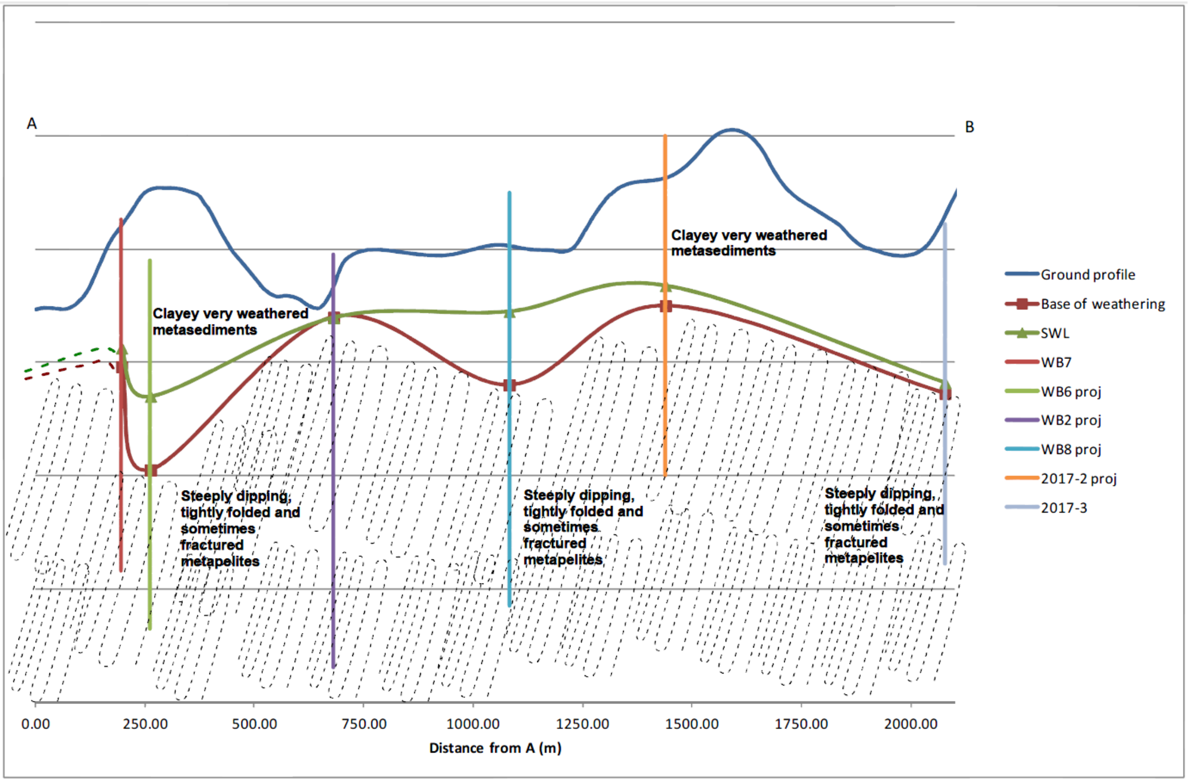


Figure 3-5: Project site surface geology





Sourced from Rob Lait and Associates, 2017.

Figure 3-6: Diagrammatic west-east geological cross-section at KUR-World

3.4 Topography

Elevation and slope classes for the project area are illustrated by Figure 3-7 and Figure 3-8, respectively. The elevation across the project area ranges from approximately 300 metres to 500 metres (Australian Height Datum) and has high relief according to the classification of Speight (2009). There is a gradient in elevation across the project area. The highest elevations (490-509 metres) are recorded in the south-east (Mount Haren) and south-west corners, grading towards the lowest point in the north of the site. The landscape is dissected by a network of waterways and drainage lines (Figure 3-7) that flow toward the north of the site ultimately discharging into the Barron River.

The area is largely moderately inclined (slope 10-32 %) and the dominant landform would be classified as rolling hills (Figure 3-8). Areas of high elevation have steeper slopes (slope >32%) and would be classified as steep hills. The area is dissected by drainage lines that are, in some cases, steeply sided (slopes can exceed 32%). These drainage features are interspersed with distinct ridgelines (discernible in Figure 3-8) that are level to gently inclined (slopes 0-10%). Slope is a risk factor for accelerated erosion and these matters are taken into account in the erosion and sediment control planning detailed in Chapter 9 (Water Quality).

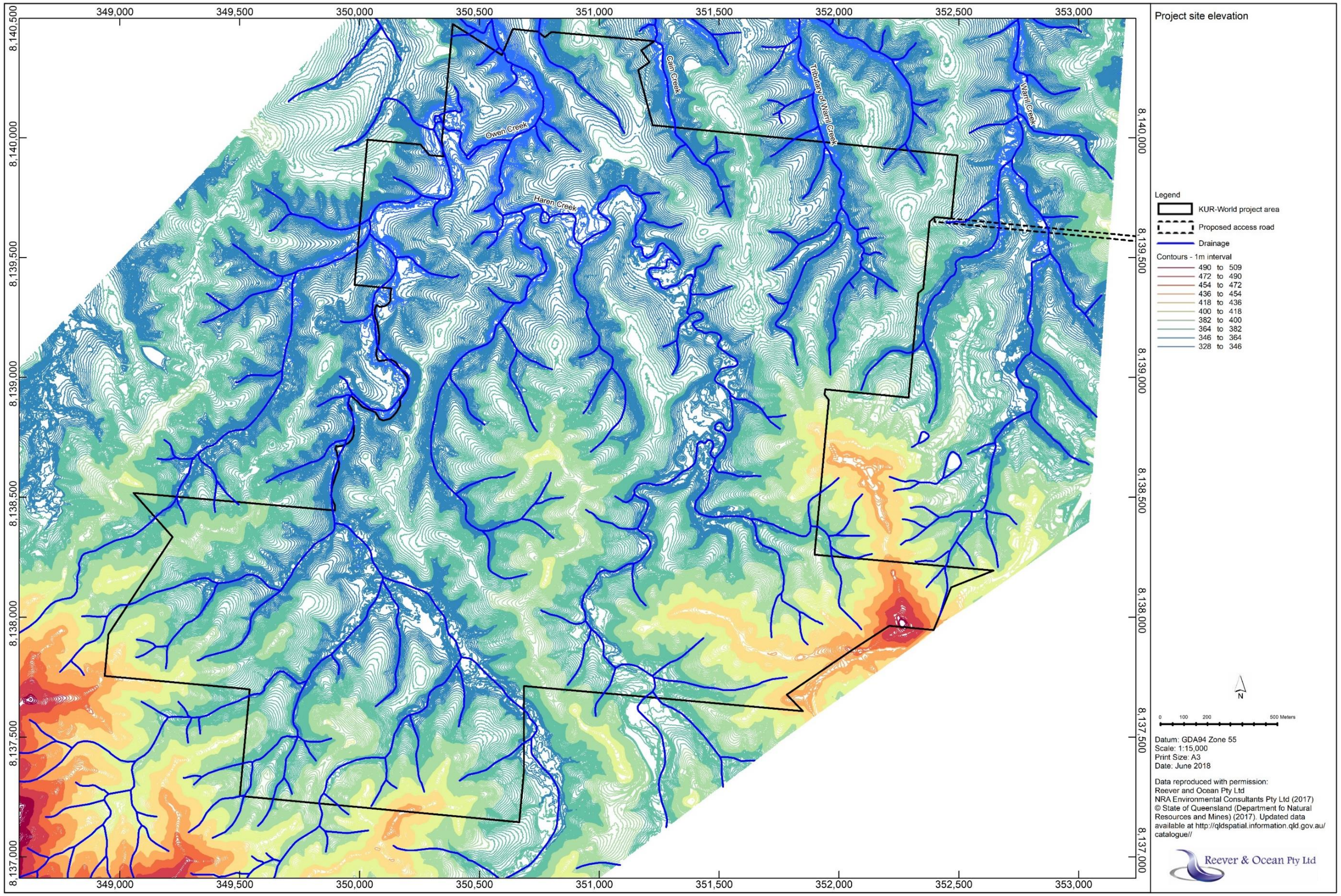


Figure 3-7: Project site elevation

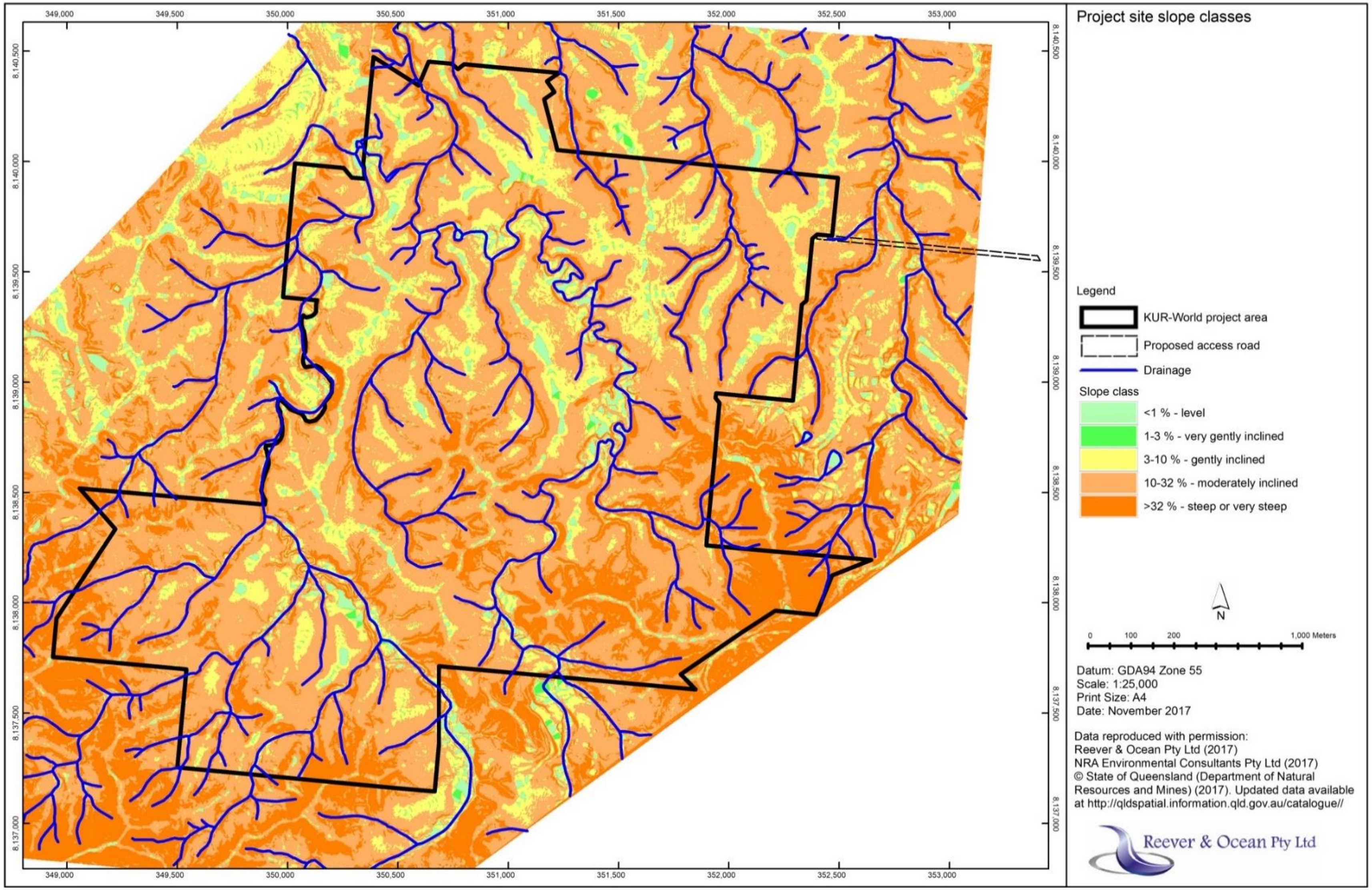


Figure 3-8: Project site slope classes

3.5 Soil

Desktop and field survey work was undertaken to identify and map soil types present in the KUR-World project area (Appendix 1 – Soils and Geology). Two main soil types (referred to as soil profile classes (SPCs) or soil series), namely Bicton and Galmara, described by Malcolm and others (1999), dominate the project site (Figure 3-9). The Bicton soil type appears to be confined to very gently inclined or level ridge tops (slopes <3%) with restricted drainage, and Galmara dominates on better drained gently to steeply inclined areas (Appendix 1). It is well recognised that these soil types can occur in the same landscape position seemingly randomly (Murtha and others 1996) and it is likely that units mapped as one soil type will include areas of the other.

As well as Bicton and Galmara series, Murtha and others (1996) and Murtha and Smith (1994) described additional soil types that develop on the metamorphic rock in the Cairns hinterland. These soil types are expected to co-occur in areas of Galmara soil and the mapping delineates where they may be co-dominant. Of these, Seymour, which occurs on steeper slopes or ridgelines, may occur in the project area, although it was not encountered in the field survey. Mission series soils are located generally within 50-100 metres of the creek lines, they occur outside the current planned project disturbance envelope and were not encountered in the field survey. Seymour soils are most likely restricted to areas with slopes over 32% but may be encountered in the southern part of the project area. The soil types confirmed or inferred to occur in the KUR-World project area are presented in Figure 3-9 and Table 3-3.

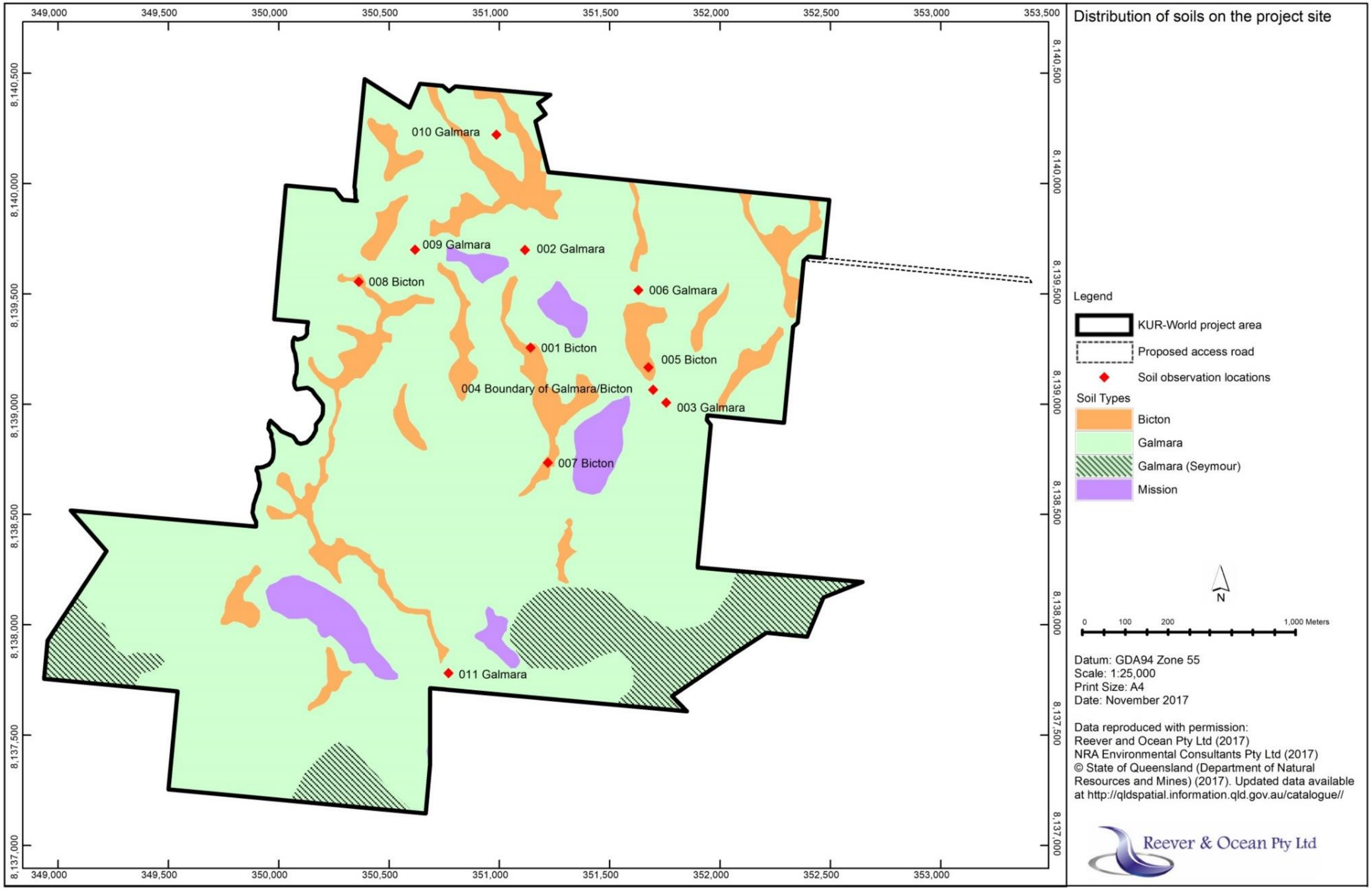


Figure 3-9: Distribution of soils on the project site

Table 3-3: Soil types described by Malcolm and others (1999) and Murtha and others (1996) confirmed or inferred to occur in the KUR-World project area

Soil Profile Class or Soil Series	Australian Soil Classification	Landform	Concept
Bicton	Brown Dermosol[1] Soils with a structured subsoil and lacking strong texture contrast between topsoil and subsoil. Colours in the upper 0.5 m of the subsoil have a hue yellower than 5YR and a value of 5 or less, with a chroma of 3 or more.	Rolling (20-32%) and steep (>32%) low hills.	Moderately deep or deep, mottled yellowish brown, pedal, gradational (increasing clay content with depth) soils with acid reaction trend formed *in situ* (*ie* not on alluvium or colluvium) on metamorphic rocks.
Galmara	Red Dermosol Soils with a structured subsoil and lacking strong texture contrast between topsoil and subsoil. Colours in the upper 0.5 m of the subsoil have a hue of 5YR or redder and a chroma of 3 or more	Gently sloping rises to steep low hills (3->32%).	Deep, red, pedal, gradational soils with acid reaction trend formed *in situ* on metamorphic rocks.
Seymour	Orthic Tenosol Soils with little soil profile development and a weakly differentiated (by structure, colour or texture) or low clay content (15% or less subsoil).	Hills and mountains including narrow ridges and crests (>32%).	Shallow gravelly soils formed *in situ* on metamorphic rocks.
Mission	Red Kandosol Soils with a massive or weakly structured subsoil and lacking strong texture contrast between topsoil and subsoil. Colours in the upper 0.5 m of the subsoil have a hue of 5YR or redder and a chroma of 3 or more.	Gently sloping rises (1-10%) (lower slopes and valleys).	Deep, red, massive, gradational soils formed on alluvial/colluvial fans on metamorphic rocks.

[1] Some profiles within this SPC may be classified as Yellow Dermosols, particularly in higher rainfall areas.

Detailed profile descriptions of the two major soils types are shown in Table 3-4 and Table 3-5 and profile photographs are presented in Figure 3-10 (pits are 120 centimetres deep). The Galmara profile contained few coarse rock (stone) fragments, but stone content can vary and was observed to be higher in areas with steeper slope angles

Table 3-4: Profile description of the Galmara soil encountered in the field survey

Site: 003		Soil series: Galmara
Landform element: Upper slope		Landform pattern: Rolling hills
Slope: 3-10%		Surface course fragments: None
Vegetation: permanent pasture - grazed		Surface condition: Hard
Horizon	**Depth (cm)**	**Soil description**
A1	0-10	Dusky red; clay loam; very few medium pebbles; firm; moderate 5-10 mm sub-angular blocky structure; distinct smooth boundary.
B21	10-35	Dark red; silty clay loam; few medium pebbles firm; moderate 10-20 mm sub-angular blocky structure; district smooth boundary.
B22	35-75	Dark red; light clay; firm; moderate 10-20 mm sub-angular blocky structure; district smooth boundary.
B23	75-120+	Dusky red; light clay; firm moderate 10-20 mm sub-angular blocky structure.

Table 3-5: Profile description of the Bicton soil encountered in the field survey

Site: 005		Soil series: Bicton
Landform element: Closed depression in mid slope		Landform pattern: Rolling hills
Slope: 3-10%		Surface course fragments: None
Vegetation: permanent pasture - grazed		Surface condition: Firm
Horizon	**Depth (cm)**	**Soil description**
A1	0-15	Brown; very few <5 mm faint orange mottles; clay loam, firm; moderate 5-10 mm sub-angular blocky structure; distinct smooth boundary.
B21	15-50	Brownish yellow; common <5 mm faint orange mottles; sandy clay loam; firm; moderate 10-20 mm sub-angular blocky structure; district irregular boundary.
B22	50-95	Yellow; common 5-15 mm faint orange mottles; silty clay; firm; moderate 10-20 mm sub-angular blocky structure; district irregular boundary.
B23	95-120+	Reddish yellow; many 5-15 mm distinct orange mottles; silty clay loam; few small pebbles; firm; moderate 10-20 mm sub-angular blocky structure.

Figure 3-10: Soil pits in Galmara series (left) and Bicton series (right) soils

The Galmara soil type is non-saline and topsoils have moderate cation exchange capacity (moderate capacity for nutrient retention). The Galmara topsoil is slightly acidic (pH <6), but pH declines in the subsoil and is acid (pH <5) at 10-35 centimetres depth. Measurements on Bicton topsoil collected from the project area indicated moderate salinity. This is likely an artefact of the presence of fine agricultural lime in sampled soil and this soil type is considered to be non-saline with good cation exchange capacity in the topsoil. The Bicton topsoil sampled during field investigations was slightly alkaline (pH 7-8) and the soil at the sampling point appears to have been limed. The upper subsoil is moderately acid (pH <6), but pH declines in the subsoil and is strongly acid (pH <5) below 50 centimetres depth. The acid pH trend down the profiles of both soils results in an increasing proportion of exchangeable acidity and, in particular, exchangeable aluminium with depth. The pH and exchangeable aluminium results for the subsoil would be acceptable for acid tolerant flora species (many native tropical species) but may be unsuited to more sensitive species used in amenity planting or to grasses used in hydromulching of exposed subsoils.
Soil bulk density was measured in the field and is not expected to significantly limit root penetration in either major soil type. The soils have good water holding capacity.

Estimated hydraulic conductivity showed some potential drainage restrictions in subsoils (particularly in the Bicton soil type where saturated hydraulic conductivity is estimated to be <10 mm/hr in the majority of the profile). This has implications for soil drainage and wetness in amenity areas, particularly the Golf Course and Sporting Precinct. Appendix 1 described soil properties related to erosion risk. Both major soil types are considered to be non-sodic and should not be prone to tunnel formation and subsequent gully erosion. This does not mean that gully formation is not possible in circumstances where concentrated flow is directed over these soil types. Soil susceptibility to sheet and rill erosion was assessed using the Revised Universal Soil Loss Equation (RUSLE) K factor (Rosewell, 1993) (reproduced in Table 3-6). Not only do the soils have moderate to very high erodibility, but the subsoils pose a fine sediment export risk. These matters are taken into account in the erosion and sediment control planning detailed in Chapter 9 (Water Quality). Should Seymour or Mission soils need to be disturbed, specific soil erosion and sediment controls will be required.

A summary of analytical results for Galmara and Bicton soil types is presented in Appendix 1, refer to Tables 5 and 7.

Table 3-6: Estimates of RUSLE K factor for Galmara and Bicton soil types

Soil property	Sample depth (cm)			
	0-10	10-35	35-75	75-120
Galmara				
RUSLE K factor	0.035	0.039	0.028	0.042
Erodibility rating[3]	Moderate	Moderate	Moderate	High
Bicton				
RUSLE K factor	0.030	0.035	0.067	0.076
Erodibility rating[3]	Moderate	Moderate	Very high	Very high

[1] Soil particle size analysis included determination of USDA and ISSS size classes allowing estimation of coarse and fine sand fractions required for calculating RUSLE K factor.

[2] Subsoil organic matter content estimated from profile data in Murtha and others (1996).

[3] Rating for sheet and rill erosion (excludes gully erosion) based on Rosewell and Loch (2002).

3.5.1 Acid sulfate soils assessment

Mareeba Shire is not included in the State Planning Policy (SPP) (DILGP 2017) as an 'acid sulfate soil affected area therefore is not recognised as an area where acid sulfate soils are present or may be present.

Potential acid sulfate soils (PASS) are generally associated with land below 5 metres Australian Height Datum (AHD). This includes soils that occur below 5 metres AHD even if the land surface elevation is above 5 metres AHD. Land in alluvial valleys with surface elevations less than 20 metres may still contain pyritic (potentially acid forming) material at depth (DLGP 2002). The SPP (State interest – emissions and hazards, where relevant to Acid Sulphate Soils) does not apply to Mareeba Shire Council Local Government Area.

The minimum elevation in the project area is approximately 300 metres AHD. PASS do not occur at these elevations in wet topical environments, and there is no risk of exposing PASS during the development. Field observations did not indicate any soil features that would be consistent with the presence of PASS. No further assessment of PASS is required.

3.5.2 Contaminated Land

The results of an Environmental Management Register (EMR) and Contaminated Land Register (CLR) search for the site revealed no positive results for inclusion on the EMR or CLR (NRA 2017). A review of aerial imagery for the project area did not find any features that indicated the presence of stock dips that may have been in long-term use. Although the desktop assessment has not identified any potential land contamination that would warrant or allow for targeted investigation, it is possible that unpredictable isolated areas of buried waste may exist. The property may not have had access to waste collection services in the past and waste may have been disposed of on-site. Wastes may include:

- domestic waste
- animal carcasses (and possibly pathogens including Anthrax)

- agrochemical containers
- scrap (including building materials such as asbestos sheeting)
- treated or painted timber, which, when burnt, may release heavy metals into the soil.

Although some scrap was observed in the field, no significant features consistent with concentrated waste dumping were identified during fieldwork (NRA 2017). Despite the findings and observations, the possibility remains that small tip sites may be encountered during earthworks.

With respect to the proposed project activities, if the volumes of petroleum products stored on-site (for back-up generators or operational vehicle refuelling) exceed the thresholds nominated for notifiable activity number 29 (as defined in the Queensland *Environmental Protection Act 1994*), this would require the land to be entered on the EMR or the CLR. No other notifiable activities are expected to occur as part of the project. In addition, land may become contaminated through:

- spills of petroleum hydrocarbons, cleaning and disinfection products and other operational chemicals;
- stormwater, containing petroleum hydrocarbons, pesticides, metals and metalloids associated with urban sources, directed through constructed swales (part of the envisaged water sensitive urban design measures);
- application or agrochemicals (such as artificial fertilisers and plant protection products for amenity areas) and pest control products;
- applications of organic fertiliser derived from recycled waste organics (such as composts, animal manures or biosolids) if source materials contain elevated concentrations of common contaminants such as lead, copper and zinc. The application of treated wastewater (through effluent irrigation) from a non-industrial operation is unlikely to cause land contamination.

Development of the site will be managed to avoid potential for land contamination in accordance with various controls and management plans discussed in greater detail in Section 4.9 and Chapter 21 of the draft EIS.

3.6 Climate

Myola has a tropical climate, with the summer months experiencing the highest rainfall. The nearest meteorological monitoring station is located at Kuranda Railway Station, approximately 3.1km east of Myola. Rainfall data is also collected at the Myola gauging station (Station ID531040). Data for this site exists for the period of November 2000 to the present day.

A review of long-term statistical monitoring data for the Kuranda Railway Station monitoring station indicates maximum daytime temperatures in the region are typically 28-30˚C during the summer months and 17-20˚C during the winter months. The average annual rainfall at Kuranda Railway Station, based on rainfall and evaporation SILO data obtained from the Queensland Government Department of Science, Information Technology and Innovation (DSITI), is 2,128mm. The average monthly breakdown in rainfall is shown on Figure 3-11.

As shown on Figure 3-11, the wet season occurs between December and April and the dry season occurs between June and November. Myola Station (ID531040) data is consistent with these trends. According to the SILO data, the wettest year was 1979 (4,658mm) and the driest year was 1915 (744mm).

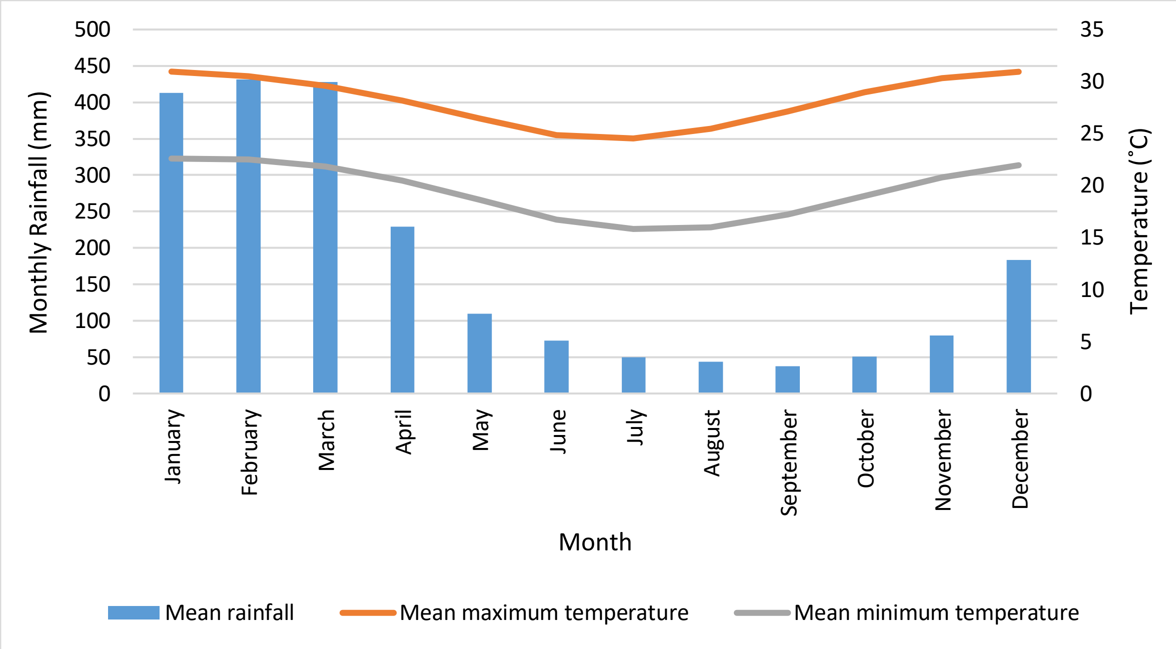


Figure 3-11: Typical rainfall and temperature patterns of Kuranda Railway Station (averages from 1898 to 2017) (Source: DSITI)

Since 1900, 14 tropical cyclones have affected the Far North Queensland coast. Four of these tropical cyclones have occurred onwards of 2000, with three identified as significant tropical cyclones (TC). TC Larry made landfall in March 2006 (category 5 system) and crossed the coast north of Mourilyan Harbour, approximately 100km south-east of Myola[5]. Maximum wind gusts of 113km/hour were recorded at Mareeba, and a 1.34m storm surge was recorded at Mourilyan Harbour. The radius of destructive winds was 120km, and individual wave height reached 2.7m in Cairns. Kuranda Railway Station recorded 665mm of rain in March 2006, compared to the average 428mm.

TC Yasi made landfall on the 3 February 2011 near Mission Beach. TC Yasi was one of the most powerful cyclones to affect Queensland since records began[6] (category 5 system). Maximum wind gusts at the cyclone centre have not been verified, but barograph readings at the Tully Sugar Mill suggest wind gusts of approximately 285km/hour were possible. TC Yasi was a strong and large system that maintained a powerful core with damaging winds and heavy rain. Based on a gauge located at Cardwell, a 5m tidal surge (2.3m above Highest Astronomical Tide) is thought to have occurred immediately south of the cyclone eye. The cyclone caused substantial forest damage between Innisfail and Townsville, particularly between Tully and Cardwell[7]. Kuranda Railway Station recorded 856mm of rain in February 2011, compared to the average 432mm.

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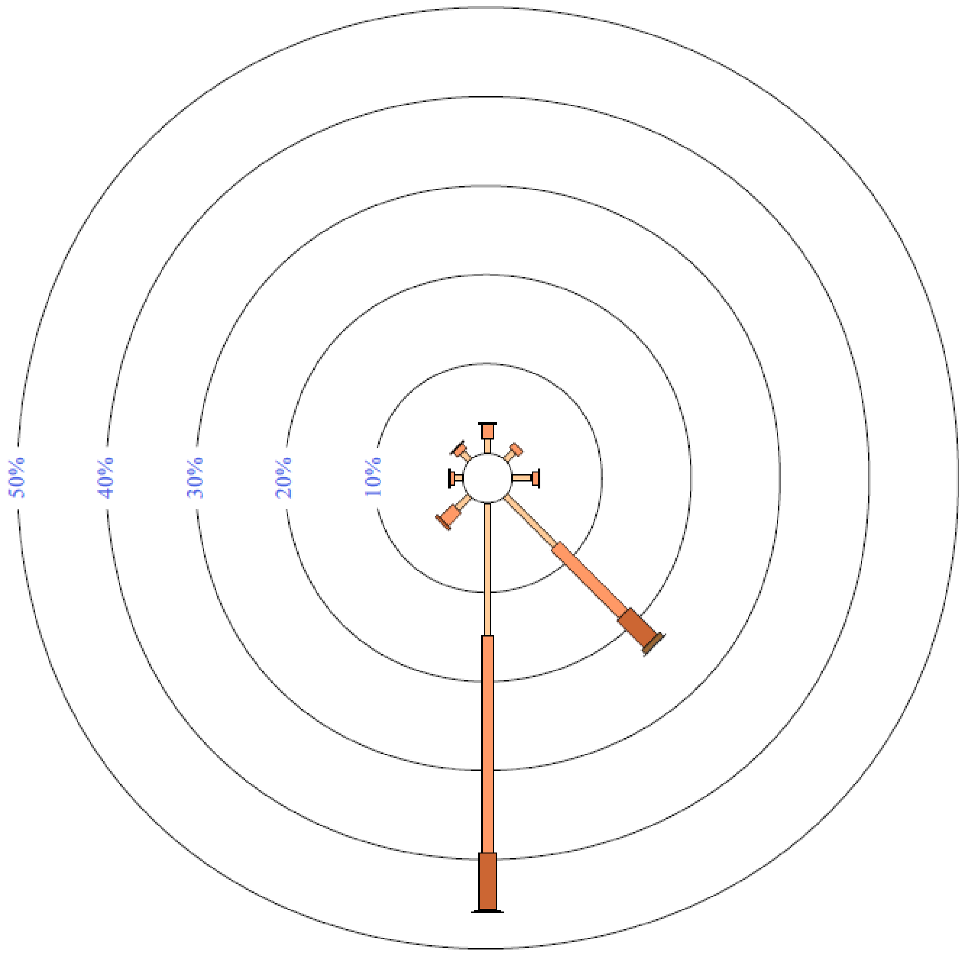
5 Bureau of Meteorology (2017). *Severe Tropical Cyclone Larry*. [online]. Available from - http://www.bom.gov.au/cyclone/history/larry.shtml. [Accessed: 20/09/2017].

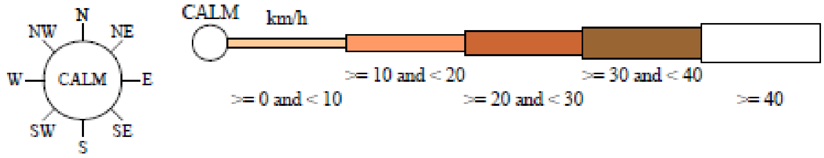
6 Bureau of Meteorology (2017). *Severe Tropical Cyclone Yasi*. [online]. Available from - http://www.bom.gov.au/cyclone/history/yasi.shtml. [Accessed: 20/09/2017].

7 Department of National Parks, Sport and Racing (2017). *Cyclone Yasi*. Available from - https://www.npsr.qld.gov.au/managing/cyclone-yasi.html. [Accessed: 20/09/2017]

The most recent tropical cyclone to affect Kuranda was TC Ita in April 2014. TC Ita was a category 4 system and made landfall at Cape Flattery. Maximum wind gusts reached 160km/hour, and a minor storm surge occurred[8]. The greatest impact from TC Ita resulted from heavy rains between Cape Melville and Innisfail. Kuranda Railway Station recorded 547 mm of rain in April 2014, compared to the average 229mm.
Myola is located in the trade wind belt and experiences south to south-east winds. During the wet season, mild winds also come from the north, east and west. Fresh south-easterly winds can blow along the coast for lengthy periods during summer and autumn. Wind roses prepared using the Cairns aero wind data is presented on Figure 3-12 and Figure 3-13. They show that the majority of winds come from the east to south quadrant.



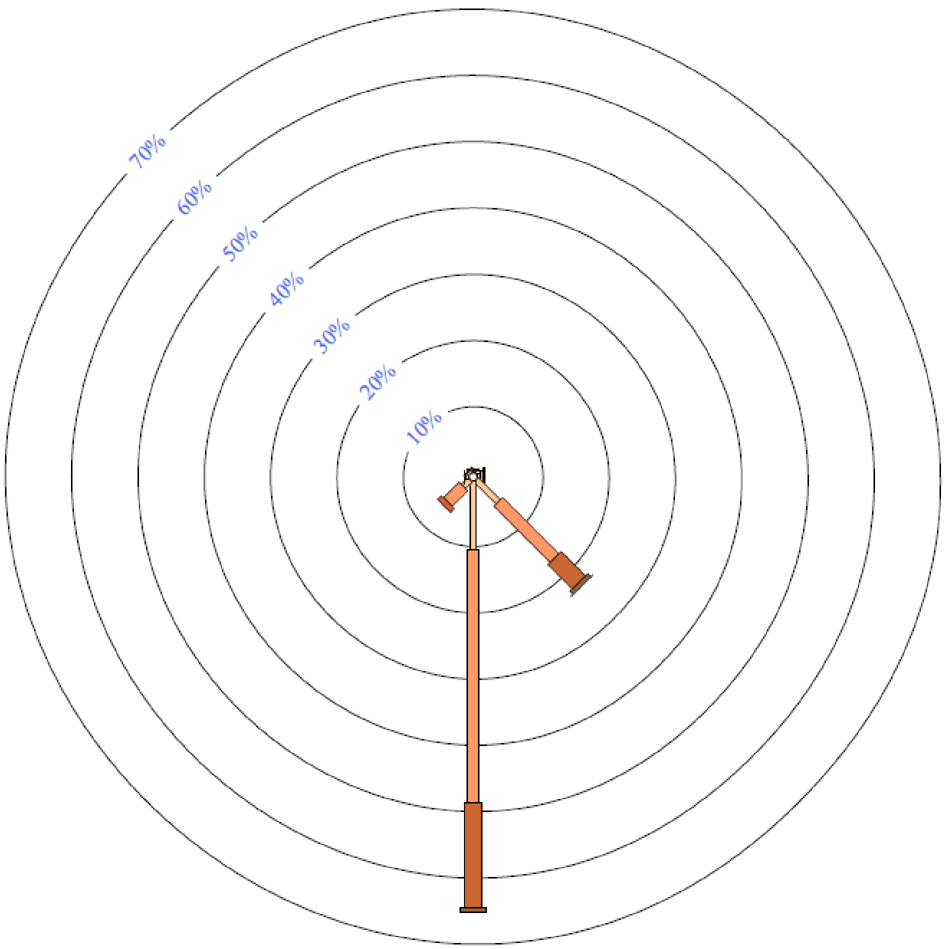
Calm: 14%



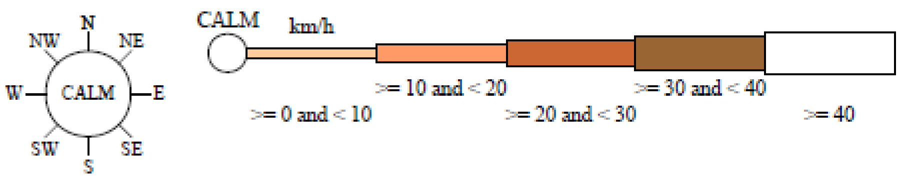
Note: Calm is the percentage of time calm air is observed (=0km/h) and has no direction.

[8] Bureau of Meteorology (2017). *Tropical Cyclone Ita*. [online]. Available from - http://www.bom.gov.au/cyclone/history/ita.shtml

Figure 3-12: Cairns Aero Wind Rose (1941-2016) Wet Season (Source: Bureau of Meteorology)



Calm: 3%



Note: Calm is the percentage of time calm air is observed (=0km/h) and has no direction.

Figure 3-13: Cairns Aero Station Wind Rose (1941-2016) Dry Sea

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