

DEPARTMENT OF TRANSPORT AND  
MAIN ROADS

MAY 2020

**SIX MILE CREEK LOWLAND  
RAINFOREST OF  
SUBTROPICAL AUSTRALIA  
BASELINE MONITORING  
TECHNICAL REPORT**

COOROY TO CURRA  
PROJECT STAGE D

wsp



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## Six Mile Creek Lowland Rainforest of Subtropical Australia Baseline Monitoring Technical Report

### Cooroy to Curra Project Stage D




Department of Transport and Main Roads

WSP

Level 12, 900 Ann Street  
Fortitude Valley QLD 4006  
GPO Box 2907  
Brisbane QLD 4001

Tel: +61 7 3854 6200  
Fax: +61 7 3854 6500  
wsp.com

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	NAME	DATE	SIGNATURE
Prepared by:	Steve Lyngcoln	26/05/2020	
Reviewed by:	Rob Harrison	26/05/2020	
Approved by:	Rob Harrison	26/05/2020	

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# 1 INTRODUCTION AND BACKGROUND

The Department of Transport and Main Roads (DTMR) contracted WSP to undertake a baseline vegetation monitoring survey of the previously mapped areas of Lowland Rainforest of Subtropical Australia Threatened Ecological Community (Lowland Rainforest TEC) at Six Mile Creek within and adjacent to the Cooroy to Curra Stage D Project area (the Project).

The purpose of the baseline monitoring was twofold. Firstly, to verify the extent of the Lowland Rainforest TEC in the Project area, including the direct and indirect impact areas and the section of Six Mile Creek extending adjacent to the Project Footprint (refer Figure 1.1). Secondly, to establish baseline monitoring transects and photo points to assess if the Project may cause any indirect impacts to the Lowland Rainforest TEC adjacent to the Project area. The baseline monitoring is a requirement under approvals conditions (EPBC 2017/7941) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report has been prepared for DTMR to communicate the results of the baseline monitoring. The baseline monitoring relates to verifying the extent of the previously mapped areas of Lowland Rainforest TEC at Six Mile Creek within the Cooroy to Curra Stage D Project area (refer Figure 1.1).

The area of Lowland Rainforest occurring along Six Mile Creek was surveyed as part of the initial Project ecological impact assessment surveys. For each assessment, the potential area of Lowland Rainforest TEC within the Project area was assessed against the key diagnostic characteristics and condition thresholds for the Lowland Rainforest TEC. The key diagnostic characteristics and condition thresholds are prescribed in the *Advice to the Minister for Sustainability, Environment, Water, Population and Communities from the Threatened Species Scientific Committee (the Committee) on an Amendment to the List of Threatened Ecological Communities under the Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Listing Advice).

A summary of the initial survey effort and results associated with the Lowland Rainforest TEC in the Project area have been listed as background below:

- BAAM Ecological Consultants [Section C](#) Baseline ecological assessments (2011–2016)
  - Surveyed December 2011, surveys included some areas of Six Mile Creek Lowland Rainforest TEC through secondary (50 x 10 m plots) and quaternary sites
  - The results identified RE 12.3.1 but communities present in survey area failed to meet condition thresholds for Lowland Rainforest TEC due to low species richness (i.e. only 20 woody species from Appendix A of the listing advice were recorded).
- BAAM Ecological Consultants 2015 (March, May) and 2016 (February)
  - Survey included a random meander survey through 1 ha patch surveyed
  - The results indicated the area failed to meet the Lowland Rainforest TEC key diagnostic characteristics due to marginal for rainfall and only identified 21 species from Appendix A (presumed due to relatively northern location and drier climate) (BAMM 2016).
- GHD undertook extensive targeted surveys within the TEC (GHD 2016)
  - The July 2016 surveys included mapping the boundaries of the TEC using a handheld GPS, assessment against the key diagnostic characteristics and condition thresholds of the TEC
  - The results indicated the Six Mile Creek was found to conform to the key diagnostic characteristics of the Lowland Rainforest of Subtropical Australia TEC although some areas of the riparian vegetation present along Six Mile Creek contained high density Cats Claw Creeper (*Dolichandra unguis-cati*).

The following sections discuss the methods and results of the 2020 baseline monitoring and assessment of the previously mapped Lowland Rainforest TEC against the key diagnostic criteria in the Listing Advice.

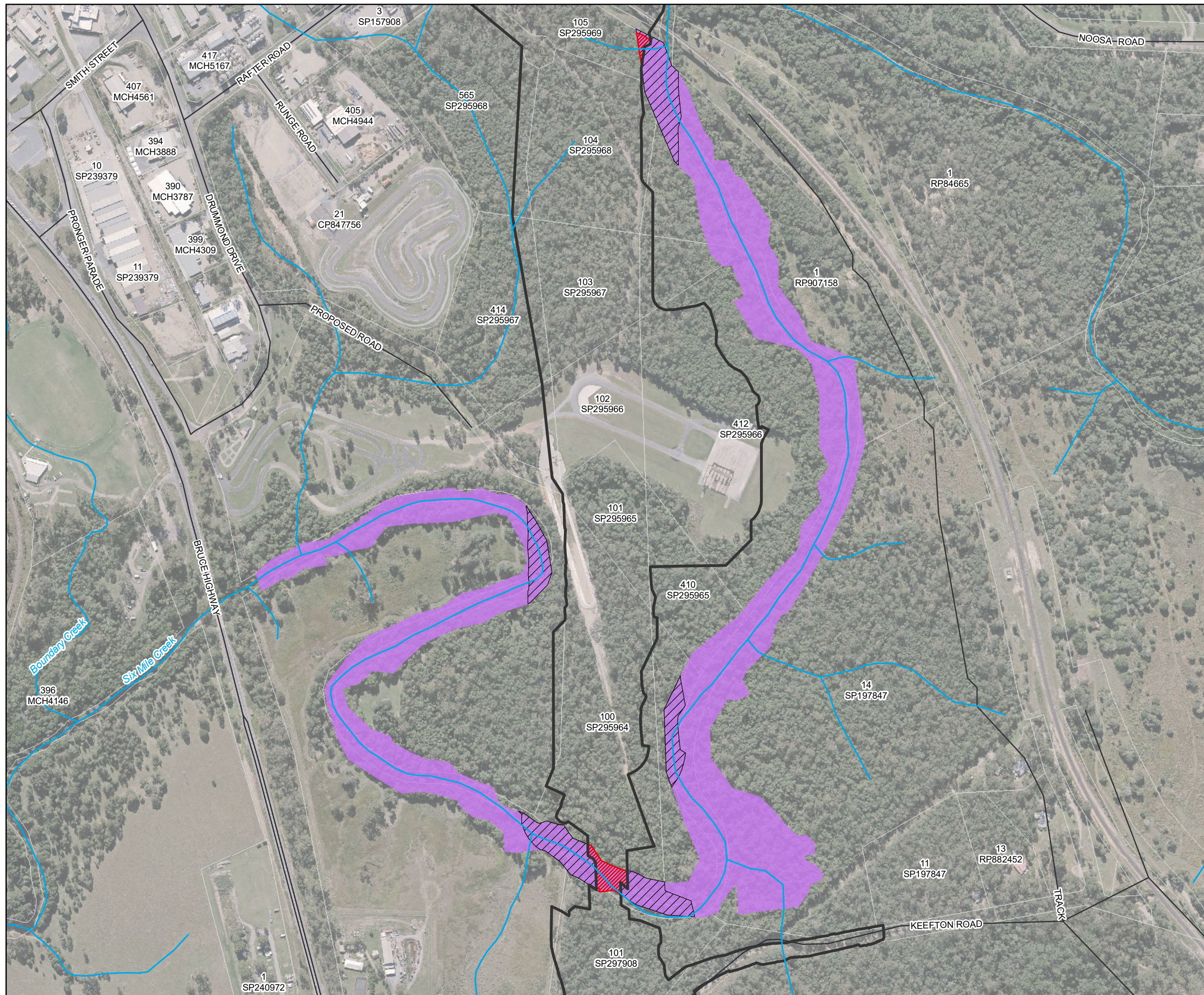


### Cooroy to Curra Lowland Rainforest TEC Baseline Monitoring

**Figure 1.1**  
Project Area and Previously Mapped  
Lowland Rainforest TEC (GHD 2016)

#### Legend

- Roads
- Watercourse
- Cadastre
- ▭ Project Footprint
- ▨ Indirect Impacts to Lowland Rainforest TEC
- ▩ Direct Impacts to Lowland Rainforest TEC
- Previously Mapped Lowland Rainforest TEC
- Rainforest TEC (RE12.3.1) (GHD 2016)



0 100 200 Meters

Coordinate system: GDA 1994 MGA Zone 56  
 Scale ratio correct when printed at A3  
 1:5,000 Date: 14/05/20

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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## 2 METHODS

Field verification of the extent of Lowland Rainforest TEC within Six Mile Creek included surveying the previously mapped extent of the community (refer Figure 1.1) (GHD 2016). The survey included the application of Quaternary level and Tertiary level surveys in accordance with the *The Methodology for Surveying and Mapping Regional Ecosystems and Vegetation Communities in Queensland Version 5.0* (Neldner et al 2019). A total of 20 Quaternary level assessment and 3 Tertiary level surveys were undertaken over two days with two ecologists (refer Figure 2.1).

In accordance with approval conditions the baseline monitoring was led by a suitably qualified person (refer CV Appendix A) and undertaken in the month of May between the 5–6 May 2020.

In accordance with the *Methodology for Surveying and Mapping Regional Ecosystems and Vegetation Communities in Queensland Version 5.0* (Neldner et al 2019) the data captured at Quaternary and Tertiary Sites is listed below.

---

### 2.1 TERTIARY SITES

Data collected at Tertiary sites included all location, environmental and overall structural information (median height and cover of each layer), as well as a full list of woody species including trees and vines, and a comprehensive list of grasses, forbs and other species within a 50m x 20m transect as required under the Listing Advice.

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### 2.2 QUATERNARY SITES

Quaternary site data is used primarily as a record of field traverses and to verify regional ecosystem/vegetation mapping. Data recorded at Quaternary sites included, the date, location, photos, structural estimates of the height and cover of the ecological dominant layer (EDL) and all strata. A list of dominant and secondary species within each strata and landform and site condition characteristics was also collated.

Quaternary sites were undertaken at regular intervals along Six Mile Creek to adequately determine the extent of the Lowland Rainforest TEC.

Within each Quaternary site the weed cover and abundance was also recorded within a 10 m x 10 m plot.

---

### 2.3 SURVEY EFFORT

The total number of sites (Tertiary and Quaternary) required to adequately sample an area depends on the variability in the vegetation and the condition of the ground layer, as well as mapping scale and the amount of remnant vegetation present (Neldner et al 2019). The minimum ground density for surveys is used by the Herbarium as only a guide. However, for a mapping scale of 1:5000 the Queensland Herbarium suggests a minimum of 100 sites per 100 ha (i.e. 1 site per hectare) with the majority being Quaternary level and 10–20% of sites being Tertiary level or of greater detail (e.g. secondary level). The total extent of the mapped Lowland Rainforest TEC in the impact areas is 14.23 ha.

The survey effort included 20 Quaternary level sites with 3 Tertiary level sites (refer Figure 2.1). Furthermore, the more detailed Tertiary level surveys were conducted within the Project footprint and adjacent to the Project footprint, above and below the area of Six Mile Creek being impacted by the Project. The Quaternary level surveys were undertaken at consistent intervals along the entire area of previously mapped Lowland Rainforest TEC. The total survey effort was therefore, conducted in accordance within and above the minimum standards for a mapping scale of 1:5000 as recommended by the Queensland Herbarium (Neldner et al 2019).

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## 2.4 PLANT SAMPLING AND IDENTIFICATION

Within each survey site, plants were either identified in the field by the SQP or samples were collected in a field herbarium for later identification using suitable reference keys and reference material including:

- Rainforest Plants of Australia Rockhampton to Victoria. Interactive Key. (Harden et al 2014)
- Rainforest Trees and Shrubs – Second Edition (Harden, G. McDonald, B. & Williams 2018)
- Rainforest Climbing Plants – Revised Edition (Harden, G. McDonald, B. & Williams 2014).

Where plant samples were unable to be identified, or confirmed, they were forward to the Queensland Herbarium for verification.

### 2.4.1 ASSESSMENT OF THE EXTENT OF THE LOWLAND RAINFOREST TEC

The overall results from all the survey sites assessed along the previously mapped extent of the Lowland Rainforest TEC at Six Mile Creek (refer Figure 1.1 and Figure 2.1) have been assessed against the key diagnostic characteristics and condition thresholds for the Lowland Rainforest TEC taken from the Listing Advice including:

#### *KEY DIAGNOSTIC CHARACTERISTICS:*

- Distribution of the ecological community is primarily in the NSW North Coast and South Eastern Queensland bioregions, according to Interim Biogeographic Regionalisation for Australia (IBRA) version 6.1 (2004).
- The ecological community occurs on: soils derived from basalt or alluvium; or enriched rhyolitic soils; or basaltically enriched metasediments.
- The ecological community generally occurs at an altitude less than 300 m above sea level.
- The ecological community typically occurs in areas with high annual rainfall (>1300 mm).
- The ecological community is typically more than 2 km inland from the coast.
- The structure of the ecological community is typically a tall (20–30 m) closed forest, often with multiple canopy layers.
- Patches of the ecological community typically have high species richness (at least 30 woody species from Appendix A).

#### *CONDITION THRESHOLDS:*

- The condition thresholds from the listing advice further indicate that a patch (>1 ha) of Lowland Rainforest TEC requires a patch to have:
  - >70% canopy cover
  - >40 native woody species from Appendix A for natural remnants and >30 for other patch types
  - >50% of the vegetation is native.





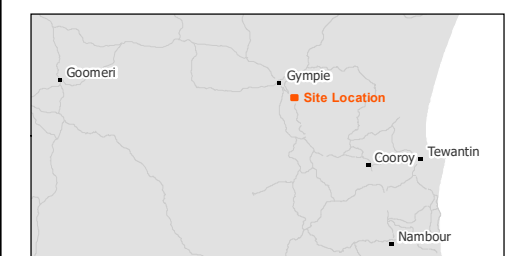
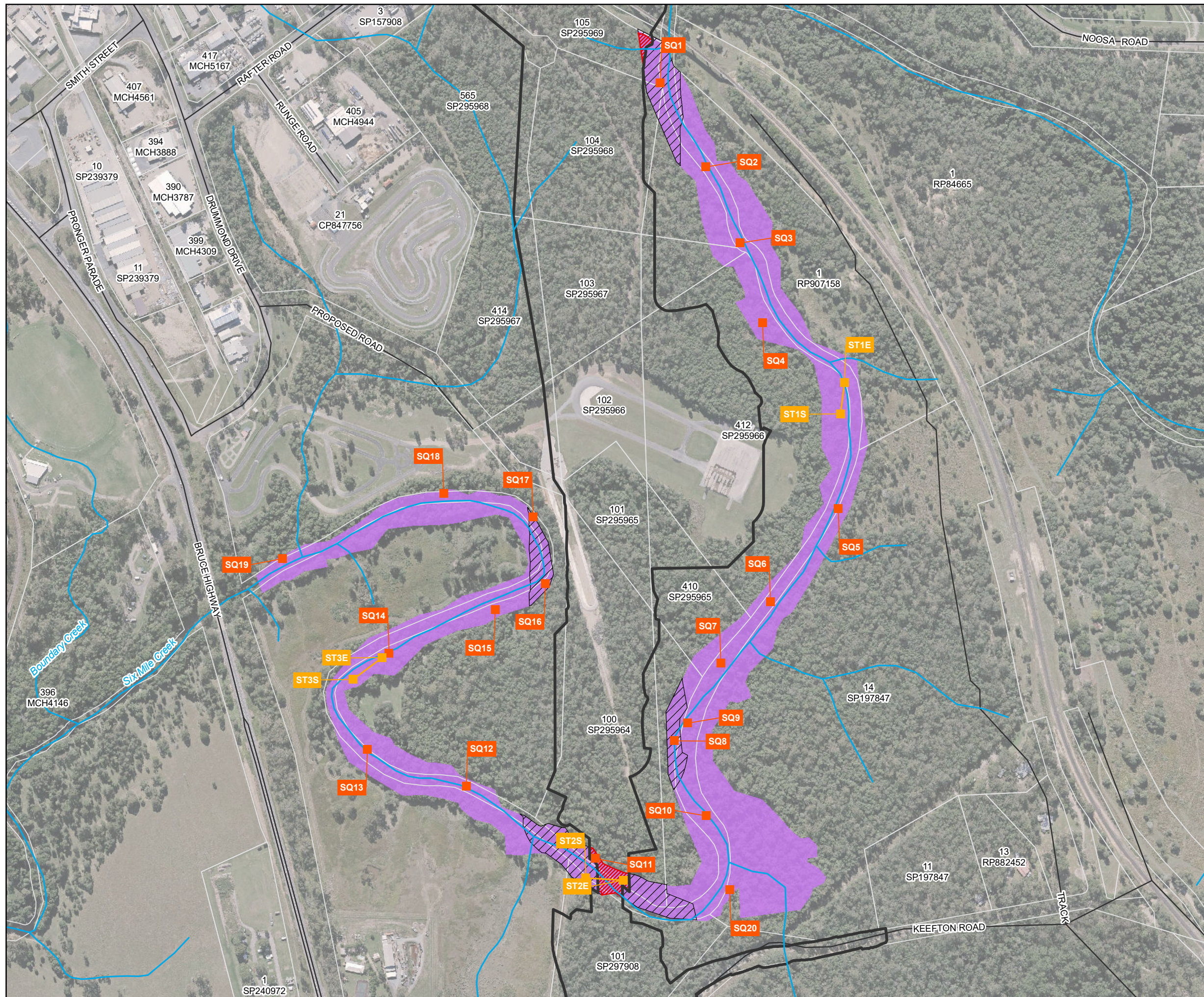
### Cooroy to Curra Lowland Rainforest TEC Baseline Monitoring

Figure 2.1  
Baseline Lowland Rainforest of Subtropical  
Australia TEC Survey Effort (WSP 2020)

#### Legend

##### Survey Effort (WSP 2020)

- Quaternary Sites
- Tertiary Sites
- Survey Transect
- Roads
- Watercourse
- Cadastre
- Project Footprint
- Indirect Impacts to Lowland Rainforest TEC
- Direct Impacts to Lowland Rainforest TEC
- Previously Mapped Lowland Rainforest TEC (RE12.3.1) (GHD 2016)



0 100 200 Meters

Coordinate system: GDA 1994 MGA Zone 56  
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# 3 RESULTS AND DISCUSSION

The results of the baseline survey to verify the extent of the Lowland Rainforest TEC are discussed in the sections below. The discussion is specific in terms of the locality of the Project area in relation to the distribution of the ecological community and climate (rainfall), the landform and geomorphology, the field verified vegetation community and regional ecosystem, the vegetation structure (height and cover), species composition, weed cover and conformation or non-conformation of the Lowland Rainforest TEC against the key diagnostic criteria as per the Listing Advice.

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## 3.1 DISTRIBUTION AND RAINFALL

The Six Mile Creek Project Area occurs approximately 36 km inland from the coastline at a latitude of S26.2332 degrees longitude E152.701 degrees. Figure 3.1 depicts the location of the previously mapped area of the Lowland Rainforest TEC at Six Mile Creek in association with the extent of the South-East Queensland Bioregion subregions and the extent of the high annual rainfall zones >1,300 mm of the Sunshine Coast Hinterlands.

Discussion with the Queensland Herbarium (personal communication, 11 May 2020) suggested using the pre-clearing regional ecosystem mapping layer for RE 12.3.1a (Complex notophyll vine forest) as a surrogate spatial layer for depicting the extent of high potential areas of Lowland Rainforest in high rainfall >1,300 mm per annum of the Sunshine Coast and Gold Coast Hinterlands.

The key diagnostic characteristics of the Listing Advice suggest the Lowland Rainforest TEC typically occurs in areas with high annual rainfall (>1,300 mm). Results of an assessment of average annual rainfall for Gympie, less than 5 kilometers from the Project area, depict that Six Mile Creek's average annual rainfall is 1,119.6 mm ([http://www.bom.gov.au/climate/averages/tables/cw\\_040093.shtml](http://www.bom.gov.au/climate/averages/tables/cw_040093.shtml)), which is approximately 13% below the typical >1,300 mm key diagnostic of the Listing Advice.

The results of the analysis of the potential distribution and extent for Lowland Rainforest TEC in high annual rainfall zones >1,300 mm of the Sunshine Coast and Gold Coast Hinterlands, is illustrated in Figure 3.1. This clearly indicates that the Six Mile Creek locality is unlikely to be within the desired distribution or rainfall zone to satisfy this key diagnostic characteristic and is therefore unlikely to be the Lowland Rainforest TEC.

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## 3.2 LANDFORM AND GEOMORPHOLOGY

The landform of Six Mile Creek consists of a narrow winding eroded stream channel that has formed through low hills of the parent geology 'meta-sediments' of the Gympie Province (Landzone 11). The 'meta-sedimentary' hills consist of semi metamorphic rocks formed through the process of compression when the continental plate was subducted by the oceanic plate during the Permian to Triassic Periods (280-235 million years ago) (Willmott 2004).

These landscapes were compressed and uplifted to form mountainous terrain along the edge of the continent (Willmott 2004). The meta-sedimentary rocks are relatively resistant to erosion and still form hilly to mountainous terrain after all this time (Willmott 2004).

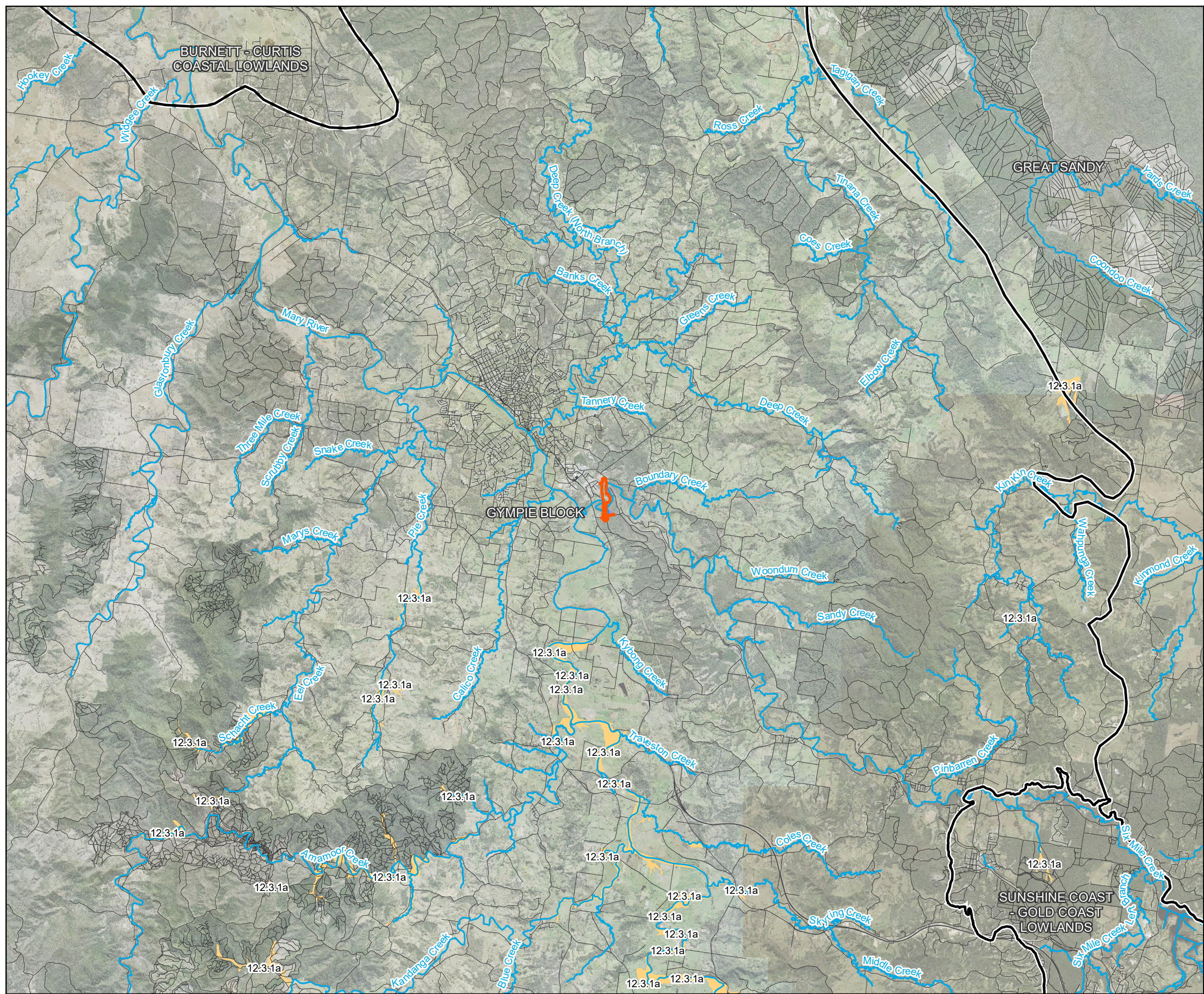
The narrow winding stream channel associated with Six Mile Creek has eroded its way through the parent geology of meta-sediments to form an incised stream channel with steep banks throughout the Project area. The results of ongoing weathering and erosion of Six Mile Creek from water flows during the Quaternary Period (2 million years ago) and more recent Pleistocene Period (140 000 to 10 000 years), has created an incised watercourse with lower channel benches, particularly on the inside of creek bends, and rocky outcrops particularly on the outside scours of creek bends.

The Listing Advice discusses the Lowland Rainforest TEC community occurs on: soils derived from basalt or alluvium; or enriched rhyolitic soils; or basaltically enriched metasediments. The Six Mile Creek landform contains some amounts of alluvium occurring as benches. However, it does not include an alluvial plain and is more associated with an incised stream channel. The Six Mile Creek has been attributed with Land Zone 3 (Wilson and Taylor 2012) only to the point where it contains alluvial benches and an incised stream channel affected by water flows. The stream grades back into parent geology of meta-sediments (Land Zone 11) where it is not affected by water flows and alluvial processes.



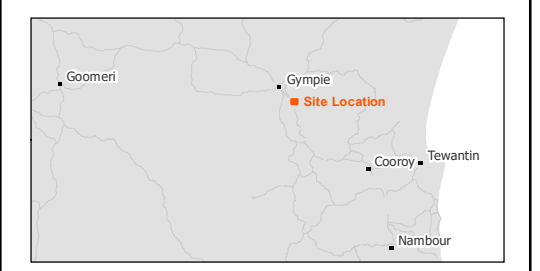
### Cooroy to Curra Lowland Rainforest TEC Baseline Monitoring

**Figure 3.1**  
Six Mile Creek Proximity to Mapped Pre-clearing  
Extents of Lowland Rainforests In High Rainfall  
Catchments (generally >1300mm) of the  
Sunshine Coast Hinterlands



**Legend**

- Watercourse
- Roads
- Biogeographic Subregions
- Project Footprint
- Pre-clearing Extent of Lowland Rainforests in High Rainfall Catchments
- Previously Mapped Lowland Rainforest TEC (RE12.3.1) (GHD 2016)



0 4,000 8,000 Meters

Coordinate system: GDA 1994 MGA Zone 56  
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### 3.3 FIELD VERIFIED VEGETATION COMMUNITY AND REGIONAL ECOSYSTEM

The field verified vegetation community and regional ecosystem at Six Mile Creek has been described in detail in Table 3.1 based on the results of the vegetation surveys. It is important to note that the previous assessments (BAMM 2011 and 2016) and (GHD 2016) mapped the vegetation in association with RE 12.3.1 (Gallery rainforest (notophyll vine forest) on alluvial plains).

On the 14<sup>th</sup> December 2016 (Regional Ecosystem Version 10) the Queensland Herbarium split RE 12.3.1 into several different regional ecosystems including RE 12.3.1a, RE 12.3.16, RE 12.3.17 and RE 12.3.21. With RE 12.3.1a being restricted to the high rainfall catchments of the Gold and Sunshine Coast hinterlands and upper Albert and Mary Rivers. Found in wetter environments than RE 12.3.16 and RE 12.3.17. Figure 3.1 clearly shows the pre-clearing extent of RE 12.3.1a (Complex notophyll vine forest on Quaternary alluvial plains and channels in areas of high rainfall (generally >1,300 mm) and the proximity to the Project area and Six Mile Creek.

Furthermore, the Queensland Herbarium confirmed that Six Mile Creek is not in the high rainfall Gold or Sunshine Coast hinterlands so RE 12.3.1a is not an option (Queensland Herbarium, personal communication, 7 May 2020).

The results of the field survey depicted the vegetation within the previously mapped area of Lowland Rainforest TEC along Six Mile Creek was more aligned with RE 12.3.17 Simple notophyll fringing forest usually dominated by *Waterhousea floribunda*.

Results of the field survey (refer Appendix B and Appendix C) indicate the vegetation community is consistently co-dominated by *Waterhousea floribunda* and simple notophyll fringing forest species within the entire previously mapped extent of the Lowland Rainforest TEC.


Based on the results of the survey and advice from the Queensland Herbarium the field verified vegetation community and regional ecosystem occurring along Six Mile Creek in the previously mapped area of Lowland Rainforest TEC has been revised to be RE 12.3.17 Simple notophyll fringing forest usually dominated by *Waterhousea floribunda* (refer Figure 3.2).

The field verified vegetation community has been described as:

*Simple notophyll fringing forest dominated by Waterhousea floribunda with Castanospermum australe, Endiandra muelleri subsp. muelleri, Aphananthe philippensis, Streblus brunonianus, Cryptocarya spp. and dense Cats Claw Creeper weed (Dolichandra unguis-cati) along creek line.*

A full summary of the revised verified vegetation community and regional ecosystem has been provided based on the results of field surveys in Table 3.1. Refer to Appendix B for a full summary of site photos and Appendix C for a summary of Quaternary and Tertiary survey sites results.

Table 3.1 Field verified vegetation community and regional ecosystem Six Mile Creek

<b>SIMPLE NOTOPHYLL FRINGING FOREST DOMINATED BY WATERHOUSEA FLORIBUNDA WITH CASTANOSPERMUM AUSTRALE, ENDIANDRA MUELLERI SUBSP. MUELLERI, APHANANTHE PHILIPPENSIS, STREBLUS BRUNONIANUS, CRYPTOCARYA SPP. AND DENSE CATS CLAW CREEPER WEED (DOLICHANDRA UNGUIS-CATI) ALONG CREEK LINE</b>		
<b>Regional ecosystem (RE) code</b>	12.3.17	
<b>Remnant status</b>	Remnant	
<b>RE VM Class</b>	Of Concern	
<b>RE Biodiversity Status</b>	Endangered	
<b>Vegetation structure formation</b>	Simple Closed Notophyll Vine Forest	
<b>Ecological Dominant layer (EDL)</b>	Tree 1	
<b>EDL height (range)</b>	22.3 m (10–25 m)	
<b>EDL crown cover class</b>	84.6%	
<b>Landform</b>	Incised creek line with narrow benches	
<b>Soil type</b>	Clay loam	
<b>Landzone</b>	3	
<b>Geology</b>	Quaternary alluvial channel through low meta-sedimentary hills	
<b>RE short description</b>	Simple notophyll fringing forest usually dominated by <i>Waterhousea floribunda</i>	
<b>EPBC Act Threatened ecological community type</b>	n/a	
<b>Emergent layer dominant species</b>	<i>Eucalyptus tereticornis</i> , <i>E. grandis</i>	
<b>Tree 1 layer dominant species</b>	<i>Waterhousea floribunda</i> , <i>Castanospermum australe</i> , <i>Mischocarpus australis</i>	
<b>Tree 2 layer dominant species</b>	<i>Endiandra muelleri</i> subsp. <i>muelleri</i> , <i>Aphananthe philippensis</i> , <i>Streblus brunonianus</i> , <i>Cryptocarya</i> spp.	
<b>Shrub layer dominant species</b>	<i>Atractocarpus chartaceus</i> , <i>Ficus fraseri</i> , <i>Tabernaemontana pandacaqui</i>	
<b>Ground layer dominant species</b>	<i>Cissus antarctica</i> , <i>Trophis scandens</i> <i>Smilax australis</i>	
<b>Invasive plants (Bio Act)</b>	<i>Dolichandra unguis-cati</i> >50% cover was recorded in every survey site	
<b>Disturbance notes</b>	<i>Dolichandra unguis-cati</i> >50% cover was recorded in every survey site	
<b>Vegetation survey sites</b>	ST1-3, SQ1-20	

Key for tables:

- Structural formation classes, qualified by height and crown cover : <1 m = dwarf; 1–2 m = shrubland/ heath; shrubs 2–8 m = scrub/ tall shrubland; trees 2–10 m = low forest/woodland, trees 10–30 m = forest/ woodland; >30 m = tall forest woodland
- Crown cover class (Walker & Hopkins 1992) : <0.2% = isolated trees or clumps; 0.2–20% = open woodland; 20–50% = woodland; 50–80% = open forest; 80–100% = closed forest

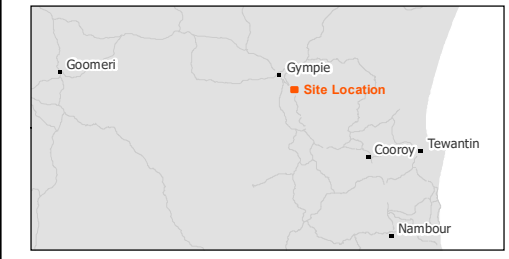
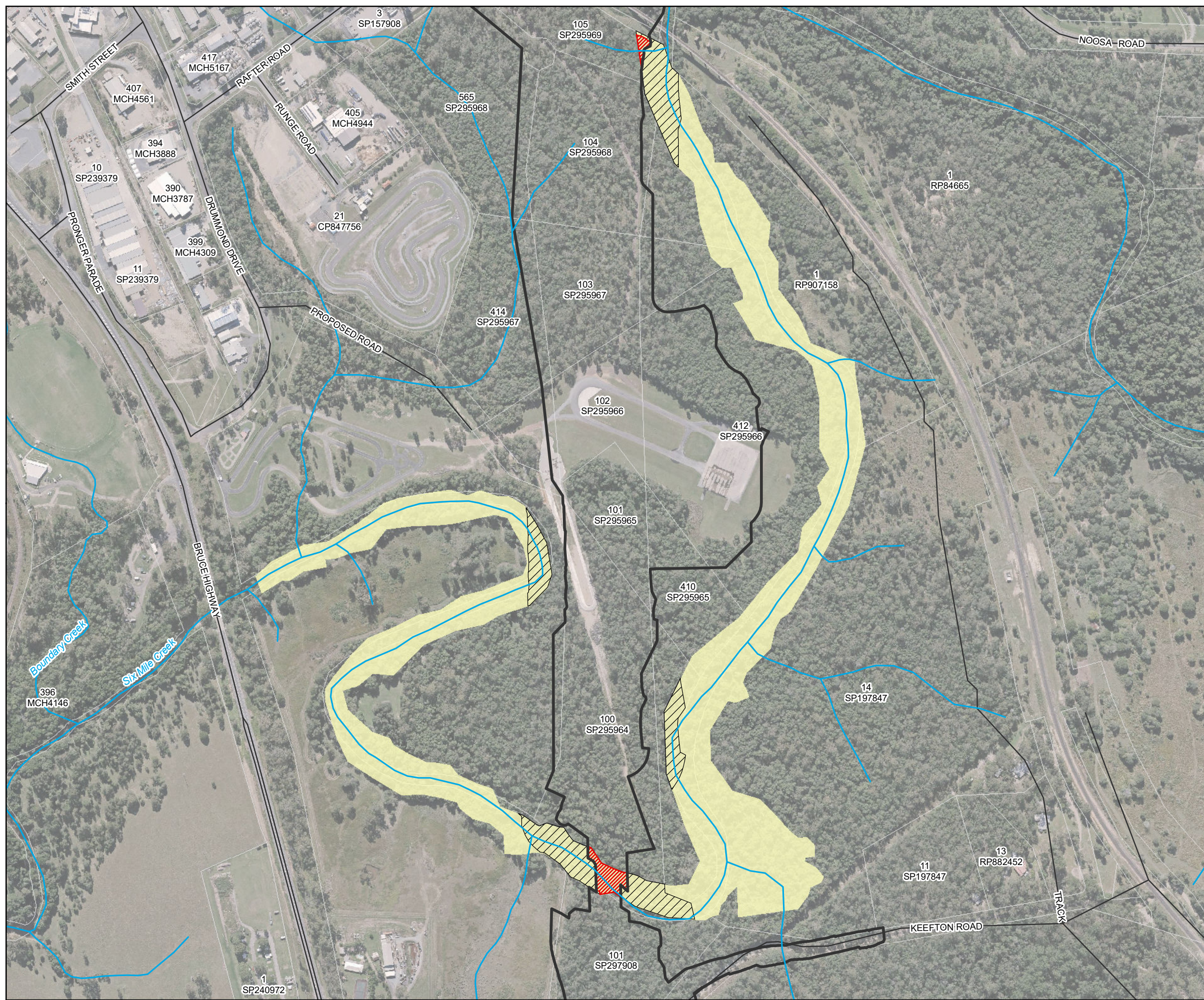


**Cooroy to Curra  
Lowland Rainforest  
TEC Baseline Monitoring**

**Figure 3.2**  
Field Verified Regional Ecosystem  
and Vegetation Community  
Six Mile Creek (WSP 2020)

**Legend**

- Roads
  - Watercourse
  - Cadastre
  - ▭ Project Footprint
  - ▨ Indirect Impacts to Lowland Rainforest TEC
  - ▩ Direct Impacts to Lowland Rainforest TEC
- RE 12.3.17 - Simple notophyll fringing forest dominated by *Waterhousea floribunda* with *Castanospermum australe*, *Aphananthe philippensis*, *Streblus brunonianus* and *Cryptocarya* spp. along creek line.



0 100 200 Meters

Coordinate system: GDA 1994 MGA Zone 56  
Scale ratio correct when printed at A3  
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Data sources: - DNRME, TMR, Translink, Geoscience Australia

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### 3.4 VEGETATION STRUCTURE (HEIGHT AND COVER),

The results of vegetation structural assessments (crown cover and height) taken from Tertiary sites is presented below for each stratum in terms of canopy cover (Table 3.2) and tree heights and height ranges (Table 3.3). The key structural characteristics for the Lowland Rainforest TEC taken from the Listing Advice states the structure of the ecological community is typically a tall (20–30 m) closed forest, often with multiple canopy layers and the condition thresholds indicate that a patch (>1 ha) of Lowland Rainforest TEC requires a patch to have >70% total canopy cover.

The results of the three Tertiary sites indicate the canopy is within 20–30 m (refer Table 3.3) and total cover is above 70% (refer Table 3.2). The total cover of each strata has also been represented graphically (refer Figure 3.3). Appendix C depicts the overall structural results taken from the Quaternary sites further indicating the median canopy height ranges from 18–25 m. It is important to note that the Listing Advice focusses on total combined canopy cover of all strata, hence is higher than that of the ecological dominant layer (T1), as depicted in Appendix C.

Table 3.2 Summary of tree and shrub crown cover (%) from Tertiary assessments

ASSESSMENT SITE	EMERGENT	TREE 1	TREE 2	SHRUB 1	TOTAL CANOPY COVER (E, T1, T2)
Tertiary 1	53	95.8	73.6	39.6	97
Tertiary 2	0	68	46	20	83
Tertiary 3	0	90	66	38	94
Average	17.7	84.6	61.9	32.5	<b>91.3</b>

Table 3.3 Summary of tree and shrub heights (m) from Tertiary assessments

ASSESSMENT SITE	EMERGENT	TREE 1	TREE 2	SHRUB 1
Tertiary 1	30 m (25–35 m)	23 m (10–25 m)	8 m (3–10 m)	2 m (1–3 m)
Tertiary 2	Not present	20 m (10–25 m)	8 m (3–10 m)	2 m (1–3 m)
Tertiary 3	Not present	24 m (12–26 m)	8 m (4–12 m)	2 m (1–3 m)
Average	30 m	22.3 m	8 m	2 m

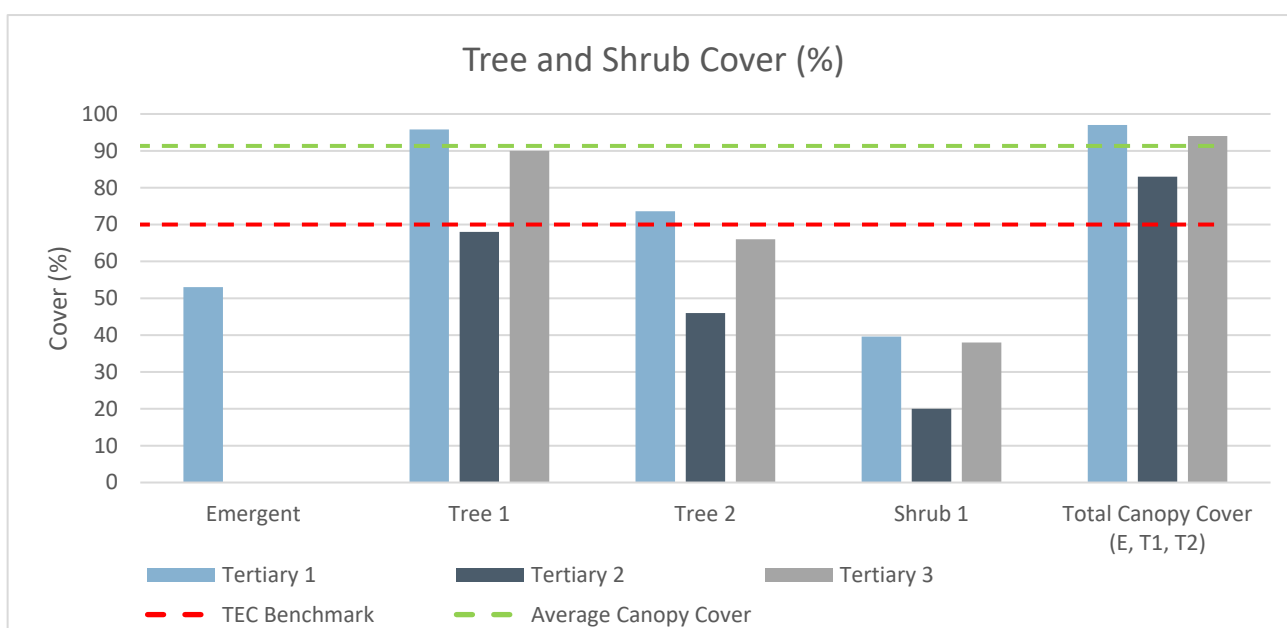


Figure 3.3 Summary of tree and shrub cover from tertiary assessments

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## 3.5 SPECIES COMPOSITION

The results of the baseline vegetation surveys across all sites are provided in Appendix C. A total of 59 flora species were recorded across all sites. A total of 23 species from Appendix A of the Lowland Rainforest TEC were recorded across all survey sites (refer Appendix C). The baseline survey returned many of the same tree and shrub species with little variation across all sites.

The species composition results illustrate the vegetation community occurring along the Six Mile Creek is associated with simple notophyll fringing vine forest and is lacking the presence and greater diversity of species in the higher rainfall >1 300 mm Lowland Rainforest TEC communities listed in Appendix A of the Listing Advice.

A total of 13 samples from up to 7 species recorded during field surveys were collected and sent to the Queensland Herbarium for verification (refer Appendix C).

The results of the Queensland Herbarium verification returned one threatened flora species, *Rhodomirtus psidioides*, listed as Endangered under the *Nature Conservation Act 1992* recorded in Tertiary Site 3 outside of the Project direct and indirect impact areas (refer Figure 2.1 and Appendix D).

A total of 9 exotic species were recorded during the baseline surveys (refer Appendix C). It is important to note that all the exotic plant species recorded are listed as invasive plants of Qld by Department of Agriculture and Fisheries (DAF). For more discussion on invasive plants refer Section 3.6.

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## 3.6 INVASIVE PLANT COVER RESULTS

Under the *Biosecurity Act 2014* (Bio Act) everyone is obligated to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). Invasive plants recorded and their status under the Bio Act have been listed in Table 3.4 below.

Table 3.4 Estimated weed cover (%) within 10x10 m quadrats

SPECIES NAME	INVASIVE PLANT STATUS (DAF)
<i>Asparagus asparagoides</i>	Restricted invasive
<i>Celtis sinensis</i>	Restricted invasive
<i>Dolichandra unguis-cati</i>	Restricted invasive
<i>Ligustrum sinense</i>	Restricted invasive
<i>Paspalum mandiocanum</i>	Other invasive
<i>Passiflora suberosa</i>	Other invasive
<i>Rivina humilis</i>	Other invasive
<i>Senna pendula var. glabrata</i>	Other invasive
<i>Tradescantia fluminensis</i>	Other invasive

The results of the vegetation survey assessments indicated that Cats Claw Creeper (*Dolichandra unguis-cati*) was present at all survey sites and was the dominant weed (refer photos Appendix B and Data Appendix C). Cats Claw Creeper has formed a dense understory cover and is present in the canopy of the majority of tree species recorded at vegetation sites.



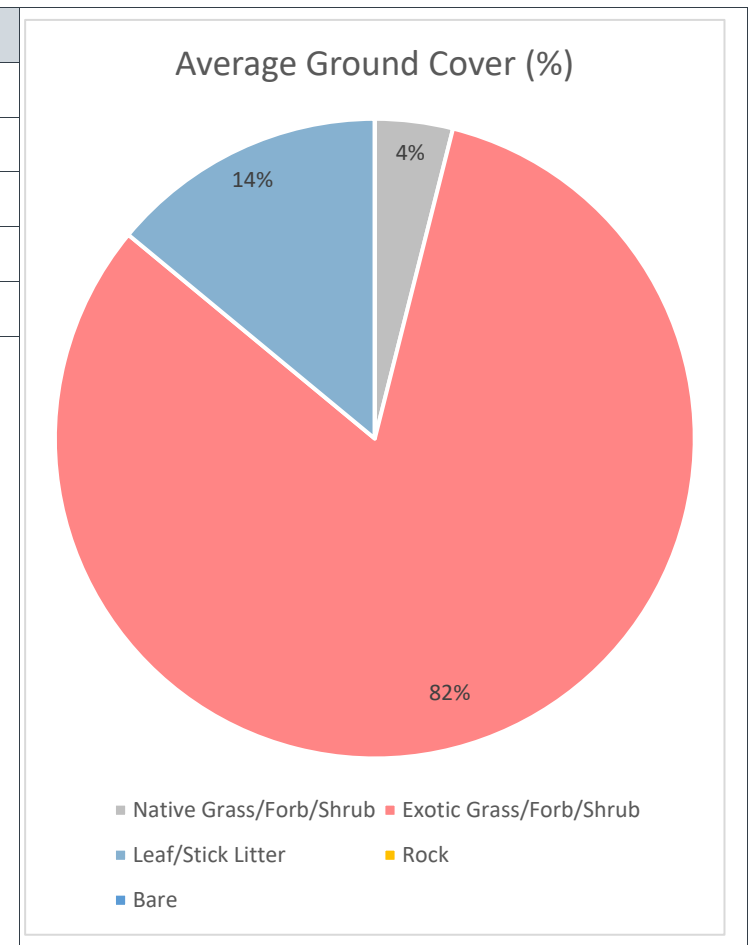
The estimated cover of invasive plants, primarily Cats Claw Creeper, within the ground layer and canopy layer recorded at all Quaternary sites is presented in Table 3.5. The results of the Tertiary ground cover assessments depict 82% of the groundcover is exotic, as presented in Table 3.6. Weed invasion particularly Cats Claw Creeper is listed as a Key Threatening Process under the Listing Advice. In addition, field data suggests the entire site contains >50% (54%) cover of Cats Claw Creeper in the canopy and 82% in the ground layer suggesting less than 50% of the vegetation composition is native.

Table 3.5 Estimated invasive plant cover (%) within 10x10 m quadrats

<b>SITE</b>	<b>CANOPY COVER (%)</b>	<b>GROUND COVER (%)</b>
Q1	50	80
Q2	50	90
Q3	60	90
Q4	50	90
Q5	70	90
Q6	50	80
Q7	50	80
Q8	50	80
Q9	60	80
Q10	50	80
Q11	50	70
Q12	50	80
Q13	55	80
Q14	80	50
Q15	50	50
Q16	50	80
Q17	30	50
Q18	30	80
Q19	80	90
Q20	70	90
<b>Average</b>	<b>54</b>	<b>78</b>

Table 3.6 Tertiary assessment average ground cover (%)

GROUND % 1X1 PLOT	TERTIARY 1	TERTIARY 2	TERTIARY 3	AVERAGE
Native Grass/ Forb/Shrub	3.4	1.8	6.6	4
Exotic Grass/ Forb/Shrub	88	83.2	75	82
Leaf/Stick Litter	8.6	15	18.4	14
Rock	0	0	0	0
Bare	0	0	0	0
Total	100	100	100	100



# 4 LOWLAND RAINFOREST TEC KEY DIAGNOSTIC CRITERIA AND CONDITION ASSESSMENT RESULTS

Table 4.1 provides a summary discussion of the results of the baseline monitoring at Six Mile creek against the key diagnostic characteristics and condition thresholds for the Lowland Rainforest TEC.

Table 4.2 provides a summary discussion of the results of the baseline monitoring at Six Mile creek against the condition thresholds for the Lowland Rainforest TEC.

Table 4.1 Assessment of Six Mile Creek key diagnostic characteristics for the Lowland Rainforest TEC

CRITERIA	DISCUSSION	CONFORMS
The ecological community occurs on: soils derived from basalt or alluvium; or enriched rhyolitic soils; or basaltically enriched metasediments.	The Six Mile Creek landform contains some amounts of alluvium occurring as benches, however does not include an alluvial plain and is more associated with an incised stream channel. The Six Mile Creek has been attributed with Landzone 3 (Wilson and Taylor 2012) only to the point where it contains alluvial benches and an incised stream channel affected by water flows. The stream grades back into parent geology of meta-sediments (Landzone 11) where it is not affected by water flows and alluvial processes.	Yes (minimal alluvium)
The ecological community generally occurs at an altitude less than 300 m above sea level	The area of Six Mile Creek within the Project is below 300 m altitude. The altitude ranges from 47 m near the NE edge of the Project area (upstream) to 40 m at the SW edge of the Project area (downstream) extending to the Bruce Highway	Yes
The ecological community typically occurs in areas with high annual rainfall (>1300 mm).	Results of an assessment of average annual rainfall for Gympie, less than 5 kilometers from the Project area, depict that Six Mile Creek's average annual rainfall is 1,119.6 mm which is approximately 13% below the typical >1,300 mm key diagnostic of the Listing Advice. Furthermore, the results of the analysis of the potential distribution and extent for Lowland Rainforest TEC in high annual rainfall zones >1,300 of the Sunshine Coast and Gold Coast Hinterlands is illustrated in Figure 3.1 and indicate that Six Mile Creek is unlikely to be within the desired distribution or rainfall zone to be considered the Lowland Rainforest TEC.	No
The ecological community is typically more than 2 km inland from the coast.	The Six Mile Creek Project Area occurs approximately 36 km inland from the coastline at a latitude of S 26.2332 degrees longitude E 152.701 degrees	Yes
The structure of the ecological community is typically a tall (20–30 m) closed forest, often with multiple canopy layers.	The results of the three Tertiary sites indicate the canopy is within 20–30 m height range (refer Table 3.3) and total canopy cover is above 70% (refer Table 3.2).	Yes

CRITERIA	DISCUSSION	CONFORMS
Patches of the ecological community typically have high species richness (at least 30 woody species from Appendix A)	A total of 61 flora species were recorded across all sites. A total of 23 species from Appendix A of the Lowland Rainforest TEC were recorded across all sites (refer Appendix C). The baseline survey returned many of the same species and little variation across all sites. The species composition results illustrate the vegetation community occurring along the Six Mile Creek is associated with simple notophyll fringing vine forest and is lacking the presence and greater diversity of species in the higher rainfall >1,300 mm Lowland Rainforest communities listed in Appendix A of the Listing Advice.	No

The condition thresholds from the listing advice further indicate that a patch (>1 ha) of Lowland Rainforest TEC requires a patch to have the conditions listed in Table 4.2. These conditions have been assessed against the results of the baseline monitoring (Table 4.2).

Table 4.2 Assessment of Six Mile Creek condition thresholds for the Lowland Rainforest TEC

CONDITIONS	DISCUSSION	CONFORMS
>70% canopy cover	The results of the three Tertiary sites indicate the canopy is within 20–30 m height range (refer Table 3.3) and total canopy cover is above 70% (refer Table 3.2).	<b>Yes</b>
>40 native woody species from Appendix A for Patch Type A and >30 species for other patch types B and C	A total of 61 flora species were recorded across all sites. A total of 23 species from Appendix A of the Lowland Rainforest TEC were recorded across all sites (refer Appendix C). The baseline survey returned many of the same species and little variation across all sites. The species composition results illustrate the vegetation community occurring along the Six Mile Creek is associated with simple notophyll fringing vine forest and is lacking the presence and greater diversity of species in the higher rainfall >1,300 mm Lowland Rainforest communities listed in Appendix A of the Listing Advice.	No
> 50% of the vegetation is native	The results of the Tertiary ground cover assessments depict 82% of the groundcover is exotic as presented in Table 3.6. Weed invasion particularly Cats Claw Creeper is listed as a Key Threatening Process under the listing advice. In addition, field data suggests the entire site contains >50% (54%) cover of Cats Claw Creeper in the canopy and 82% in the ground layer suggesting less than 50% of the vegetation is native.	No

# 5 CONCLUSION AND RECOMMENDATIONS

The results of the baseline Lowland Rainforest TEC monitoring survey of Six Mile Creek revealed the previously mapped area of Lowland Rainforest TEC within the Project area does not conform with the key diagnostic characteristics and condition thresholds to be considered the Lowland Rainforest TEC for the following reasons:

- Results of an assessment of average annual rainfall for Gympie, less than 5 kilometres from the Project area, depict that Six Mile Creek's average annual rainfall is 1,119.6 mm which is approximately 13% below the typical >1,300 mm key diagnostic of the Listing Advice.
- The species composition results for the previously mapped area of Lowland Rainforest TEC along the Six Mile Creek indicated the vegetation community contained 23 species (<30) from Appendix A of the Lowland Rainforest TEC Listing Advice (refer Appendix C). The results of the baseline survey further indicate the vegetation community is associated with simple notophyll fringing vine forest (RE 12.3.17) and is lacking the presence and greater diversity of species in the higher rainfall >1,300 mm Lowland Rainforest communities listed in Appendix A of the Listing Advice.
- The results of the Tertiary ground cover assessments depict 82% of the groundcover is exotic as presented in Table 3.6. Weed invasion particularly Cats Claw Creeper is listed as a Key Threatening Process under the listing advice. In addition, field data suggests the entire site contains >50% (54%) cover of Cats Claw Creeper in the canopy and 82% in the ground layer suggesting less than 50% of the vegetation is native.

The results of the baseline monitoring survey are consistent with the previous survey results from the *Summary of survey effort in the Section D study area (2011 to 2016) and details of the Threatened Ecological Community (TEC) assessment of a patch of RE 12.3.1 conducted in 2011 (BAMM 2016)*, who concluded the Six Mile Creek vegetation was marginal in terms of meeting key conditions for the ecological community occurring in areas with high annual rainfall (>1,300 mm) and the community did not meet the key criteria for having >30 woody species from Appendix A with only 21 species from Appendix A recorded (BAMM 2016).

Based on the results of this baseline Lowland Rainforest TEC monitoring survey and previous survey of the Project area undertaken by BAMM 2016 it is recommended the status of the Lowland Rainforest within Six Mile Creek does not meet the Lowland Rainforest Listing Advice and therefore does not require additional monitoring or offsetting for this matter in this area for the Project.

# 6 LIMITATIONS

## *SCOPE OF SERVICES*

This rehabilitation report has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the client and WSP (scope of services). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or disturbance constraints.

## *RELIANCE ON DATA*

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

## *ENVIRONMENTAL CONCLUSIONS*

In accordance with the scope of services, WSP has relied upon the data and has conducted environmental field surveys in the preparation of the report. The nature and extent of survey conducted is described in the report.

Varying degrees of non-uniformity are encountered across all natural areas. Hence no sampling technique can eliminate the possibility that results are not totally representative of conditions encountered. The conclusions are based upon the data and the ecological surveys and are therefore merely indicative of the environmental condition of the study area at the time of preparing the report.

Also, it should be recognised that conditions, including the presence of threatened biodiversity, can change with time. No sampling technique can eliminate the possibility that a species is present within the proposal area. For example, some flora may be present in the soil seed bank and some fauna species use habitats on a sporadic or seasonal basis and may not be present within the study areas during surveys.

Within the limitations imposed by the scope of services, the surveys and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

## *REPORT FOR BENEFIT OF CLIENT*

The report has been prepared for the benefit of the client (and no other party). WSP assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of WSP or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Except as provided below parties other than the client should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

# REFERENCES

- BAMB (2016) Addendum 1: Detailed Terrestrial Flora Surveys, Bruce Highway Cooroy to Curra (Section D: Woondum to Curra). Biodiversity Assessment and Management Pty Ltd, Cleveland, QLD.
- GHD (2016) Technical Memorandum. Bruce Highway Cooroy to Curra (Section D: Woondum to Curra) Detailed Design Job No. 232/10A/7, Invitation No. WBYD-1335. Threatened Ecological Community at Six Mile Creek and Woondum State Forest Assessment and Outcomes (Revision 1). GHD, Australia.
- Harden, G. Nicholson, H. McDonald, B. Nicholson, N. Tame, T. Williams, J (2014) Rainforest Plants of Australia Rockhampton to Victoria. Interactive Key. Gwen Harden Publishing
- Harden, G. McDonald, B. & Williams (2018) Rainforest Trees and Shrubs – Second Edition. Gwen Harden Publishing
- Harden, G. McDonald, B. & Williams (2018) Rainforest Climbing Plants – Revised Edition. Gwen Harden Publishing
- Neldner, V.J., Wilson, B.A., Dillewaard, H.A., Ryan, T.S., Butler, D.W., McDonald, W.J.F, Addicott, E.P. and Appelman, C.N. (2019) Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland. Version 5.0. Updated March 2019. Queensland Herbarium, Queensland Department of Environment and Science, Brisbane.
- Willmott, W. (2004). Rocks and Landscapes Of the National Parks Of Southern Queensland. The Geological Society Of Australia Queensland Division.
- Wilson, P.R. and Taylor, P.M. (2012) Land Zones of Queensland. Queensland Herbarium, Queensland Department of Science, Information Technology, Innovation and the Arts, Brisbane. 79 pp.

# APPENDIX A

SUITABLY QUALIFIED PERSON  
CURRICULUM VITAE







## STEVE LYNGCOLN

*Principal Ecologist/ Botanist*



**5 years with WSP**

**20 years of experience**

### AREAS OF EXPERTISE

*Terrestrial ecology*

*Regional ecosystem and threatened ecological community survey and mapping*

*Threatened flora surveys*

*Groundwater dependent ecosystems*

*Ecosystem rehabilitation*

*Environmental offsets*

*Ecological impact assessment*

*Project management*

### LANGUAGES

*English*

### PROFILE

Steve has over 20 years' experience in environmental management in Queensland and New South Wales. He has a Masters in Environmental Science and is skilled and experienced in terrestrial ecology, vegetation survey and mapping, threatened flora surveys, groundwater dependent ecosystems, ecosystem rehabilitation and environmental offsets.

Steve has experience in the preparation and delivery of terrestrial ecology environmental impact assessments for clients in the transport, utilities and coal mining and sectors. He has experience working with regulators to obtain environmental approvals associated with ecological impact assessment for coal mines, coal seam gas operations, major roads, water pipelines, government infrastructure, electricity transmission lines and solar farms.

He has specialist experienced and knowledge in undertaking targeted surveys for threatened ecological communities (TECs) and threatened flora species as they relate to legislative requirements under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), *Nature Conservation Act 1992* (NC Act), and *Environmental Offsets Act 2014* (EO Act 2014).

Steve also has specialist experience in the preparation of rehabilitation revegetation and monitoring plans. Known within the industry for his in-depth knowledge of regional ecosystems and ecological impact assessment and rehabilitation throughout Queensland and New South Wales, accompanied with his proven ability to work with clients and regulators to deliver tangible on ground environmental outcomes, Steve has a unique blend of technical and management skills.

### EDUCATION

Masters of Business Administration (MBA), University of Queensland.	2018
Masters of Environmental Science, University of New England	2015
Graduate Diploma in Natural Resources, University of New England	2008
Bachelor of Applied Science (Protected Area Management), University of Queensland	2003
Diploma in Applied Science (Nature Conservation) (distinction), University of Queensland	2001

### PROFESSIONAL ASSOCIATIONS

Australasian Land & Groundwater Association	ALGA
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**PROFESSIONAL EXPERIENCE**

*Transport sector*

- **Bruce Highway Smart Motorways Project. Ecological Assessment 2020. Department of Transport and Main Roads. Principal Ecologist.**

Responsible for conducting field surveys and mapping for regional ecosystems, conducting targeted botanical surveys for threatened flora species, and the preparation of the terrestrial flora ecological assessment report.
- **Burleigh to Palm Beach (P2B). ISCA Assessment (2019-20). Department of Transport and Main Roads. Principal Ecologist**

Responsible for completing the Eco -1 Ecological Value and Eco – 2 Habitat Connectivity ISCA Sustainability Assessment.
- **The Narrabri to North Star (N2NS) section of the Inland Rail Project Ecology ISCA Assessment (2018). ARTC. Principal Ecologist.**

Responsible for completing the Eco -1 Ecological Value and Eco – 2 Habitat Connectivity ISCA Sustainability Assessment.
- **Cooroy to Curra Section D Energex and Telstra Vegetation Survey Report, Cooroy to Curra, Qld, Australia (2019). Department of Transport and Main Roads. Principal Ecologist.**

Responsible for leading field based threatened flora surveys, vegetation clearing assessments, and preparing the associated vegetation survey report.
- **Bruce Highway Interchange Upgrades - Maroochydore Road and Mons Road Ecological Assessment Report (WSP 2019). Department of Transport and Main Roads. Principal Ecologist.**

Responsible for conducting field surveys and mapping for regional ecosystems, conducting targeted botanical surveys for threatened flora species, and the preparation of the terrestrial flora ecological assessment report.
- **Bruce Highway Interchange Upgrades - Maroochydore Road and Mons Road ISCA Assessment (WSP 2019). Department of Transport and Main Roads. Principal Ecologist.**

Responsible for completing the Eco -1 Ecological Value and Eco – 2 Habitat Connectivity ISCA Sustainability Assessment.
- **Protected Plants Flora Survey Report, Beechmont Road Safety Improvements Project, Qld, Australia (2017). Department of Transport and Main Roads, Principal Ecologist.**

Responsible for conducting field surveys and mapping for regional ecosystems, conducting targeted botanical surveys for threatened flora species, and the preparation of the Flora Survey Report.
- **Toowoomba Range Clearance Upgrade Protected Plants Flora Survey Report Toowoomba, Qld, Australia (2017). Queensland Rail. Principal Ecologist.**

Responsible for conducting field surveys and mapping for regional ecosystems, conducting targeted botanical surveys for threatened flora species, and the preparation of the Flora Survey Report.
- **Nerang-Murwillumbah Road Hidden Woods Road Intersection Flora and Fauna Assessment, Nerang, Qld, Australia (2016). Department of Transport and Main Roads. Principal Ecologist.**

Responsible for conducting field surveys and mapping for regional ecosystems, conducting targeted botanical surveys for threatened flora species, and the preparation of the Flora Survey Report.

- **Toowoomba Second Range Crossing Project, Toowoomba, Qld, Australia (2016). Transport and Main Roads. Principal Ecologist.**

Responsible for leading field based ecological pre-clearance surveys for geotechnical sites and leading the project threatened flora survey.

- **ARTC Gowrie to Kagaru Project, Qld, Australia (2016). ARTC. Technical Lead Flora Ecology.**

Responsible for completing the initial corridor desktop assessment and identifying potential ecological constraints associated with matters of national and state significance. Assisted with stage 1 and stage 2 detailed ecology desktop assessments and field survey scopes of work.

- **Tinana Road Interchange Upgrade, Tinana, Qld, Australia (2015). Transport and Main Roads, Terrestrial flora ecologist.**

Responsible for conducting field surveys and mapping for regional ecosystems, conducting targeted botanical surveys for threatened flora species, and the preparation of the terrestrial flora ecological assessment report.

- **Boundary Road Interchange Upgrade, Narangba, Qld, Australia (2015). Transport and Main Roads. Terrestrial flora ecologist.**

Responsible for conducting field surveys and mapping for regional ecosystems, conducting targeted botanical surveys for threatened flora species, and the preparation of the terrestrial flora ecological assessment report.

- **Cooroy to Curra Section C Energex and Telstra Vegetation Survey Report, Cooroy to Curra, Qld, Australia (2015). Department of Transport and Main Roads. Principal Ecologist.**

Responsible for leading field based threatened flora surveys, vegetation clearing assessments, and preparing the associated vegetation survey report.

*Utilities sector*

- **Significant Impact Assessment for *Philotheca sporadica*, Darling Downs Solar Farm Powerline Connection, Qld, Australia (2017). Powerlink Queensland. Principal Ecologist.**

Responsible for preparation of the Significant Impact Assessment (SIA) for *P. sporadica* potentially impacted as a result of the proposed powerline connection.

- **Sunshine Coast Airport Runway Diversion Pipeline Project, Sunshine Coast, Qld, Australia (2016). Unitywater. Principal Ecologist.**

Responsible for the delivery of the protected plant and marine plant flora survey.

- **Russel Island Project Threatened Flora Survey Report, Brisbane, Qld, Australia (2015). Energex. Principal Ecologist.**

Responsible for the delivery of the protected plant survey and Flora Survey Report.

*Mining and CSG*

- **Dawson Coal Mine. Kianga Creek Diversion Revegetation Plan (2018). Anglo American. Principal Ecologist**

Responsible for the development and preparation of the Kianga Creek Diversion Revegetation Plan. The plan was based on achieving native ecosystems within the planned diversion similar to surrounding environment, aligned with soil types, underlying

geologies and stream bank and bed zones. A full risk assessment and management actions were also included in the development of the plan.

- **Peabody Energy Rehabilitation Monitoring Program, Qld (2017). Peabody Energy. Project manager**

Responsible for managing the delivery of Peabody's 2017 Rehabilitation Monitoring Program across all of its Queensland operations in accordance with the Peabody Rehabilitation Monitoring Methodology.

- **Blair Athol Coal Mine Rehabilitation Monitoring Plan (2016). Rio Tinto Coal. Project manager.**

Responsible for the delivery of the 2016 Rehabilitation current status review and update of the Blair Athol Rehabilitation Monitoring Plan (2016)

- **Origin Energy Darling Downs Solar Farm Project (2015-16). Origin Energy Terrestrial flora ecologist.**

Responsible for conducting field surveys and mapping for regional ecosystems, conducting targeted botanical surveys for threatened flora species, and the preparation of the terrestrial flora section of the report.

- **Wesfarmers Curragh MDL162 Expansion Project (2014–2016). Wesfarmers. Terrestrial flora ecologist.**

Responsible for delivery of the terrestrial flora impact assessment, groundwater dependent ecosystem classification and mapping and preliminary environmental offset strategy.

- **Rolleston Coal Mine Expansion EIS (2012–2015). Glencore Coal Qld. Technical lead terrestrial ecology.**

Responsible for delivery of the terrestrial flora and fauna impact assessment, groundwater dependent ecosystem classification and mapping, and project environmental offset strategy.

- **Arrow Energy Rehabilitation Monitoring Project (2013–2014). Arrow Energy. Technical lead rehabilitation monitoring.**

Responsible for developing the rehabilitation monitoring methods, training key staff members and leading rehabilitation monitoring field teams.

- **Blair Athol Coal Mine Rehabilitation Revegetation Planning Report (2013). Rio Tinto Coal. Terrestrial ecologist and project manager.**

Responsible for developing revegetation plans for post coal mining rehabilitation domains at Blair Athol Coal Mine.

- **Blair Athol Coal Mine Micro-habitat Rehabilitation Planning Assessment (2013). Rio Tinto Coal. Terrestrial ecologist and project manager.**

Responsible for the development of micro-habitat plans for post coal mining rehabilitation domains.

- **Boundary Hill EIS (2012). Anglo American. Terrestrial flora ecologist.**

Responsible for the delivery of the terrestrial flora ecological impact assessment.

- **Meridian Seam Gas Soils and Vegetation Baseline Assessment (2012). Westside Corporation. Terrestrial ecologist and project manager.**

Responsible for surveying and mapping regional ecosystems and environmentally sensitive areas across the Meridian Seam Gas Project operations.

- **Washpool Environmental Impact Statement - Environmental Offset Strategy (2012). Aquila Resources. Technical lead terrestrial ecology.**

Responsible for the preparation of the project's environmental offset strategy.

- **Wards Well EIS (2011–2012). BHP Billiton Mitsubishi Alliance. Terrestrial flora ecologist.**

Responsible for conducting field surveys and mapping for regional ecosystems and threatened ecological communities, conducting targeted botanical surveys for threatened flora species, and the preparation of the terrestrial flora ecological impact assessment report.

- **Peak Downs Expansion Project EIS (2011–2012). BHP Billiton Mitsubishi Alliance. Terrestrial flora ecologist.**

Responsible for conducting field surveys and mapping for regional ecosystems and threatened ecological communities, targeted botanical surveys for threatened flora species, and preparation of the terrestrial flora ecological assessment report.

- **North Goonyella Coal Rehabilitation and Land Use Management Plan (2011–2012). Peabody Energy. Terrestrial ecologist.**

Responsible for developing revegetation plans for post coal mining rehabilitation domains.

- **New Acland Stage 3 EIS (2011). New Hope Coal. Terrestrial flora ecologist.**

Responsible for conducting vegetation and botanical surveys, and the preparation of the terrestrial flora Bluegrass Offsets Management Plan and associated Threatened Species Relocation Plan.

- **Togara North Expansion Project EIS (2011–2012). Xstrata Coal Qld. Terrestrial flora ecologist.**

Responsible for conducting field surveys and mapping for regional ecosystems and threatened ecological communities, and preparation of the terrestrial flora ecological impact assessment report.

- **Saraji East Pipeline (2011). BHP Billiton Mitsubishi Alliance. Terrestrial flora ecologist.**

Responsible for conducting targeted botanical field surveys, mapping regional ecosystems and threatened ecological communities, and the preparing the project terrestrial flora ecological assessment report.

- **Caval Ridge Pipeline Review of Environmental Factors (2011). Sunwater. Terrestrial flora ecologist.**

Responsible for conducting desktop constraints assessment and targeted field surveys for the purpose of identifying terrestrial flora and fauna constraints within the proposed pipeline corridor.

**PROFESSIONAL DEVELOPMENT**

Senior First Aid (nationally recognised)	2014
Queensland and NSW Coal Board Medical	2014
Standard 11 Surface Operations - Refresher	2018
Bio condition training, Queensland Herbarium	2011
Queensland Herbarium Regional Ecosystem Training	2009



***PROFESSIONAL HISTORY***

WSP	2018 - Present
Biodiversity Australia	2018
WSP/ Parsons Brinckerhoff	2014 - 2017
AECOM	2012 – 2014
Sinclair Knight Merz	2010 – 2012
SEQ Catchments Regional NRM Group	2005 – 2010
Queensland Parks and Wildlife Service	2001 – 2005

# APPENDIX B

BASELINE SURVEY SITE PHOTOS



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# B1 QUATERNARY SITE PHOTOS



Photo B.1 Quaternary Site 1 (QS1)



Photo B.2 Quaternary Site 2 (QS2)



Photo B.3 Quaternary Site 3 (QS3)



Photo B.4 Quaternary Site 4 (QS4)



Photo B.5 Quaternary Site 5 (QS5)



Photo B.6 Quaternary Site 6 (QS6)





Photo B.7 Quaternary Site 7 (QS7)



Photo B.8 Quaternary Site 8 (QS8)



Photo B.9 Quaternary Site 9 (QS9)



Photo B.10 Quaternary Site 10 (QS10)



Photo B.11 Quaternary Site 11 (QS11)



Photo B.12 Quaternary Site 12 (QS12)



Photo B.13 Quaternary Site 13 (QS13)



Photo B.14 Quaternary Site 14 (QS14)



Photo B.15 Quaternary Site 15 (QS15)



Photo B.16 Quaternary Site 16 (QS16)



Photo B.17 Quaternary Site 17 (QS17)



Photo B.18 Quaternary Site 18 (QS18)



Photo B.19 Quaternary Site 19 (QS19)



Photo B.20 Quaternary Site 20 (QS20)

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## B2 TERTIARY SITE PHOTOS



Photo B.21 Tertiary Site 1 Start (ST1S)



Photo B.22 Tertiary Site 1 End (ST1E)



Photo B.23 Tertiary Site 2 Start (ST2S)



Photo B.24 Tertiary Site 2 End (ST2E)



Photo B.25 Tertiary Site 3 Start (ST3S)



Photo B.26 Tertiary Site 3 End (ST3E)

# APPENDIX C

SPECIES LIST AND VEGETATION SURVEY  
SITE RESULTS



# C1 SPECIES LIST AND VEGETATION SURVEY SITE RESULTS

SURVEY SITES		TER 1	TER 2	TER 3	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	STRUCTURAL SUMMARY
Field verified regional ecosystems (RE)		12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	12.3.17	RE 12.3.17
Ecological dominant layer (EDL)		T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1
EDL median height (m)		23	20	24	20	20	20	25	23	24	24	24	25	24	20	20	20	25	20	18	25	25	20	15	22m (18m-25m)
EDL Canopy Cover % (estimated Quaternary sites)		95.8	68	90	60	50	70	50	50	60	50	20	50	50	50	60	70	50	50	50	30	30	70	20	54
Species Name	Lowland Rainforest Appendix A Species																								
<i>Acacia disparrima</i>				x																				x	
<i>Acacia maidenii</i>																								x	
<i>Adiantum hispidulum</i>		x	x		x																				
<i>Alchornea ilicifolia</i>						x																			
<i>Alphitonia excelsa</i>	x																						x		x
<i>Aphananthe philippensis</i>	x	x	x	x		x				x									x	x					x
<i>Archontophoenix alexandrae</i>				x						x															
<i>Asparagus asparagoides**</i>			x																						
<i>Atractocarpus chartaceus</i>	x	x	x	x	x				x	x	x			x	x					x					
<i>Austrosteenisia blackii</i>																									x
<i>Castanospermum australe</i>	x	x	x	x			x	x	x				x	x	x	x	x	x	x						
<i>Celtis sinensis**</i>			x	x	x		x								x	x			x				x		
<i>Cissus antarctica</i>	x	x																x							
<i>Cleistanthus cunninghamiana</i>	x	x																					x		
<i>Clerodendrum tomentosum</i>		x			x																				
<i>Cryptocarya obovata</i>	x	x	x																						
<i>Cryptocarya triplinervis</i>		x	x		x	x					x	x	x	x							x	x	x		
<i>Dianella caerulea</i>			x																						
<i>Diospyros fasciculosa</i>		x																							
<i>Dolichandra unguis-cati**</i>		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
<i>Embelia australiana</i>																									x
<i>Endiandra discolor</i>								x		x															x
<i>Endiandra muelleri subsp. muelleri</i>		x	x		x	x	x	x		x					x	x							x		
<i>Eucalyptus grandis</i>							x																		
<i>Eucalyptus tereticornis</i>		x				x		x	x																x
<i>Eustrephus latifolius</i>	x	x		x																					
<i>Ficus coronata</i>	x	x	x	x																					
<i>Ficus fraseri</i>	x	x	x	x	x					x	x						x	x	x	x	x				x
<i>Ficus opposita</i>	x				x																				

SURVEY SITES		TER 1	TER 2	TER 3	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	STRUCTURAL SUMMARY
<i>Ficus watkinsiana</i>	x											x													
<i>Freycinetia scandens</i>		x						x																	
<i>Gossia bidwillii</i>	x			x												x						x	x		
<i>Ligustrum sinense**</i>		x	x	x	x		x	x	x	x					x		x		x						
<i>Lomandra hystrix</i>		x		x									x	x											
<i>Lomandra longifolia</i>				x																		x			
<i>Lophostemon suaveolens</i>		x			x							x				x		x				x	x		
<i>Maclura cochinchinensis</i>	x																						x		
<i>Mallotus claoxyloides</i>							x																		
<i>Mallotus philippinensis</i>	x		x						x	x				x											
<i>Meiogyne stenopetala</i>		x																							
<i>Mischocarpus australis</i>		x	x	x									x	x			x	x	x						
<i>Neolitsea dealbata</i>	x	x																							
<i>Ottochloa gracillima</i>		x	x	x	x																				
<i>Paspalum mandiocanum**</i>				x														x							
<i>Passiflora suberosa**</i>					x																				
<i>Pilidistigma rhytispermum</i>																						1			
<i>Pittosporum revolutum</i>	x		x	x								x													
<i>Polyscias elegans</i>	x		x																						
<i>Rhodomyrtus psidioides (Endangered Nature Conservation Act 1992)</i>				x																					
<i>Ripogonum album</i>					x																				
<i>Rivina humilis**</i>																									
<i>Senna pendula var. glabrata**</i>										x															
<i>Smilax australis</i>	x	x	x	x	x	x			x								x					x			
<i>Streblus brunonianus</i>	x	x	x	x	x	x	x		x	x		x		x	x	x	x	x	x			x	x		
<i>Tabernaemontana pandacaqui</i>	x	x	x		x									x										x	
<i>Tradescantia fluminensis**</i>				x																					
<i>Trophis scandens</i>		x	x	x	x				x					x		x									
<i>Waterhousea floribunda</i>	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x		x	x	x	
<i>Wilkiea austroqueenslandica</i>	x	x																							
<b>Sub totals</b>		<b>30</b>	<b>24</b>	<b>24</b>	<b>19</b>	<b>10</b>	<b>8</b>	<b>7</b>	<b>10</b>	<b>12</b>	<b>6</b>	<b>5</b>	<b>6</b>	<b>12</b>	<b>8</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>9</b>	<b>6</b>	<b>11</b>	<b>8</b>	<b>7</b>	<b>8</b>	
<b>Total Species</b>	<b>59</b>																								
<b>Total Lowland Rainforest Appendix A Species</b>	<b>23</b>																								
<b>Total native species</b>	<b>50</b>																								
<b>Total exotic invasive species **</b>	<b>9</b>																								

# APPENDIX D

## QUEENSLAND HERBARIUM SPECIES IDENTIFICATION RESULTS







Queensland  
Government

Department of  
Environment and Science

## Queensland Herbarium

Brisbane Botanic Gardens Mt Coot-tha • Toowong 4066 Queensland • Australia  
Telephone +61 7 3199 7699 • Facsimile +61 7 3876 1278  
e-mail [Queensland.Herbarium@qld.gov.au](mailto:Queensland.Herbarium@qld.gov.au)  
<http://www.qld.gov.au/herbarium>

Enquiries            Jason Halford  
Telephone            07 3199 7666  
Your reference  
Our reference        JJH:mh 269/20

25 May 2020

Steve Lyngcoln  
WSP  
14/900 Ann Street  
BRISBANE Qld 4000

Dear Steve

The botanical specimens received by the Queensland Herbarium on 13 May 2020 have been identified as:

ST1A      *Endiandra muelleri* subsp. *muelleri*  
ST1B      *Cleistanthus cunninghamii*, confirmed  
ST1C      *Endiandra muelleri* subsp. *muelleri*, confirmed  
ST1D      *Mischocarpus australis*, confirmed  
ST1E      *Mischocarpus australis*  
ST1B      *Cryptocarya obovata*, confirmed  
ST2A      *Cryptocarya obovata*, confirmed  
ST2B      *Endiandra muelleri* subsp. *muelleri*  
SQ17B     *Cleistanthus cunninghamii*, confirmed  
SQ17C     *Endiandra discolor*, confirmed  
SQ20      *Endiandra muelleri* subsp. *muelleri*, confirmed.  
Q5/Q20    *Cryptocarya triplinervis* var. *triplinervis*  
SF3        #*Rhodomyrtus psidioides*. This species is listed as Endangered under  
              Queensland's *Nature Conservation Act 1992*.

# This specimen has been kept for incorporation into the Herbarium collection, with thanks.

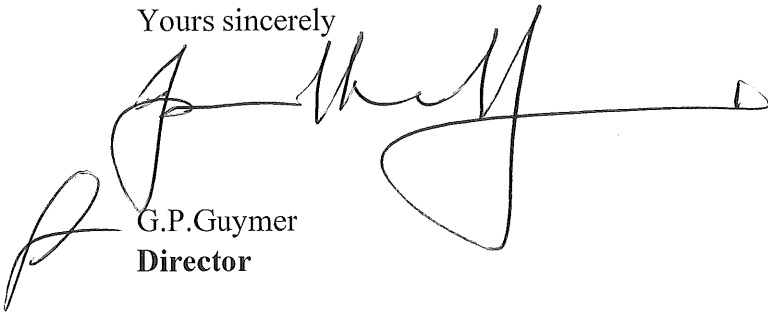
There is a charge of \$379.93 (3.25 hrs @ \$116.90 per hr incl GST) for these identifications.

Download a full version of Census of the Queensland Flora 2019  
<https://data.qld.gov.au/dataset/census-of-the-queensland-flora-2019>

You can contribute to Queensland's biodiversity information by submitting this/these plant identification(s) and associated information to the Atlas of Living Australia using the 'Report a sighting' template at (<https://www.ala.org.au/>)

Note that for specimens retained by the Queensland Herbarium we provide the specimen data to the Australasian Virtual Herbarium and to the Atlas of Living Australia.

Yours sincerely

A handwritten signature in black ink, appearing to read 'G.P. Guymer', with a long horizontal flourish extending to the right.

G.P. Guymer  
**Director**

## ABOUT US

WSP is one of the world's leading engineering professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, planners, surveyors, environmental specialists, as well as other design, program and construction management professionals. We design lasting Property & Buildings, Transportation & Infrastructure, Resources (including Mining and Industry), Water, Power and Environmental solutions, as well as provide project delivery and strategic consulting services. With approximately 48,000 talented people globally, we engineer projects that will help societies grow for lifetimes to come.

