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APPENDIX 1: MCU COURT APPROVAL CONDITIONS

Duplicate

In the Planning and Environment Court
Held at: Brisbane

No. 2606 of 2010

Between:	WESTLINK PTY LTD AS TRUSTEE FOR WESTLINK INDUSTRIAL TRUST	Appellant
And:	LOCKYER VALLEY REGIONAL COUNCIL	Respondent
And:	CHIEF EXECUTIVE, DEPARTMENT OF ENVIRONMENT AND RESOURCE MANAGEMENT	First Co-Respondent by Election
And:	MICHAEL WILLIAM ASHLEY	Second Co-Respondent by Election
And:	GERALD SCOTT	Third Co-Respondent by Election
And:	KEEP LOCKYER RURAL INC.	Fourth Co-Respondent by Election
And:	LYNNE HALL	Fifth Co-Respondent by Election
And:	GEOFFREY KING	Sixth Co-Respondent by Election

FINAL ORDER

Before: His Honour Judge Robin QC
Date of Hearing: 3 – 7 June 2013 and 28 February 2014
Date of Judgment:

THIS MATTER having on 3 – 7 June 2013 and this day come on for hearing by way of appeal against the Respondent's decision to refuse a development application (**Application**) made in respect of land located at Ranger Road, Adare, which has a real property description of Lot 191 on Crown Plan CSH2361 (**Land**), which seeks:

1. a development permit for a material change of use of the Land for electricity generation infrastructure comprising a staged development of a gas-fired peaking power generation plant consisting of up to six open cycle gas turbines with a total generating capacity of up to 1,000 MW;



Final Order
Filed on behalf of the Appellant
Form PEC-7

McInnes Wilson Lawyers
Level 14, Central Plaza One
345 Queen Street BRISBANE QLD 4000
Phone: 07 3231 0600
Facsimile: 07 3221 2921
Email: tgallienne@mcw.com.au
Our ref: TWG:NMC:97064

FINAL ORDER

2. a development permit for environmentally relevant activity no.14 – electricity generation threshold 1 – generating electricity by using gas at a rated capacity of 10 MW electrical or more; and
3. a development permit for operational work for clearing vegetation made assessable under Schedule 8 of the *Integrated Planning Act 1997* (Qld).

IT IS ORDERED THAT:

1. The appeal be allowed.
2. The Application be approved subject to the approval package attached and marked 'Annexure A', which is comprised of:
 - (a) conditions required to be imposed by the Respondent and the approved plan, which appear at pages 1 to 10 of Annexure A;
 - (b) conditions required to be imposed by the First Co-Respondent by Election, which appear at pages 11 to 33 of Annexure A; and
 - (c) conditions recommended by Energex, which appear at pages 34 to 36 of Annexure A, and are imposed through condition 49 required to be imposed by the Respondent.

Filed on:
Filed by: McInnes Wilson Lawyers
Trevor Gallienne
Service Address: Level 14, Central Plaza One
345 Queen Street, BRISBANE QLD 4000
Phone: 07 3231 0600
Fax: 07 3221 2921
Email: tgallienne@mcw.com.au



Registrar

Annexure A

CONDITIONS OF APPROVAL		
NO.	CONDITION	TIMEFRAME
Scope of Approval		
1.	Deleted	N/A
2.	Whilst the facility may be staffed (e.g. security, maintenance and operational staff) 24 hours a day, every day, electricity generation is limited to satisfy peak electricity demand.	Ongoing
Approved Plans and Documents		
3.	<p>The development shall be undertaken generally in accordance with the following plans and documents:</p> <p>A. Plan 41-21379-SK004 Rev E (Plant Layout Option 1 Plan View) prepared by GHD and dated 3 December 2009.</p> <p>B. Westlink Power Project Site Based Management Plan Rev 0 prepared by GHD and dated 3 September 2009.</p> <p>C. Westlink Power Project Landscape Management and Revegetation Plan Rev 0 prepared by GHD and dated 23 February 2010.</p> <p>D. Westlink Power Project Draft Landscape Specification Rev 0 prepared by GHD and dated 23 February 2010.</p> <p>E. Westlink Power Project Erosion Management Plan Rev 0 prepared by GHD and dated 23 February 2010.</p> <p>F. Westlink Power Project Stormwater Management Plan Rev 0 prepared by GHD and dated 23 February 2010.</p> <p>G. Westlink Power Project Waste Management Plan Rev 0 prepared by GHD and dated 23 February 2010.</p> <p>H. Westlink Power Project Visual Impact Rev 0 and Landscape Assessment prepared by GHD and dated 31 August 2009.</p> <p>I. Westlink Power Project Visual Impact and Landscape Assessment Addendum prepared by GHD and dated February 2010.</p>	Ongoing

	J. Vegetation Clearing Plan 41-22282-L007 prepared by GHD and dated 28 May 2010.																
Relevant Period of Approval and Staging																	
4.	<p>(a) The relevant period is stated in Section 341(1)(a) of the <i>Sustainable Planning Act 2009</i> (i.e. 'four years starting the day the approval takes effect'). To avoid doubt, this condition does not effect the operation of section 341(4) of the <i>Sustainable Planning Act 2009</i>.</p> <p>(b) The proposed development may be constructed in stages, to reflect market demand for peak electricity generation.</p> <p>(c) If the proposed development is constructed in stages, the staged development shall not exceed the following:</p> <table border="1"> <thead> <tr> <th>Stage</th> <th>Max. Generation Capacity (Total)</th> <th>Max. No. of Turbines (Total)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>350MW</td> <td>2</td> </tr> <tr> <td>2</td> <td>700MW</td> <td>4</td> </tr> <tr> <td>3</td> <td>1,000MW</td> <td>6</td> </tr> <tr> <td>Total</td> <td>1,000MW</td> <td>6</td> </tr> </tbody> </table>	Stage	Max. Generation Capacity (Total)	Max. No. of Turbines (Total)	1	350MW	2	2	700MW	4	3	1,000MW	6	Total	1,000MW	6	Ongoing
Stage	Max. Generation Capacity (Total)	Max. No. of Turbines (Total)															
1	350MW	2															
2	700MW	4															
3	1,000MW	6															
Total	1,000MW	6															
Internal Road Works and Vehicle Parking																	
5.	All internal roads, driveways, vehicle parking spaces and manoeuvring areas shall be sealed or of concrete construction.	To be included in Operational Works application															
6.	The construction width of internal roads shall be sufficient to accommodate the turning movements of operational vehicles, maintenance vehicles and fire trucks.	To be included in Operational Works application															
7.	A total of 27 car parking spaces are to be provided generally in accordance with Drawing 41-21379-SK004 Rev E	To be included in Operational Works application															
8.	The minimum dimensions of car parking spaces and heavy vehicle loading and manoeuvring areas shall be in accordance with the requirements of AS/NZS2890.1 and AS 2890.2.	To be included in Operational Works application															
9.	All internal roads, driveways, vehicle parking spaces and manoeuvring areas shall be maintained and kept available for their intended purposes.	Ongoing															
Vegetation Clearing and Rehabilitation																	
10.	Clearing of vegetation shall only occur within areas identified on Vegetation Clearing Plan 41-22282-L007 prepared by GHD and dated 28 May 2010	Prior to the commencement of any site works and															

	and in accordance with the requirements of the Department of Environmental Resource Management as a referral agency.	ongoing
11.	All vegetation that is cleared on the site or external to the site to provide access shall be mulched on-site and used for onsite landscaping works	During and after any clearing works
12.	Where vegetation that is cleared on the site or external to the site to provide access cannot be used for onsite landscaping works it shall be removed and disposed of in an approved facility.	During and after any clearing works
13.	A Koala spotter must be present on-site during all vegetation clearance works of trees greater than 15cm diameter at breast height (DBH).	During clearing works
14.	Within Area B as defined by the Department of Environmental Resource Management approval map RARP2009/009249 the 50m boundary fire trail/break shall be reduced to 1.5 times the height of the tallest vegetation or 20m whichever is the greater. The difference between this and the 50m firebreak is to be rehabilitated to reflect the pre-cleared Regional Ecosystem. The Applicant is to submit and secure Council approval of an amended Landscaping and Rehabilitation Plan to reflect this condition.	Prior to the commencement of any site works and ongoing
15.	Within Area B as defined by the Department of Environmental Resource Management approval map RARP2009/009249, the developer shall provide wildlife friendly fencing that allows the movement of macropods, koalas and gliders. This fencing must also be designed to reduce possible injury to native wildlife. Within the balance of the lot, the applicant must utilise wildlife friendly fencing that is designed to minimise possible injury native wildlife.	Prior to the commencement of any site works and ongoing
16.	Except where amended by conditions of this approval all rehabilitation and landscaping works are to be undertaken in accordance with: <p>A. Westlink Power Project Landscape Management and Revegetation Plan Rev 0 prepared by GHD and dated 23 February 2010.</p> <p>B. Westlink Power Project Draft Landscape Specification Rev 0 prepared by GHD and dated 23 February 2010.</p> <p>C. Westlink Power Project Visual Impact Rev 0 and Landscape Assessment prepared by GHD and dated 31 August 2009.</p> <p>D. Westlink Power Project Visual Impact and</p>	Prior to commencement of the use and included in Operational Works application.

	<p>Landscape Assessment Addendum prepared by GHD and dated February 2010.</p> <p>E. Vegetation Clearing Plan 41-22282-L007 prepared by GHD and dated 28 May 2010.</p>	
17.	All areas of vegetation that are not cleared in accordance with the approval and all rehabilitation areas shall be protected in perpetuity in the form of a statutory covenant placed on the land title in accordance with the <i>Land Title Act 1994</i> .	Prior to commencement of the use
18.	All Revegetated Earth Bunds identified on Vegetation Clearing Plan 41-22282-L007 prepared by GHD and dated 28 May 2010 shall be protected in perpetuity in the form of a statutory covenant placed on the land title in accordance with the <i>Land Title Act 1994</i> .	Prior to commencement of the use
Mitigation of Bushfire Risk		
19.	<p>A Bushfire Management Plan shall be prepared by a suitably qualified person in consultation with the local rural fire brigade which provides:</p> <p>A. An evaluation of bushfire hazard on Lot 191 CSH2361.</p> <p>B. Mitigation measures during construction and operational phases of the development.</p> <p>C. Details of the responsibilities and obligations of the operator of the facility for the ongoing management of bushfire hazard on the Land.</p>	Prior to commencement of the use
Lighting		
20.	Lighting shall only be provided on-site for security and safety purposes and shall be designed, constructed, located and maintained in accordance with Australian Standard 4282 – 1997 (Control of the obtrusive effects of outdoor lighting) so as not to cause nuisance to the occupants of nearby properties or passing traffic. In addition on-site lighting must be wildlife friendly and so shall not include flood lighting, bare bulbs and any lighting pointing upward and shall comply with the mitigation measures outlined in Table 5.1 of Detailed Ecological Assessment Prepared by Conics, dated 21 April 2009.	Ongoing
20A.	Notification of the structure shall be given in accordance with Civil Aviation Safety Authority publication AC139-08(0) Reporting of Tall Structures.	Prior to the commencement of any works
20B.	The advice of the Civil Aviation Safety Authority shall be sought regarding the requirements to	Prior to the commencement of

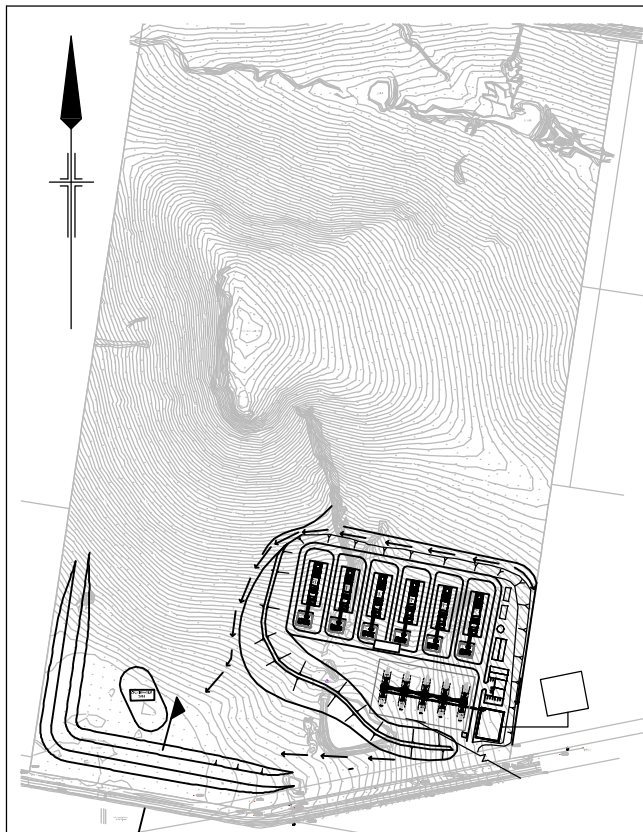
	provide obstacle lighting on the structure.	any works
Environmental Health		
21.	<p>All waste storage and management shall be undertaken in accordance with Westlink Power Project Waste Management Plan Rev 0 prepared by GHD and dated 23 February 2010 subject to the following:</p> <p>A. An adequate number of an appropriate type of commercial and bulk waste containers shall be provided at a central location to accommodate all waste produced on the site;</p> <p>B. Arrangements shall be made for all waste collected on the site to be removed not less than once per week;</p> <p>C. The waste collection area shall be provided with an imperviously paved area on which to stand all waste containers and a suitable form of enclosure to conceal and secure the waste disposal area; and</p> <p>D. The waste collection area must be located such that the waste collection vehicle can collect the waste without obstruction and leave the property in a forward gear.</p>	To be included in Operational Works application
Access and External Road Works		
22.	Access to the site from the Warrego Highway for construction traffic (other than Heavy Oversized Vehicles and Heavy Haulage Road Trains) during all stages of construction is to be via Gatton-Esk Road, Redbank Creek Road and Fords Road.	During all construction activities
23.	Subject to the requirements of the Department of Transport and Main Roads access to the site for from the Warrego Highway for Heavy Oversized Vehicles and Heavy Haulage Road Trains during all stages of construction is to be via a direct temporary connection between the Warrego Highway and Fords Road.	During all construction activities
24.	Where temporary access is provided for Heavy Oversized Vehicles and Heavy Haulage Road Trains in accordance with Condition 21, the developer shall be responsible for the design and construction of all works on Fords Road necessary to provide temporary access and shall be responsible for removal of temporary works upon completion of all stages of the development.	To be included in Operational Works application and ongoing
25.	The applicant shall enter into an infrastructure agreement with the Lockyer Valley Regional Council to address the mitigation of the impacts of	To be completed prior to the commencement of

	<p>construction traffic generated by the development on the local road network. The agreement shall include but not be limited to:</p> <p>A. The identification of works required to be undertaken on Redbank Creek Road and Fords Road and the intersections of Gatton-Esk Road /Redbank Creek Road and Redbank Creek Road/Fords Road/Adare Road to accommodate construction traffic generated by the development;</p> <p>B. The requirement for the developer to design and construct the required works identified in Point A prior to the commencement of construction of the first stage of the development;</p> <p>C. The extent to which the works identified in Point A which are not temporary works and which are required to be constructed by Point B constitute trunk infrastructure that can be offset against the infrastructure contributions required to be paid to Council pursuant to Condition 46.</p> <p>D. The basis for the calculation of the amount of the reduction in infrastructure contributions payable pursuant to Condition 46 as a result of the offset identified in Point C.</p>	any works on the land
26.	Access to the development from Fords Road shall be designed by an RPEQ to an industrial access standard and be configured to accommodate the turning movements of all construction traffic to Austroad Standards. To this end drawings provided with the Operational Works application shall indicate proposed width, turning movements, drainage provision and detail all required road or shoulder widening.	To be included in Operational Works application
27.	The minimum sealed width of the main entrance from Fords Road shall be 6m.	To be included in Operational Works application
Operational Works		
28.	Approval of Operational Works for all site works, internal roads, parking and manoeuvring areas, drainage and landscaping and all external works for each applicable stage shall be obtained prior to the undertaking of any works or clearing on the land or external to the land.	Prior to the commencement of any works
29.	An application for Operational Works shall be supported by detailed plans, drawings and calculations that includes but is not limited to:	To be included in Operational Works application

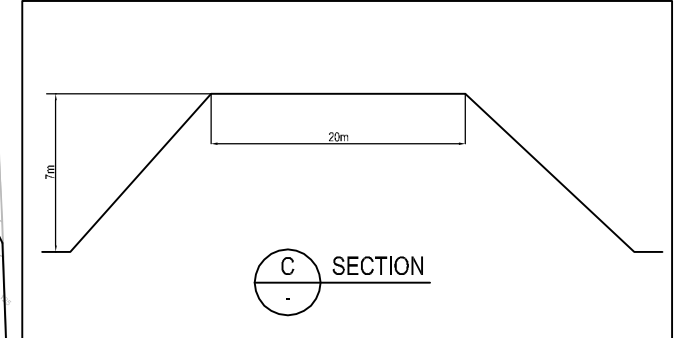
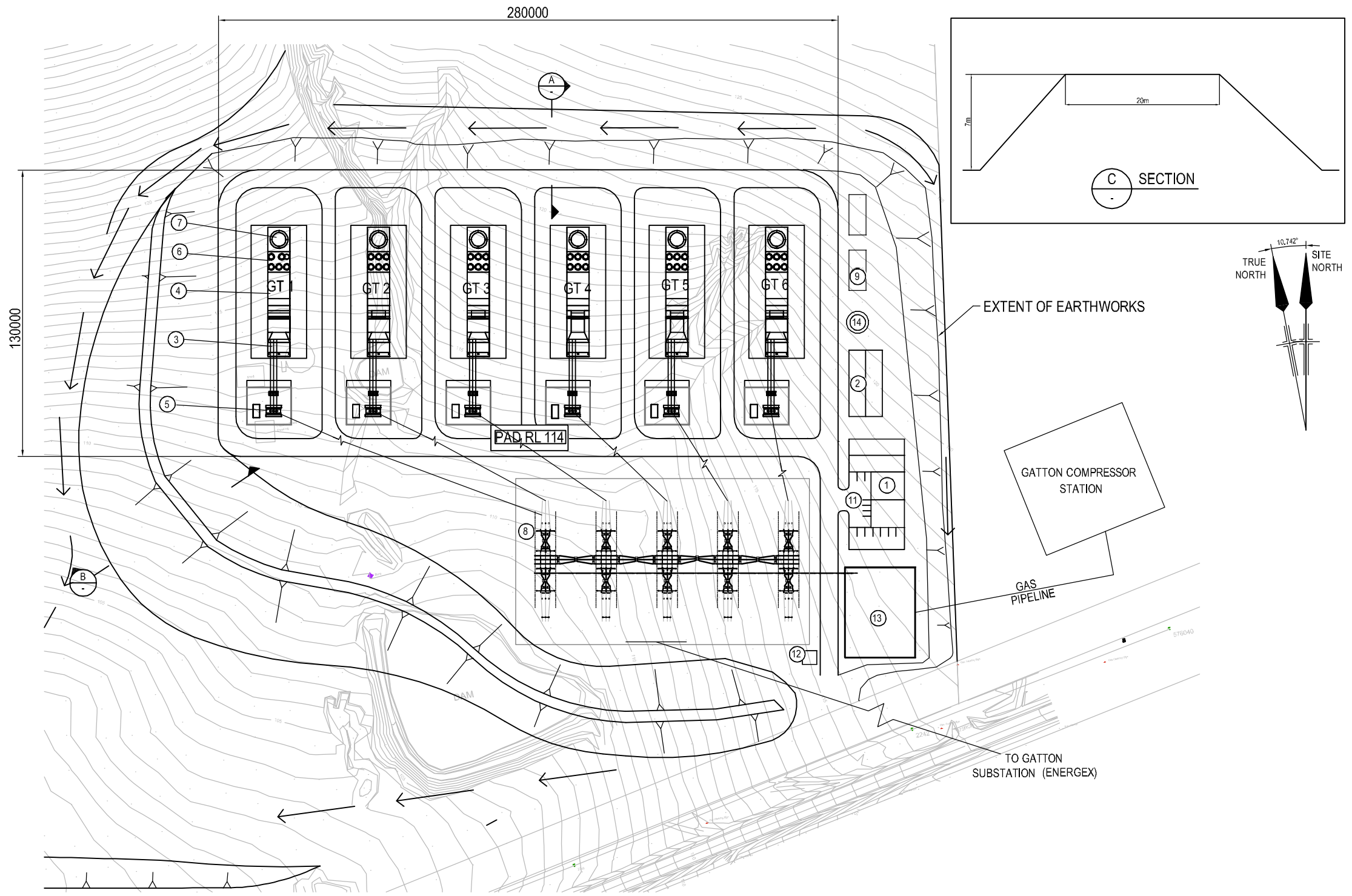
	<p>A. Three full sets plans and drawings in A3 size showing full construction details, layout dimensions and finished surface levels;</p> <p>B. All relevant calculations supporting all proposed stormwater and drainage infrastructure;</p> <p>C. Evidence that all plans, drawings and calculations have been checked, approved and signed by a current RPEQ with their registration number; and</p> <p>D. Any other detail or documentation required to be included in the Operational Works application by conditions of this approval.</p>	
30.	All batters resulting from earthworks (cut and fill) associated with the development must be located within the subject land.	To be included in Operational Works application
31.	With regard to the construction of infrastructure to become Council owned, all works must be supervised by a RPEQ competent in civil works and must be undertaken by a nominated Principal Contractor experienced in the construction of Municipal Works. Council reserves the right to request evidence of the Principal Contractor's competency.	At all times during construction
32.	With regard to the construction of infrastructure to become Council owned, works must be accepted "On Maintenance" prior to commencement of use. A maintenance bond equal to 10% of the construction cost (minimum of \$1,000.00) must be retained by Council for a minimum period of twelve months, or until such time as the works are accepted "Off Maintenance" by Council.	To be included in Operational Works application
33.	On completion of the works a certificate must be submitted to Council by an RPEQ certifying that the works have been constructed in accordance with Council's construction standards and in compliance with the approved plans and specification. It is expected that the RPEQ will undertake the necessary inspections to make this certification.	To be included in Operational Works application
Stormwater Management and Drainage		
34.	<p>All stormwater management and drainage infrastructure shall be designed by an RPEQ generally in accordance with:</p> <p>A. Westlink Power Project Stormwater Management Plan Rev 0 prepared by GHD and dated 23 February 2010;</p>	To be included in Operational Works application

	<p>B. Gatton Shire Council Planning Scheme;</p> <p>C. Queensland Urban Drainage Manual; and</p> <p>D. Any other detail or documentation required to be included in the Operational Works application by conditions of this approval.</p>	
35.	Stormwater drainage structures shall be designed so that there is 'no worsening' of runoff beyond that which occurs on the existing undeveloped site.	To be included in Operational Works application
36.	Detailed design plans submitted with the Operational Works Application shall show the location and details of the stormwater treatment devices identified in Section 4.4 of Westlink Power Project Stormwater Management Plan Rev 0 prepared by GHD and dated 23 February 2010.	To be included in Operational Works application
37.	All devices shall be installed on the development site and responsibility for maintenance shall rest with the relevant site manager. Details of required operation and maintenance procedures shall be supplied for future Council reference if required.	To be included in Operational Works application and ongoing
38.	The Fords Road table drain on the outlet for the culverts through the landscape bund shall be reshaped and stabilised as necessary to carry the ARI 100 year design outlet flow from the detention basin. Such works shall be continued as necessary to an agreed point of discharge.	To be included in Operational Works application
39.	Ponding of stormwater must not occur on the subject land, adjoining allotments or road reserve unless specifically conditioned as part of this development approval or the subsequent approval for Operational Works.	Ongoing
Erosion, Sediment and Pollutant Management		
40.	Erosion and sediment control measures shall be provided generally in accordance with Westlink Power Project Erosion Management Plan Rev 0 prepared by GHD and dated 23 February 2010.	To be included in Operational Works application
41.	Detailed design plans shall show the location and dimensions of the relevant erosion and sediment control devices.	To be included in Operational Works application
42.	All unlined open drains on the site and along Fords Road adjacent to the site shall be stabilised with vegetation upon completion in accordance with Table 9.05.3 of QUDM.	Prior to the commencement of any site works and ongoing
Impact of Works on Assets, Services and Infrastructure		
43.	Any alterations which are necessary or damage which is incurred as a result of the proposed development, to any public infrastructure, must be	During any works and ongoing

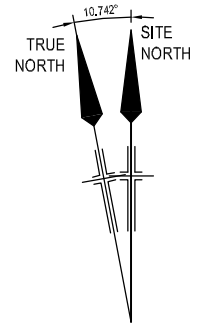
	carried out or repaired at the applicant's expense and with the approval of the relevant asset owner.	
44.	Where existing features or services are required to be removed or relocated to suit the development the terms and conditions of the relevant controlling authority are required to be met. The developer is required to contact controlling authorities for determination of conditions prior to any works being undertaken.	During any works and ongoing
45.	Any costs from repairs due to damage caused to Council assets as a result of proposed works undertaken shall be met by the applicant. Where pedestrian and vehicular traffic safety is exposed to hazards created from damage, the damage shall be repaired immediately.	During any works and ongoing
Infrastructure Contributions		
46.	Infrastructure contributions shall be payable to the Lockyer Valley Regional Council in accordance with an Adopted Infrastructure Charges Notice issued pursuant to the Council's Adopted Infrastructure Charges Resolution.	To be paid prior to commencement of the use
47.	Should the development be connected to the reticulated water supply an infrastructure contribution shall be payable to Queensland Urban Utilities in accordance with an Adopted Infrastructure Charges Notice issued pursuant to the Council's Adopted Infrastructure Charges Resolution.	To be paid prior to commencement of the use and connect to the reticulated water supply
Plumbing And Wastewater Disposal		
48.	No plumbing or drainage works are to be undertaken until plumbing approval has been granted.	Prior to plumbing and drainage work
Concurrence and Advice Agency Conditions		
49.	This approval is subject to the requirements and conditions of the following referral agencies which are provided in Schedule 1: A. Department of Environment and Resource Management; and B. Energex	As set out in the requirements and conditions of the relevant agencies



SITE LOCATION
SCALE 1:5000

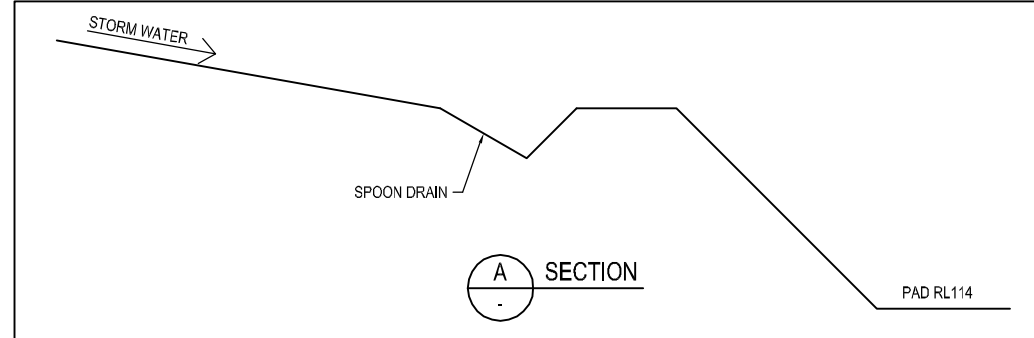


C SECTION



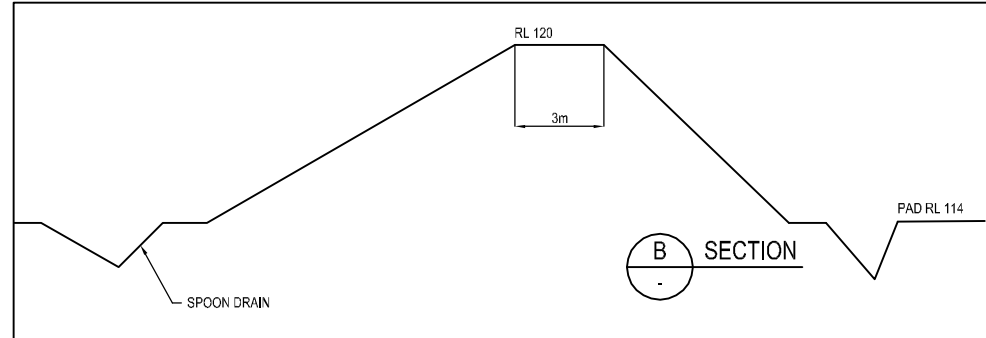
DESCRIPTION	HEIGHT (m)
① CONTROL AND ADMIN BUILDING	7.0
② WAREHOUSE AND WORKSHOP	14.0
③ GAS TURBINE AIR INTAKE	26.0
④ GAS TURBINE ENCLOSURE	8.5
⑤ TRANSFORMER	5.0
⑥ COOLING FANS	13.0
⑦ EXHAUST STACK	30.0
⑧ SWITCHYARD	11.0
⑨ OTHER TANKS & PUMPS	7.0
⑩ FIRE SYSTEM	4.0
⑪ CAR PARK	-
⑫ SECURITY HOUSE	4.0
⑬ GAS SKID (IF REQUIRED)	6.0
⑭ FIRE TANK	9.0

- NOTES:**
- SITE LOCATION, SIZING AND LAYOUT INDICATIVE ONLY.
 - EXISTING DAM TO BE FILLED IN.
 - ARROWS INDICATE STORMWATER FLOW



A SECTION

SITE LAYOUT
SCALE 1:1000



B SECTION

PRELIMINARY

E	BUND MODIFIED	GHD		03/12/09
D	BUND & STORMWATER ADDED	GHD		24/11/09
C	EXTERNAL INFRASTRUCTURE INCLUDED	GHD		25/08/09
B	CLIENT COMMENTS INCORPORATED	GHD		17/07/09
A	ISSUED FOR CLIENT REVIEW	GHD		

GHD CLIENTS | PEOPLE | PERFORMANCE

Level 4, 201 Charlotte St Brisbane QLD 4000 Australia
 GPO Box 888 Brisbane QLD 4001
 T 61 7 3316 3000 F 61 7 3316 3333
 E bne@mail@ghd.com W www.ghd.com

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Drafting Check			Design Check
Approved			
Date			
Scale	AS SHOWN		This Drawing must not be used for Construction unless signed as Approved

Client	WESTLINK PTY. LTD.
Project	WESTLINK POWERSTATION DEVELOPMENT ASSISTANCE
Title	PLANT LAYOUT OPTION 1
	PLAN VIEW
Original Size	A1
Drawing No:	41-21379-SK004
Rev:	E

Referral Agency Response – Material Change of Use

s 3.3.16 Integrated Planning Act 1997

1. Application information

- 1.1. **Applicant's name:** Westlink Pty Ltd as trustee for Westlink Industrial Trust
- 1.2. **Property description:** 191 CSH2361 - Lockyer Valley Regional Council
- 1.3. **Assessment Manager/Reference:** DA6538
- 1.4. **Date application was referred to Department:** 24 September 2009
- 1.5. **Departmental Reference:** eLVAS Case No: 2009/009249, File Ref. No: SER/017011, Trackjob No: IC0909BEE0028
- 1.6. **Type/s of development sought by the application:**
 - Material Change of Use

2. Concurrence Agency response:

The Chief Executive of the Department of Environment and Resource Management directs that the following conditions must be imposed on any approval given by the Assessment Manager:

- 2.1 Clearing of assessable native vegetation is limited to Area A as shown on the attached Referral Agency Response (Vegetation) Plan that has the reference RARP2009/009249;
- 2.2 Clearing within Area A is limited to the extent necessary to establish the Westlink Powerstation as shown on siteplan titled 'Plan Layout Option 1' prepared by GHD, drawing number 41-2139-SK004 Rev E, dated 3 December 2009; and
- 2.3 No clearing as a result of the Material Change of Use is to occur within the area shown as Area B on the attached *Referral Agency Response (Vegetation) Plan* that has the reference RARP2009/009249, unless the clearing is—
 - By fire under the *Fire and Service Rescue Service Act 1990* to reduce hazardous fuel loads or an activity under the *Fire Service and Rescue Act 1990*, section 53, 68 or 69; or
 - Where it is necessary to remove or reduce the imminent risk that the vegetation poses to serious personal injury or damage to property; or
 - To establish a firebreak to protect the Westlink Powerstation as shown on siteplan titled 'Plan Layout Option 1' prepared by GHD, drawing number 41-2139-SK004 Rev E, dated 3 December 2009 for a maximum width not exceeding 1.5 times the height of the tallest vegetation adjacent to the infrastructure, or 20 metres, whichever is the greater; and
 - To give effect to any subsequent development approvals for operational works that is the clearing of native vegetation.
- 2.4 Prior to, during and post clearing of assessable native vegetation, sediment and erosion controls must be implemented in accordance with the site management plan titled 'Westlink Power Project Erosion Management Plan' prepared by GHD, dated February 2010; and
- 2.5 Clearing of assessable native vegetation must be staged in accordance with operational needs; and

- 2.6 Any clearing or activities associated with clearing within Permit Area A on the attached Referral Agency Response (Vegetation) Plan that has the reference RARP2009/009249 must not adversely impact on assessable native vegetation outside Permit Area A; and
- 2.7 Within Permit Area A as shown on the attached Referral Agency Response (Vegetation) Plan that has the reference RARP2009/009249 clearing must only commence once the clearing area has been clearly defined; and
- 2.8 Land clearing debris must not be pushed into gullies, watercourses, other drainage line or waterlogged areas; and
- 2.9 Site briefings for all construction staff must occur prior to any major works and before commencement of works daily to discuss approved clearing processes and provide clear understanding of areas to be protected from construction; and
- 2.10 No clearing as a result of the Material Change of Use shall occur in any High Value Regrowth vegetation unless clearing is exempt under schedule 24 of the *Sustainable Planning Regulation 2009* or done in accordance with *the Regrowth Vegetation Code – Version 1*, October 2009.

THIRD PARTY ADVICE MATTERS

Aboriginal Cultural Heritage Act 2003

The Department of Environment and Resource Management (DERM) also takes this opportunity to advise the Assessment Manager of the responsibilities of applicants under the *Aboriginal Cultural Heritage Act 2003*. The Assessment Manager may wish to include this information as an Advisory Note on the Decision Notice issued for the application.

Under section 23 of the *Aboriginal Cultural Heritage Act 2003* a person who carries out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage (the "cultural heritage duty of care"). Maximum penalties for breaching the duty of care are \$750,000 for a corporation and \$75,000 for an individual.

Applicants will comply with the duty of care in relation to Aboriginal cultural heritage if they are acting in accordance with cultural heritage duty of care guidelines gazetted under the *Aboriginal Cultural Heritage Act 2003*, available on the DERM website, or in accordance with an agreement with the Aboriginal party for the area or a cultural heritage management plan approved under Part 7 of the *Aboriginal Cultural Heritage Act 2003*.

Applicants are also encouraged to undertake a search of the Aboriginal Cultural Heritage Database and the Aboriginal Cultural Heritage Register, administered by the Cultural Heritage Coordination Unit, Department of Environment and Resource Management. Application forms to undertake a free search of the Cultural Heritage Register and the Database may be obtained by contacting the Cultural Heritage Coordination Unit on (07) 3239 3647 or on the DERM website http://www.derm.qld.gov.au/cultural_heritage/index.html.

Water Act 2000

- There is no watercourse on or adjacent to this land.
- There are no water authorities attached to this parcel of land.
- Property falls within the Moreton Water Resource Plan area and is in a Groundwater Management area

- No new bores permitted unless for stock or domestic purposes or to replace an existing bore.
- Construction of any dams or other interference with overland flow of water is to be in accordance with the requirements of the codes developed under Schedule 8, Part 1, table 4 of *Integrated Planning Act 1997*(IPA).
- Property falls within the Great Artesian Basin Water Resource Plan area
- No new bores tapping aquifers of the Great Artesian Basin are permitted unless for stock or domestic purposes or to replace an existing bore

3. Reasons:

A Statement of Reasons is attached at Schedule 1.

4. Additional comments or information:

South East Queensland Planning unit to provide on departmental response.

5. Authorised Officer Signature:



Shannon Cooper
Vegetation Management Officer
South East Region

Date of Response: 23 March 2010

Att. Schedule 1 – Statement of Reasons

Schedule 1

**Statement of Reasons
Referral Agency Response
Application for Material Change of Use
Westlink Pty Ltd as trustee for Westlink Industrial Trust**

The following Statement of Reasons is provided pursuant to s. 3.3.18(8) of the *Integrated Planning Act 1997*

Introduction

1. The Department of Environment and Resource Management (DERM) received an application from Westlink Pty Ltd on 24 September 2009.
2. The application is for a MCU for Electricity Generation and Infrastructure (Concurrence-Multiple Issue) on 191 CSH2361 - Lockyer Valley Regional Council.
3. A departmental Information Request was sent to the applicant on the 23 October 2009.
4. The applicant responded to the Information Request on 26 February 2010.
5. An Assessment Report was approved by the delegated officer on 17 March 2010.
6. The Delegate determined the Referral Agency Response on 23 March 2010.

Evidence

1. Application dated 23 September 2009.
 - a) Completed IDAS Form 1 Parts "A, D & J".
 - b) Property Vegetation Management Plan.
2. Smartmap
3. Regional ecosystem mapping, version 6.0
4. *Integrated Planning Act 1997 & Integrated Planning Regulation 1998 (Schedule 2)*
5. *Vegetation Management Act 1999*
6. *Department of Environment and Resource Managements Concurrence Agency Policy for Material Change of Use dated 23 August 2007*
7. *State Planning Policy (SPP) 1/03 – Mitigating the Adverse Impacts of Flood, Bushfire, and Landslide.*
8. Information Request to applicant dated 23 October 2009.
9. Response to Information Request from applicant received 26 February 2010.
10. Assessment Report dated 17 March 2010.

Findings of fact

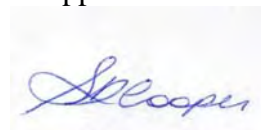
1. The application received by DERM on 24 September is for a Material Change of Use (MCU) for Electricity Generation and Infrastructure on lot 191 CSH2361.
2. Smartmap identifies the land tenure as freehold.
3. Regional ecosystem mapping identifies lot 191 on CSH2361 contains Least Concern (12.9-10.2 & 12.9-10.5a) regional ecosystem and non-remnant vegetation.
4. A rectified image of the proposed development area and regional ecosystem mapping identifies clearing of a Least Concern regional ecosystem will occur.
5. The application was assessed against Criteria Table H-2 of the Concurrence Agency Policy for Material Change of Use – Clearing as a result of the MCU involves clearing of a Least Concern regional ecosystem.
6. The assessment report concluded the application satisfied all the performance requirements of the concurrence agency policy with the following conditions applied to any development approval.
 - Clearing of assessable native vegetation is limited to Area A as shown on the attached *Referral Agency Response (Vegetation) Plan* that has the reference RARP2009/009249;
 - Clearing within Area A is limited to the extent necessary to establish the Westlink Powerstation as shown on site plan titled ‘Plan Layout Option 1’ prepared by GHD, drawing number 41-2139-SK004 Rev E, dated 3 December 2009; and
 - No clearing as a result of the Material Change of Use is to occur within the area shown as Area B on the attached Referral Agency Response (Vegetation) Plan that has the reference RARP2009/009249, unless the clearing is—
 - By fire under the *Fire and Service Rescue Service Act 1990* to reduce hazardous fuel loads or an activity under the *Fire Service and Rescue Act 1990*, section 53, 68 or 69; or
 - Where it is necessary to remove or reduce the imminent risk that the vegetation poses to serious personal injury or damage to property; or
 - To establish a firebreak to protect the Westlink Powerstation as shown on site plan titled ‘Plan Layout Option 1’ prepared by GHD, drawing number 41-2139-SK004 Rev E, dated 3 December 2009 for a maximum width not exceeding 1.5 times the height of the tallest vegetation adjacent to the infrastructure, or 20 metres, whichever is the greater; and
 - To give effect to any subsequent development approvals for operational works that is the clearing of native vegetation.
 - Prior to, during and post clearing of assessable native vegetation, sediment and erosion controls must be implemented in accordance with the site management plan titled ‘Westlink Power Project Erosion Management Plan’ prepared by GHD, dated February 2010; and
 - Clearing of assessable native vegetation must be staged in accordance with operational needs; and
 - Any clearing or activities associated with clearing within Permit Area A on the attached Referral Agency Response (Vegetation) Plan that has the reference RARP2009/009249 must not adversely impact on assessable native vegetation outside Permit Area A; and

- Within Permit Area A as shown on the attached Referral Agency Response (Vegetation) Plan that has the reference RARP2009/009249 clearing must only commence once the clearing area has been clearly defined; and
- Land clearing debris must not be pushed into gullies, watercourses, other drainage line or waterlogged areas; and
- Site briefings for all construction staff must occur prior to any major works and before commencement of works daily to discuss approved clearing processes and provide clear understanding of areas to be protected from construction; and
- No clearing as a result of the Material Change of Use shall occur in any High Value Regrowth vegetation unless clearing is exempt under schedule 24 of the *Sustainable Planning Regulation 2009* or done in accordance with *the Regrowth Vegetation Code – Version 1*, October 2009.

Reasons

1. The application complies with the performance requirements of the departmental concurrence agency policy for material change of use.
2. The application is consistent with purpose of the concurrence agency policy for material change of use which achieves the outcomes of the *Vegetation Management Act 1999*.

To ensure that any decision regarding this application is consistent with the purpose of the Vegetation Management Act 1999, conditions 2.1 to 2.10 of this referral agency response must be applied.



Shannon Cooper
Vegetation Management Officer
South East Region

23 March 2010

Concurrence Agency Response

This notice is issued by the Department of Environment and Resource Management pursuant to sections 3.3.16 and 3.3.18 of the Integrated Planning Act 1997 to advise of a decision.

Lockyer Valley Regional Council
PO Box 82
GATTON QLD 4343

CC: Westlink Pty Ltd
PO Box 1803
MILTON QLD 4064

Assessment Manager Ref: DA6538
Our reference: 341117

Dear Sir/Madam

Re: Referral for Concurrence Agency Response

The Department of Environment and Resource Management (DERM), wishes to advise that the referral for a concurrence agency response, received on 24-SEP-2009, has been assessed, and on 01-JUN-2010 it was approved subject to conditions.

1. Property/Location:

Street address - Ranger Road ADARE QLD 4343
Lot/Plan - Lot 191 Plan CSH2361

2. Details of the recommendation

Aspect of Development:

- Concurrence Response for a MCU involving an ERA.
- ERA 14 Electricity generation Threshold 1 - generating electricity by using gas at a rated capacity of 10MW electrical or more.

Recommendation:

- Approved subject to conditions.

DERM Ref Number:

- IPCE01630209.

~~3. Currency period~~

~~This approval will lapse unless substantially started within the standard currency periods stated in section 3.5.21 of the Integrated Planning Act 1997 applying to each aspect of development in this approval.~~

4. Codes for self-assessable development

Any self-assessable development for an environmentally relevant activity conducted in conjunction with this approval, must comply with the relevant code of environmental compliance.

5. Assessment Manager Responsibilities

Please note that it is a requirement under Sections 3.5.15 and 3.5.17 of the Integrated Planning Act 1997 that a copy of the final Decision Notice (which includes the DERM's concurrence response) for this application issued by the Lockyer Valley Regional Council, be forwarded to each referral agency. Therefore could you please send a signed hardcopy to DERM's Permits and Licences Management Unit (PALM), GPO Box 2454 BRISBANE QLD 4001 and an electronic copy to palm@derm.qld.gov.au.

In addition, the State's Native Title Work Procedures indicate that responsibility for assessment of native title issues for an IDAS application rest with the Assessment Manager. Therefore in this instance, the EPA has not provided a notification to native title parties.

If you require more information please contact John Rice, DERM's project manager for application, on the telephone number listed below.

Yours sincerely



John Rice
Delegate of the Administering Authority
Department of Environment and Resource Management
01-JUN-2010

Enquiries:
ES-RSD-SER-Ipswich
PO Box 864
IPSWICH QLD 4305
Phone: (07) 3381 7550
Fax: (07) 3381 7560

Section 3.3.16 and 3.3.18 Integrated Planning Act 1997

DERM Permit¹ number: IPCE01630209

EPA Permit¹ number:	IPCE01630209
Assessment Manager reference:	Assessment Manager application number: DA6538
Date application received by EPA:	24-SEP-2009
Permit¹ Type:	Concurrence Response for a MCU involving an ERA
Date of Decision:	01-JUN-2010
Decision:	Granted with conditions
Relevant Laws and Policies:	<i>Environmental Protection Act 1994</i> and any subordinate legislation
Jurisdiction:	Item 1 in Table 2 of Schedule 2 of the <i>Integrated Planning Regulation 1998</i>

Development Description

Property	Lot/Plan	Aspect of Development
Ranger Road, ADARE QLD 4343	Lot 191 Plan CSH2361	ERA 14 Electricity generation Threshold 1 - generating electricity by using gas at a rated capacity of 10MW electrical or more

Reasons for inclusion of development conditions

In accordance with section 3.3.18(8) of the *Integrated Planning Act 1997* and section 27B of the *Acts Interpretation Act 1954*, the reasons for the inclusion of development conditions are:

- 1) the Department of Environment and Resource Management (DERM) is a concurrence agency under the *Integrated Planning Regulation 1998* for the purposes of the *Environmental Protection Act 1994*.
- 2) any development conditions placed on this permit for an environmentally relevant activity are in accordance with section 73B of the *Environmental Protection Act 1994*.

Additional comments or advice about the application

Nil.

Additional information for applicants

Trackable Waste

Where regulated waste is removed from site, the registered operator must monitor and keep records in accordance with schedule 2 of the *Environmental Protection (Waste Management) Regulation 2000* – Prescribed information for waste tracking.

¹ Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

Contaminated Land

It is a requirement of the *Environmental Protection Act 1994* that if an owner or occupier of land becomes aware a notifiable activity (as defined by Schedule 2 of the *Environmental Protection Act 1994*) is being carried out on the land or that the land has been affected by a hazardous contaminant, they must, within 22 business days after becoming so aware, give notice to the Department of Environment and Resource Management.

Environmentally Relevant Activities

The aforementioned description of any environmentally relevant activity (ERA) for which this permit is issued is simply a restatement of the ERA as prescribed in the legislation at the time of issuing this permit. Where there is any conflict between the abovementioned description of the ERA for which this permit is issued and the conditions specified herein as to the scale, intensity or manner of carrying out of the ERA, then such conditions prevail to the extent of the inconsistency.

This permit authorises the ERA. It does not authorise environmental harm unless a condition within this permit explicitly authorises that harm. Where there is no such condition, or the permit is silent on a matter, the lack of a condition or silence shall not be construed as authorising harm.

In addition to this permit, the person to carry out the ERA must be a registered operator under the *Environmental Protection Act 1994*. For the person to become a registered operator, they must apply for a registration certificate under section 73F of the *Environmental Protection Act 1994*.



John Rice

Delegate of Administering Authority

Department of Environment and Resource Management

01-JUN-2010

CONDITIONS OF APPROVAL

Condition for: ERA 14 Electricity generation Threshold 1 - generating electricity by using gas at a rated capacity of 10MW electrical or more

Agency Interest: General

- General 1** In carrying out the activity to which this approval relates, all reasonable and practicable measures must be taken to prevent or to minimise the likelihood of environmental harm being caused.
- General 2** Subject to condition General 3, the person undertaking the activity to which this approval relates must do each of the following—
- (a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this approval;
 - (b) maintain such measures, plant and equipment in a proper and efficient condition; and
 - (c) operate such measures, plant and equipment in a proper and efficient manner.
- General 3** Condition General 2 applies to measures, plant or equipment intended to measure compliance with condition Air 4 only if the person undertaking the activity to which this approval relates is directed by the administering authority under condition Air 5 to undertake monitoring for these contaminants, and then only for the period of time stated in the direction.

Qualified persons only to undertake monitoring, maintenance and calibration of measuring devices

- General 4** The following activities, as required under this approval or a site based management plan applying to the site, must be carried out only by a person with appropriate experience or qualifications —
- (a) all monitoring assessments and reports;
 - (b) maintenance of measures, plant and equipment; and
 - (c) calibration of instruments or equipment used for maintenance, measuring and monitoring the operational performance of, and emissions from, the power station.

Site based management plan

- General 5** From commencement of the activity to which this approval relates, a site based management plan that addresses the following matters must be implemented —
- (a) environmental commitments — a commitment by the person undertaking the activity to which the approval relates to achieve environmental goals stated in the plan and undertake continuous improvement in the overall environmental performance of the environmentally relevant activity;
 - (b) identification of environmental issues (including all sources or potential sources of environmental harm) and potential impacts of those issues on the environment;
 - (c) control measures for routine operations and all sources of actual or potential environmental harm mentioned in (b) to prevent or minimise the likelihood of environmental harm;
 - (d) contingency plans and emergency procedures for non-routine situations;
 - (e) organisational structure and responsibility;
 - (f) effective communication;
 - (g) monitoring of contaminant releases;
 - (h) conducting environmental impact assessments;
 - (i) staff training;
 - (j) record keeping;
 - (k) periodic review of environmental performance and benchmarks against which compliance with the terms of the site based management plan can be measured; and
 - (l) commitment by the operator to undertake continuous improvement in the overall environmental performance of the environmentally relevant activity.
- General 6** The site based management plan, or any amendments made to it, must not be inconsistent with any condition(s) of this approval if the inconsistency would result in a lower standard of environmental performance than is required under the conditions of the approval.

Example for condition General 6: A lower standard of environmental performance might include, for example—

- (a) specifying targets for the release of contaminants (incl. air, noise or water) at concentrations higher than those permitted for the contaminant under this approval, or where the concentrations of contaminants are specified under this approval as a range, by specifying concentrations targets for emissions outside that range; or
- (b) requiring less frequent monitoring or reporting than required under the conditions of this approval.

General 7 To the extent of any inconsistency between a site based management plan and any condition(s) of this approval, other than where the inconsistency is of a type authorised under condition General 6, or any law of the State or Commonwealth in force at the relevant time, the site based management plan is invalid.

General 8 To remove any doubt, if a site based management plan imposes a higher standard of environmental performance than the standard required under the conditions of this approval, the registered operator must, under condition General 5, give effect to higher standard stated in the site based management plan.

Example for condition General 8: a higher standard of environmental performance requirement might include, for example—

- (a) specifying lower emissions targets for contaminants to air or lower noise emissions than the limits specified for the contaminant under this approval;
- (b) requiring more frequent monitoring or reporting of emissions than is required under this approval ; or
- (c) requiring more frequent training for employees undertaking the activity about environmental issues than is required under the conditions of this approval.

General 9 If a site based management plan prescribes a higher standard of environmental performance than is required under the conditions of this approval, the plan can only be amended in a way that lowers the standard of environmental performance with the written approval of the administering authority.

Record keeping

General 10 The person undertaking the activity to which this approval relates must keep the following documents in a location accessible by all employees at the authorised place—

- (a) a copy of this approval, incorporating any amendments made to the approval;
- (b) a copy of the site based management plan, incorporating any amendments made to the site based management plan;
- (c) all records kept under a condition of this approval; and
- (d) all monitoring results compiled in accordance with the conditions of this approval.

General 11 The person undertaking the activity to which this approval relates must give the documents mentioned in condition General 10 to an authorised person or the administering authority as soon as possible upon request.

General 12 The person undertaking the activity to which this approval relates must keep all records or monitoring results made or compiled in accordance with the conditions of this approval for a minimum of five (5) years from the date the record is made or the result is compiled.

Auditing compliance with conditions of approval

General 13 The person undertaking the activity to which this approval relates must ensure that an audit of compliance with the conditions of this approval is commenced, by a suitably qualified third party auditor who is nominated by the approval holder and accepted by the administering authority, within 28 days following the commissioning of the power station.

General 14 The person undertaking the activity to which this approval relates must submit to the administering authority a complete and final report prepared by the auditor (the “auditor’s report”) mentioned in condition General 13 describing the auditor’s findings and accompanied by a statutory declaration made under the *Oaths Act 1867* signed by the auditor declaring that the contents of the auditor’s report are true and correct to the auditor’s belief, within the timeframes specified below —

- (a) if the audit is completed within 6 months of its commencement — within 28 days after the audit is completed; or
- (b) if the audit is not completed within 6 months of its commencement — within 28 days after a period of 6 months has passed since the audit commenced.

General 15 If the auditor’s report submitted under condition General 14 shows non-compliance with the conditions of this approval, the person undertaking the activity to which this approval relates

must, within 14 days after giving the auditor's report to the administering authority, give the administering authority a complete and final report —

- (a) describing the person's response to the findings stated in the auditor's report;
- (b) describing the actions that the person intends to undertake to rectify each non-compliance issue identified in the auditor's report; and
- (c) if the action(s) mentioned in (b) will take more than 28 days to complete — describing the timeframes by which the action will be completed and specifying benchmarks against which compliance with the conditions of the approval will be achieved.

General 16 The total financial cost of the audit(s), and preparation and lodgement of the auditor's report, will be the responsibility of the person undertaking the activity to which this approval relates.

General 17 If the person undertaking the activity to which this approval relates gives the administering authority a report to which condition General 15(c) applies, the person must comply with the timeframes specified in the report.

General 18 If condition General 15(c) applies, the administering authority may, at the end of the timeframes specified in 15(c), by written notice, require the person undertaking the activity to which this approval relates to submit a further auditors report prepared by the same auditor in accordance with conditions General 13 to 15 and the person must comply with the requirement forthwith.

Notification of non-conforming discharges to the environment

General 19 The person undertaking the activity to which this approval relates must telephone the administering authority as soon as practicable after becoming aware of any release of contaminants not in accordance with the conditions of this approval.

General 20 The person undertaking the activity to which this approval relates must give the administering authority a written notice detailing the following information within 14 days of any advice provided in accordance with condition General 19 —

- (a) the name of the person undertaking the activity, the number of this approval and the number stated on the registration certificate under which this activity is undertaken;
- (b) the name and telephone number of a designated contact person;
- (c) quantity and substance released;
- (d) vehicle and registration details (if applicable);
- (e) person/s involved (driver and any others);
- (f) the location and time of the release;
- (g) the suspected cause of the release;
- (h) a description of the effects of the release;
- (i) the results of any sampling performed in relation to the release;
- (j) actions taken to mitigate any environmental harm caused by the release; and
- (k) proposed actions to prevent a recurrence of the release.

Equipment must be calibrated to appropriate standard

General 21 All instruments, equipment and measuring devices used for measuring or monitoring in accordance with any condition of this approval must be calibrated —

- (a) if a statutory instrument or standard made under a law of the State prescribes standards for calibrating the equipment — in accordance with that statutory instrument or standard; or
- (b) otherwise — according to any relevant Australian Standard applicable to the calibration of the equipment.

Spill kits and training requirements

General 22 The person undertaking the activity to which this approval relates must keep an appropriate spill kit, personal protective equipment, operator instructions and emergency procedure guides for the management of wastes and chemicals associated with the activity in a place accessible to all employees at the authorised place.

General 23 The person undertaking the activity to which this approval relates must ensure that all employees undertaking the activity at the authorised place have received training in the use of the spill kit and the handling of chemicals stored at the authorised place.

General 24 The training mentioned in condition General 23 must be repeated for each employee at the authorised place at intervals of not greater than two (2) years.

- General 25** The person undertaking the activity to which this approval relates must keep a record of the training provided to employees, including —
- the names of all persons who undertook the training;
 - the date on which the training was provided; and
 - an outline of the training provided.
- General 26** The site layout for the power station, and associated structures, must comply with the document titled "PLANT LAYOUT OPTION 1 PLAN VIEW" with the reference number "Drawing No: 41-21379-SK004 rev: E" attached to this approval.
- General 27** The proposed power station may be comprised of not more than 6 generators with a total electrical generating capacity of $\leq 1000\text{MW}$.

Agency Interest: Air

- Air 1** The only fuel that may be used to power the power station gas turbines is natural gas.
- Air 2** The nitrogen dioxide (NO_2) emissions control technology known as a "low NO_x burner" must be installed for each generator.
- Air 3** The release of dust or particulate matter resulting from the activity to which this approval relates must not cause an environmental nuisance at any nuisance sensitive place or commercial place.
- Air 4** Dust and particulate matter must not exceed the following levels when measured at any nuisance sensitive place or commercial place:
- dust deposition of 120 milligrams per square metre per day, when monitored in accordance with Australian Standard AS 3580.10.1 of 2003 (or more recent editions); or
 - a concentration of particulate matter with an aerodynamic diameter of ≤ 10 micrometre (μm) (PM_{10}) suspended in the atmosphere of 50 micrograms per cubic metre over a 24 hour averaging time, at a nuisance sensitive or commercial place downwind of the authorised place, when monitored in accordance with —
 - Australian Standard AS 3580.9.6 of 2003 (or more recent editions) 'Ambient air — Particulate matter - Determination of suspended particulate PM_{10} high-volume sampler with size-selective inlet — Gravimetric method'; or
 - any alternative method of monitoring PM_{10} which may be permitted by the 'Air Quality Sampling Manual' as published from time to time by the administering authority; or
 - a concentration of particulate matter with an aerodynamic diameter of ≤ 2.5 micrometre (μm) ($\text{PM}_{2.5}$) suspended in the atmosphere of 25 micrograms per cubic metre over a 24 hour averaging time, at a nuisance sensitive or commercial place downwind of the authorised place, when monitored in accordance with —
 - any relevant Australian Standard to the extent it is relevant to the measurement of $\text{PM}_{2.5}$ particles; or
 - any alternative method of monitoring $\text{PM}_{2.5}$ which may be permitted by the 'Air Quality Sampling Manual' as published from time to time by the administering authority.

Monitoring dust or particulate matter

- Air 5** The administering authority may, by written notice, direct the person undertaking the activity to which this approval relates to undertake monitoring for dust or particulate matter (PM_{10} or $\text{PM}_{2.5}$) if, based upon information available to the authority, the authority reasonably believes the activity to which this approval relates is causing, or is likely to cause, either or both of the following:
- environmental nuisance contrary to condition Air 3; or
 - an exceedence of the concentration specified in condition Air 4 for the contaminant.
- Air 6** If directed by the administering authority under condition Air 5 to undertake monitoring for dust or particulate matter, the person undertaking the activity to which this approval relates must undertake the monitoring for the contaminant, and a copy of the results must be given to the administering authority within 14 days following completion of monitoring. Monitoring must be carried out at a place(s) relevant to the potentially affected dust sensitive place and at upwind control sites and must include —
- for a complaint alleging dust nuisance — dust deposition; and

- (b) for a complaint alleging adverse health effects caused by dust — the concentration per cubic metre of particulate matter with an aerodynamic diameter of ≤ 10 micrometre (μm) (PM_{10}) suspended in the atmosphere over a 24 hour averaging time.

Air 7 Subject to condition Air 8, the concentration of contaminants must not exceed the maximum release limits specified in the following table —

Table 1— Contaminant release limits to air

Release point number	Minimum release height (metres)	Minimum velocity (m/sec)	Contaminant release	Maximum release limit	Sampling frequency
All generator stacks	25	25 at full power output or pro-rata at lower output	Oxides of nitrogen	143.3 grams per second.	Continuous First sample within 28 days of commissioning of power plant. Thereafter, once in each period of six months or 876 hours of operating, whichever is the longer interval, but no longer than 12 months.
			Carbon Monoxide	28.3 grams per second.	
			Sulphur dioxide	6.9 grams per second	
			PM_{10}	22.7 grams per second	
			$\text{PM}_{2.5}$	11.35 grams per second	

- Air 8** The release limits for oxides of nitrogen are applicable at all times except during start up and shut down phases of operation.
- Air 9** Start-up and shut-down phases for the power plant must not exceed the time specified for the phase as follows —
- start-up (cold) — 1 hour;
 - start-up (warm) — 30 minutes; or
 - shut down — 30 minutes.
- Air 10** Contaminants may be discharged only from the release points mentioned in the table called “Table 1 — Contaminant release limits to air” forming part of condition Air 7.
- Air 11** Contaminants must be directed vertically upwards and without any impedence or hindrance, other than arising from the installation of the stack outlet silencer required under condition Noise 1.
- Air 12** Sampling for each contaminant mentioned in the table called “Table 1 — Contaminant release limits to air” forming part of condition Air 7 must be performed at the frequency specified for the contaminant in that table.
Note: the plant is taken to operate for one (1) hour where one or more generators are generating electricity over that period, regardless of the configuration or electrical output of each generator. Therefore, sampling of all stacks for each contaminant should occur at or about the same time (e.g. emissions from stacks should be undertaken within 1 week, or where a single sampler is used to sample all stacks, sampling of each stack should be undertaken consecutively).
- Air 13** The combustion efficiency and electrical efficiency of each gas turbine must be monitored and recorded at all time whilst operational. This continuous monitoring, which is based on process parameters, is required to ensure combustion efficiency and power station efficiency are maintained all the time at the manufacturer’s guaranteed performance levels.
- Air 14** An audible and visual alarm is to be installed, and the person undertaking the activity to which this approval relates must implement a process to investigate and address instances where the combustion efficiency falls below the manufacturer’s guaranteed performance levels and all such alarm instances must be recorded.
- Air 15** Monitoring of any releases to the atmosphere required by a condition of this approval must be carried out in accordance with the following requirements —
- monitoring provisions for the release points listed in the following table must comply with the Australian Standard AS 4323.1 - 1995 'Stationary source emissions Method 1: Selection of sampling positions' (or more recent editions);
 - the following tests must be performed for each contaminant specified in the table called “Table 1 — Contaminant release limits to air” forming part of condition Air 7 —
 - gas velocity and volume flow rate;
 - temperature;

- water vapour concentration (moisture content);
- (c) where practicable, samples must be taken when emissions are expected to be at maximum rates;
- (d) during the sampling period the following additional information must be gathered —
 - power station and turbine load;
 - number of turbines operating; and
 - reference to the actual test methods and accuracy of the methods.

Air 16 Contaminants must be released to the atmosphere from a release point at a height and a flow rate not less than the corresponding height and velocity stated for that release point in the table called “Table 1 — Contaminant release limits to air” forming part of condition Air 7.

Air 17 The person undertaking the activity to which this approval relates must submit a report to the administering authority each period of 12 months describing the quality characteristics of emissions from the power station for the contaminants (averaged over the term specified for each characteristic) specified in the following table —

Table 2 — Reporting emissions characteristics

Monitoring point	Quality characteristics	Data report as	Averaging period for reporting of emissions
All stack discharge points	Combustion efficiency [CO] v [CO ₂]	$\frac{[\text{CO}_2] - [\text{CO}]}{[\text{CO}_2]} \times \frac{100}{1}$ or as agreed in writing by the administering authority	Six monthly
All stack discharge points	Oxides of Nitrogen	Parts per million & Grams/Second	Six monthly
All stack discharge points	Sulphur dioxide	Parts per million & Grams/second	Twelve monthly

Note: [CO₂] means the concentration of carbon dioxide and [CO] means the concentration of carbon monoxide.

Air 18 The person undertaking the activity to which this approval relates must—

- (a) implement a monitoring program to regularly leak test all components including pumps, piping and controls, vessels and tanks;
- (b) implement operating, maintenance and management practices to mitigate fugitive emission sources; and
- (c) ensure ducting and extraction systems that transfer effluent gases from one location to another must be constructed, operated and maintained so as to minimise any leakage of effluent gases and vapours to the atmosphere occurring from these sources.

Air 19 The release of noxious or offensive odours or any other noxious or offensive airborne contaminant resulting from the activity to which this approval relates must not cause a nuisance at any nuisance sensitive place or commercial place.

Air 20 The person undertaking the activity to which this approval relates must install a monitoring station, in accordance with Australian Standard AS2923 — 1987 (Ambient air – guide for measurement of horizontal wind for air quality applications) (or a later standard), to record and log the following parameters —

- barometric pressure;
- humidity;
- temperature; and
- wind speed and direction.

Air 21 The data from the monitoring station mentioned in condition Air 20 must be given to the administering authority or an authorised person upon request.

Air 22 The person undertaking the activity to which this approval relates must install and operate a device to measure and record the total hours of operation of each generator, and the total accumulated hours of operation where the plant is generating electricity, and the record must be given to the administering authority or an authorised person upon request.

Agency Interest: Land

- Land 1** A person must not, at any time, release contaminants to land, except to an evaporation pond at the authorised place that complies with condition Water 6 and that is designed and maintained specifically for the purpose of containing or treating the contaminant.
- Land 2** If contaminants are released from the authorised place to land outside the authorised place, the person undertaking the activity to which this approval relates must as soon as reasonably practicable, notify, in writing, all persons affected or likely to be affected by the release, by providing the following information:
- (a) the nature and extent of the contaminant release;
 - (b) a description of the contaminant released;
 - (c) if the incident involves the release of a chemical — a copy of the Material Safety Data Sheet for the chemical; and
 - (d) stating that the person who released the contaminant to land, or if the person who released the contaminant is not known, the person undertaking the activity to which the approval relates is required to remove or neutralise the contamination at the place.
- Land 3** If contaminants are released from the authorised place to land contrary to this approval, the person who released the contaminant from the authorised place, or if the person who released the contaminant is not known, the person undertaking the activity to which this approval relates, must take all reasonable and practicable measures to remove or neutralise the contamination from the affected land, subject to directions of the landholder or occupier of the affected land and the administering authority or an authorised person.
- Land 4** To remove any doubt, condition Land 3 does not authorise any person to enter another person's land without the consent of the landowner or occupier.
- Land 5** The person who released the contaminant, or if the person who released the contaminant is not known, the person undertaking the activity to which this approval relates, shall be liable to pay all costs for removal or neutralisation of contaminants released to land contrary to this approval.
- Land 6** All fuels and chemicals must be stored in an on-site containment system of a type suitable to prevent the spillage of the material and its discharge to the environment.
- Land 7** In all instances, the storage and handling of chemicals and fuels done in accordance with the relevant Australian Standard (as amended or substituted by a later standard) shall be taken to be sufficient for compliance with condition Land 6.
At this date, see Standards:
- AS1940 — 2004 The storage and handling of flammable and combustible liquids;
 - AS3780 — 2008 The storage and handling of corrosive substances; and
 - AS/NZS 3833:2007 The storage and handling of mixed classes of dangerous goods, in packages and bulk intermediate containers.

Agency Interest: Noise

- Noise 1** The following noise attenuation devices and design specifications must be installed or applied to the power plant before it is commissioned —
- air inlet attenuator;
 - stack outlet silencers;
 - stack body noise absorbing material;
 - transformer noise attenuation barriers; and
 - gas turbine and generator hall enclosures.
- Noise 2** Noise from the activity to which this approval relates must not cause an environmental nuisance at any nuisance sensitive place or commercial place.
- Noise 3** All noise from the power station, in any phase of operation, must not exceed the levels specified in Table 3 — Noise limits at any nuisance sensitive place or commercial place, following —

Table 3 — Noise limits at any nuisance sensitive place or commercial place

Noise level dB(A) measured as	7am - 6pm	6pm - 10pm	10pm - 7am
Noise measured at a “nuisance sensitive place”			
L _{Aeq, adj, 15 mins}	43	38	37
Noise measured at a “commercial place”			
L _{Aeq, adj, 15 mins}	48	43	42

Noise 4 When requested by the administering authority, the person undertaking the activity to which this approval relates must undertake, or commission the undertaking of, noise monitoring to investigate any complaint of noise nuisance, and the administering authority given a copy of the results of the monitoring within 14 days of the completion of monitoring. Monitoring must include the following —

- background noise level;
- L_{Aeq, adj, 15 min};
- the level and frequency of occurrence of impulsive or tonal noise;
- atmospheric conditions including wind speed and direction;
- effects due to extraneous factors such as traffic noise; and
- location, date and time of recording.

Noise 5 The method of measurement and reporting of noise levels must comply with the latest edition of the ‘Noise Measurement Manual’ as published from time to time by the administering authority.

Agency Interest: Social

Social 1 The person undertaking the activity to which this approval relates must record the following information for each complaint received about the activity —

- time, date, name and contact details of the complainant;
- reasons for the complaint;
- any investigations undertaken by the person undertaking the activity to which this approval relates;
- conclusions formed by the person undertaking the activity to which this approval relates following the investigation; and
- any actions taken by the person undertaking the activity to which this approval relates to resolve the complaint(s).

Social 2 External lighting at the authorised place must conform to AS 4282 — 1997 (Control of the obtrusive effects of lighting) (or a later Australian Standard).

Social 3 Light emitted from the authorised place must not cause nuisance at a nuisance sensitive place.

Agency Interest: Waste

Waste 1 Sludges or any industrial wastewaters from the evaporation ponds may be disposed of only in the following ways:

- discharging to trade waste infrastructure (whether by direct connection to the authorised place or otherwise) in accordance with a trade waste approval; or
- tankering off-site to a facility authorised under the *Environmental Protection Act 1994* to receive the waste.

Waste 2 The person undertaking the activity to which this approval relates must ensure that regulated waste that are to be sent to another facility for disposal or treatment are transported only by a person authorised under the *Environmental Protection Act 1994* to transport it.

Waste 3 Waste (other than wastewater or sludges in the evaporation pond) must be removed from the authorised place within the timeframe specified for the waste as follows —

- if the waste is surplus from the construction of the power station — within three (3) months after the power station is commissioned; or
- otherwise — within three (3) months of the waste being generated.

- Waste 4** Waste generated by the activity to which this approval relates must be stored, pending its lawful disposal to landfill or to a recycling facility, or another place with the written approval of the administering authority, in a location at the authorised place where it is not visible to a person outside the authorised place.
- Waste 5** Waste must not be imported for storage or disposal at the authorised place.
- Waste 6** Waste must not be buried or burned at the authorised place.
- Agency Interest: Water**
- Water 1** Erosion protection and sediment control measures must be implemented and maintained to minimise erosion and prevent the release of sediment to any surface waters during construction of the power plant.
- Water 2** A person must not allow or cause industrial wastewater or stormwater from the authorised place that has been in contact with any contaminant arising from the activity to be released to land or waters, other than to an on-site evaporation pond that complies with condition Water 6, at any time.
- Water 3** All industrial wastewater or stormwater that has been in contact with any contaminant associated with the conduct of the activity to which this approval relates must be diverted to an on-site evaporation pond that complies with condition Water 6.
- Water 4** All evaporation ponds must be constructed in a way that achieves Q100 flood line immunity.
- Water 5** Evaporation ponds must have sufficient capacity to contain runoff expected from a 24-hour storm with an average recurrence interval of 1 in 5 years.
- Water 6** The person undertaking the activity to which this approval relates must ensure that all evaporation ponds used for the storage or treatment of industrial wastewater or contaminated stormwater are constructed, installed and maintained —
- (a) so as to prevent any release of contaminants through the bed or banks of the pond to any waters (including ground water);
 - (b) so that a freeboard of not less than 0.5 metres is maintained at all times; and
 - (c) so as to ensure the stability of the ponds construction.
- Water 7** The person undertaking the activity to which this approval relates must ensure that industrial wastewater or contaminated stormwater is disposed of in accordance with condition Waste 1 if the evaporation ponds are not in compliance with condition Water 6, until such time as the non-compliance with condition Water 6 is rectified.
- Water 8** The person undertaking the activity to which this approval relates must ensure that suitable banks or diversion drains are built and maintained to prevent stormwater runoff from entering any ponds or other structures used for the storage or treatment of industrial wastewater or contaminated stormwater.
- Water 9** Banks and diversion drains must be of suitable design and capacity to disperse non-contaminated stormwater so as not to cause flooding, or contribute to increased flood potential, of the area.

DEFINITIONS

Words and phrases used throughout this permit are defined under the *Environmental Protection Act 1994*. Where a term is not defined under the *Environmental Protection Act 1994*, or the term is defined below, the definition in this permit prevails.

“**activity**” include that part, if any, of an activity relating to:

- preparing the authorised place for the activity before carrying out the activity; or
- rehabilitating the authorised place after it has been used for carrying out the activity.

“**authorised place**” means Lot 191 CSH2361 situated at Ranger Road, ADARE QLD 4343.

“**background noise**” means either —

- $L_{A90,T}$ being the A-weighted sound pressure level exceeded for 90 percent of the time period not less than 15 minutes, using Fast response, or
- $L_{A_{bg},T}$ being the arithmetic average of the minimum readings measured in the absence of the noise under investigation during a representative time period of not less than 15 minutes, using Fast response.

“**commercial place**” means a place, other than a nuisance sensitive place, that is used as an office or for business or commercial purposes, and includes a place within the curtilage of such a place reasonably used by persons at that place.

“**dwelling**” means any of the following structures or vehicles that is principally used as a residence —

- a house, unit, motel, nursing home or other building or part of a building;
- a caravan, mobile home or other vehicle or structure on land; or
- a water craft in a marina.

“ $L_{A_{eq,adj,15min}}$ ” means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a 15 minutes period has the same mean square sound pressure as a sound level that varies with time.

“**land**” in the “land schedule” of this document means land excluding waters and the atmosphere.

“**noxious**” means harmful or injurious to health or physical well being.

“**nuisance sensitive place**” means —

- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- a motel, hotel or hostel; or
- a kindergarten, school, university or other educational institution; or
- a medical centre or hospital; or
- a protected area; or
- a public thoroughfare, park or gardens.

“**offensive**” means causing offence or displeasure; is disagreeable to the sense; disgusting, nauseous or repulsive.

“**protected area**” means —

- a protected area under the *Nature Conservation Act 1992*; or
- a marine park under the *Marine Parks Act 2004*; or
- a World Heritage Area.

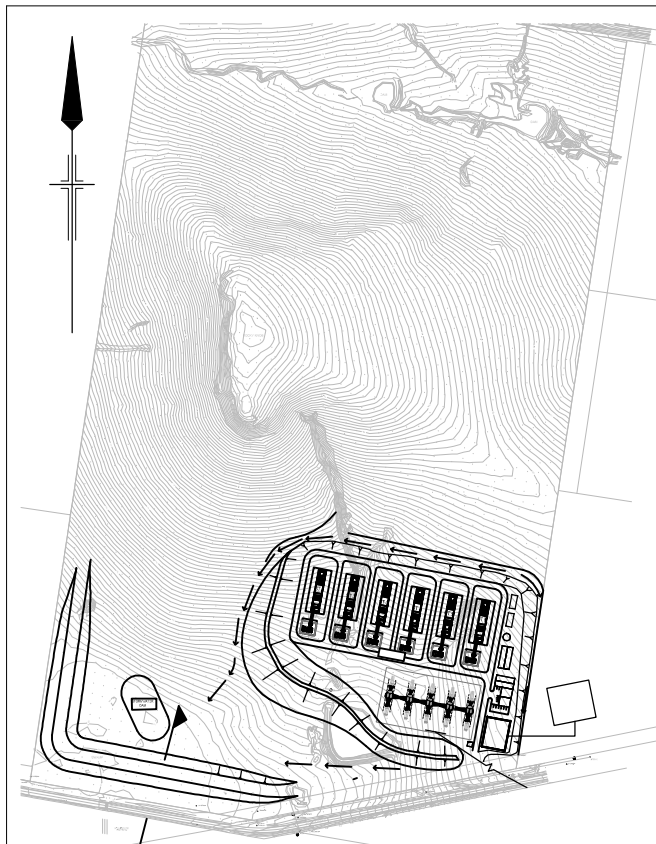
“**site**” means land on or in which it is proposed to carry out the development approved under this development approval.

“**watercourse**” means a river, creek or stream in which water flows permanently or intermittently—

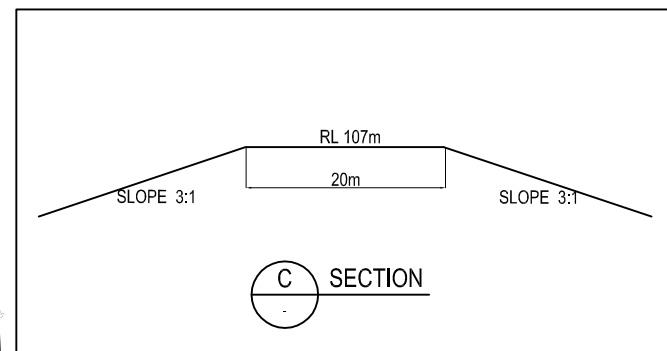
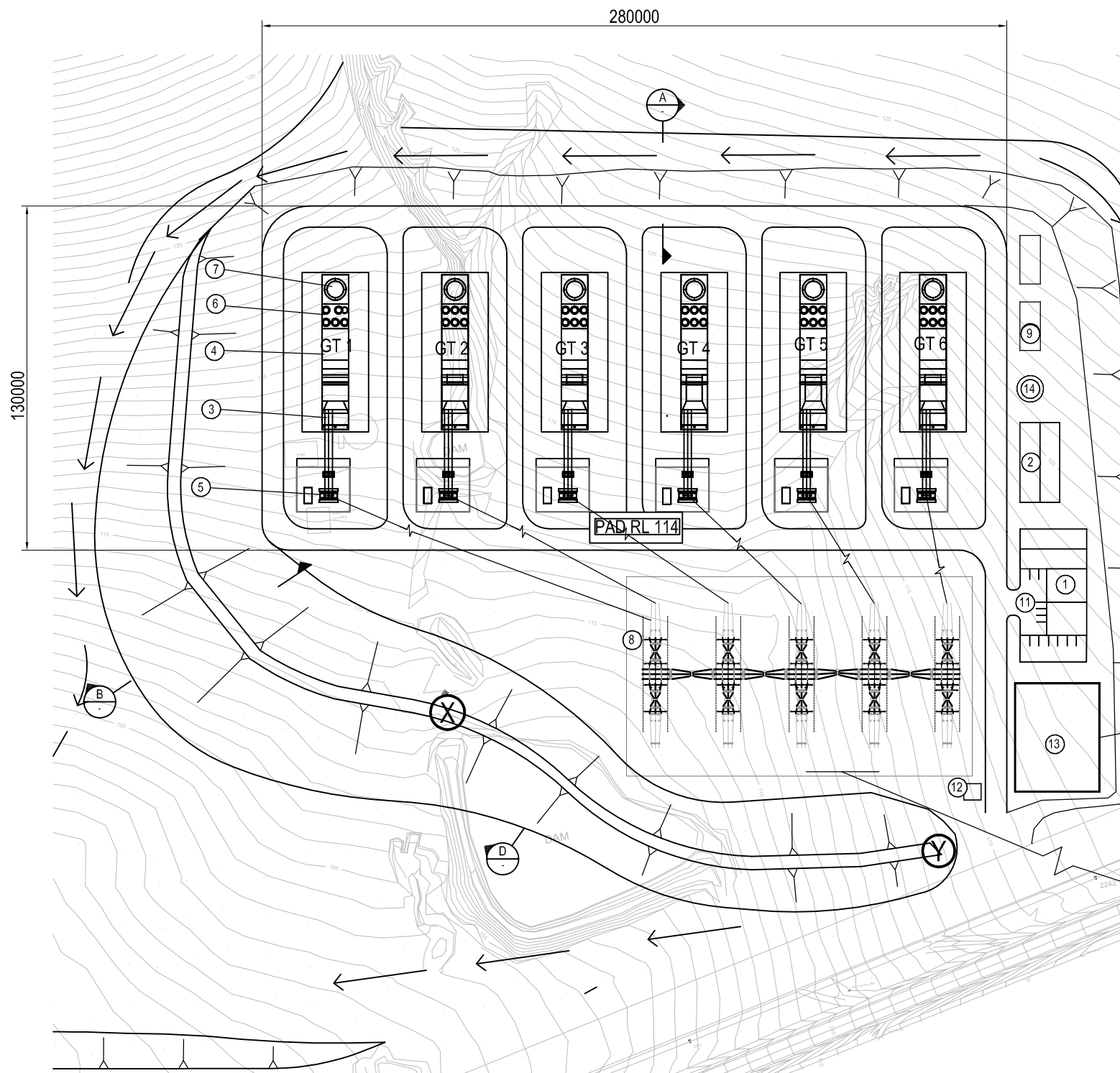
- in a natural channel, whether artificially improved or not; or
- in an artificial channel that has changed the course of the watercourse.

“**waters**” includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water natural or artificial watercourse, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater and any part thereof.

END OF CONDITIONS



SITE LOCATION
SCALE 1:5000



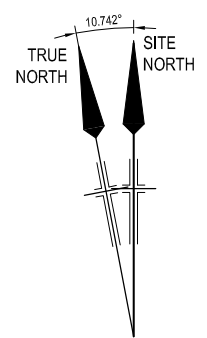
C SECTION

EXTENT OF EARTHWORKS

GATTON COMPRESSOR STATION

GAS PIPELINE

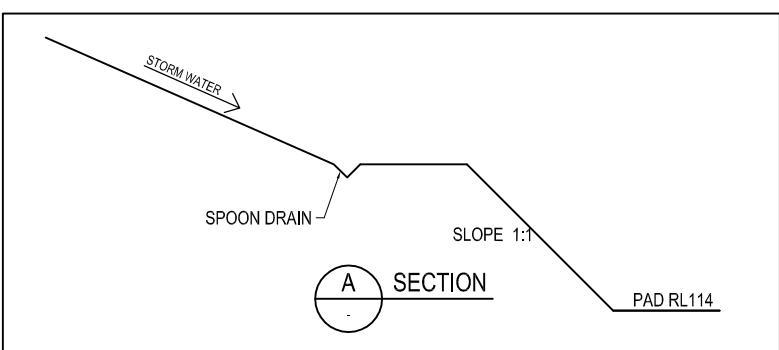
TO GATTON SUBSTATION (ENERGEX)



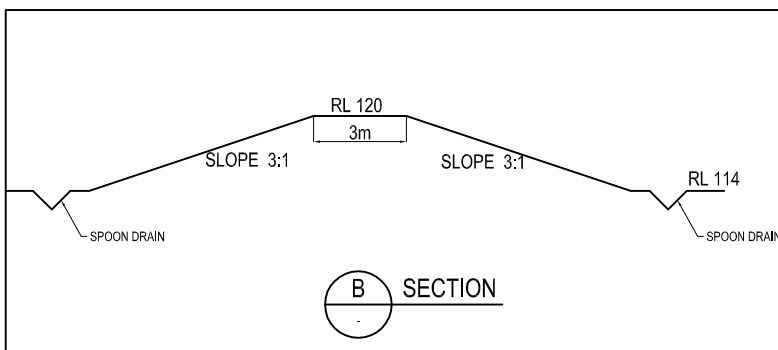
SITE LAYOUT
SCALE 1:1000

DESCRIPTION	HEIGHT (m)
① CONTROL AND ADMIN BUILDING	7.0
② WAREHOUSE AND WORKSHOP	14.0
③ GAS TURBINE AIR INTAKE	26.0
④ GAS TURBINE ENCLOSURE	8.5
⑤ TRANSFORMER	5.0
⑥ COOLING FANS	13.0
⑦ EXHAUST STACK	30.0
⑧ SWITCHYARD	11.0
⑨ OTHER TANKS & PUMPS	7.0
⑩ FIRE SYSTEM	4.0
⑪ CAR PARK	-
⑫ SECURITY HOUSE	4.0
⑬ GAS SKID (IF REQUIRED)	6.0
⑭ FIRE TANK	9.0

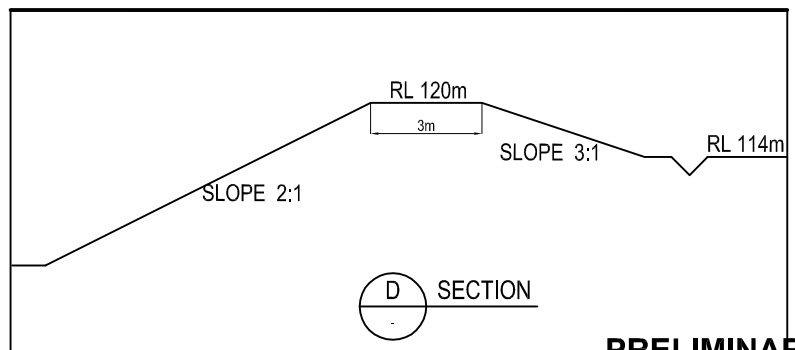
- NOTES:**
- SITE LOCATION, SIZING AND LAYOUT INDICATIVE ONLY.
 - EXISTING DAM TO BE FILLED IN.
 - ARROWS INDICATE STORMWATER FLOW
 - FOR BUND LENGTH X-Y, REFER TO SECTION D.



A SECTION



B SECTION



D SECTION

PRELIMINARY

No	Revision	Note	Drawn	Checked	Approved	Date
E		BUND MODIFIED	GHD			03/12/09
D		BUND & STORMWATER ADDED	GHD			24/11/09
C		EXTERNAL INFRASTRUCTURE INCLUDED	GHD			25/08/09
B		CLIENT COMMENTS INCORPORATED	GHD			17/07/09
A		ISSUED FOR CLIENT REVIEW	GHD			

GHD CLIENTS | PEOPLE | PERFORMANCE

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Drawn GHD
 Designed
 Drafting Check
 Design Check
 Approved
 Date
 Scale AS SHOWN

Client **WESTLINK PTY. LTD.**
 Project **WESTLINK POWERSTATION DEVELOPMENT ASSISTANCE**
 Title **PLANT LAYOUT OPTION 1 PLAN VIEW**

Original Size **A1**
 Drawing No: **41-21379-SK004**
 Rev: **E**

5 October 2009



Westlink Power Project
PO Box 1803
MILTON QLD 4064

Attention: Peter Dalton

cc Lockyer Valley Regional Council
PO Box 82
GATTON QLD 4343
Attention: Tracy Ryan

Dear Peter,

**Development Application – Material Change of Use (Impact Assessment) for Electricity Generation Infrastructure and Development Permit for ERA and Operational Works for Vegetation Clearing located at Ranger Road Adare, described as Lot 191 on CSH2361.
Council Ref: DA6538
Our Ref: HBD 1183133 206042**

We refer to your correspondence regarding the above application. ENERGEX Limited acting as an Advice Agency has **no objection** to the proposed Material Change of Use, subject to the following conditions:

1. All easement conditions must be maintained
2. All previous conditions must be adhered to and ENERGEX may, at its discretion, audit the finished development to check that it conforms to the conditions of the development.
3. Detailed civil design drawings showing any proposed cut and fill levels on the easement and the location of the ENERGEX assets in relation to the proposed development must be approved by ENERGEX before any works can commence on site.

When considering the construction of a Power Generation Plant either on ENERGEX easements or in the vicinity of ENERGEX assets, please be aware of the following general conditions:

- Satisfactory clearance from your proposed structure to the existing (and/or future) electricity wires must be maintained in accordance with the Electrical Safety Regulations 2002.

Reference: HBD 1183133 206042



Enquiries
Kirsten Sellers
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Facsimile
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Email
kirstensellers
@energex.com.au

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Facsimile (07) 3407 4609
www.energex.com.au

ENERGEX Limited
ABN 40 078 849 055

- No civil works are to occur within 5 metres of any part of an ENERGEX Structure (e.g. - tower base, pole or stay) without ENERGEX approval.
- If the minimum 5m horizontal separation to the ENERGEX structure cannot be achieved, the Developer must consult ENERGEX with regards to allowable construction methods. This may include full depth shoring of the excavation sides for a minimum of 5 metres either side of the structure.
- Any excavations deeper than 5m must have a minimum horizontal separation from the excavation to any tower, base or pole at least equal to the excavation depth . The excavation is not to be left open overnight and backfill is to be compacted in 150mm layers in the immediate vicinity of the structure.
- 10 metres clear access must be provided around all towers and pole structures after the completion of any works on the easement.
- Natural ground level on the easement should not be disturbed without ENERGEX approval.
- Final ground levels should slope gently to the edge of the easement, surrounding area or kerb such that pooling of water on the easement is avoided and conductor ground clearances are not decreased.
- Stockpiling of spoil on the easement is prohibited.
- Lighting structures are not permitted in the easement without prior written consent of ENERGEX. Lighting designs for proposed developments (e.g. road, carparks etc) on the easement are likely to require reduced height structures. Please submit detailed design to ENERGEX for approval. These drawings must clearly show the following;
 - Proposed height of the lighting structures and the ground level at the structure base,
 - Relative (to lighting structures) ground levels at ENERGEX structures (towers, pole etc) either side of the lighting structures, and
 - The location of the ENERGEX structures in relation to the proposed lighting
- Proposed underground services such as stormwater, sewerage, water and the like are to be kept to the outer edge of the easement. Services crossing the easement should be as near as practicable to right angles to the overhead conductor direction and not within 10 metres of any tower, pole or stay. **Pipelines and crossings are to be clearly marked.** Please submit the relevant design drawings to the Principal Mains Design Engineer for review.

The identification, assessment and mitigation of any possible hazards in the service due to electromagnetically induced voltages, is the responsibility of the Developer.

- Any cut in the vicinity of a structure or between a structure and the road kerb will need to be stabilised by a retaining wall. The retaining wall design and location is to be submitted to ENERGEX for approval.
- Access to the easement and access along the easement must be available to ENERGEX personnel and heavy equipment at all times. ENERGEX will require the Developer / owner to supply and install gates where fencing prohibits access to and along the easement area. To enable travel along the easement at anytime the gates

Reference: HBD 1183133 206042

must be series locked with an ENERGEX padlock. Both the padlock and a design drawing of an acceptable gate will be provided by ENERGEX.

- Any costs incurred by ENERGEX as a result of the works on the easement are to be met by the property Developer / owner.
- At all times the following clearance must be maintained from the top of any machinery moving in the vicinity of energised conductors:
 - 132kV and 110kV conductors – 4.5m minimum clearance
 - 33kV and 11kV conductors – 3m minimum clearance
 - Should it be necessary to transport equipment or extend any equipment, such that these clearances cannot be confidently maintained, you are required to contact our office to ascertain whether a Safety Officer is required on-site. All operators of machinery are to be made aware of the presence of high voltage conductors.
- Any proposal for landscaping on the easement must have prior approval from ENERGEX. Please submit the relevant landscaping design to Principal Mains Design Engineer for approval. When considering landscape designs the planting of trees must be kept to the edges of the easement and not under any overhead conductors. When mature, plants or trees must not grow in excess of 3.5 metres in height. If pertinent the ENERGEX Guide to "Powerline Friendly Plants" will be enclosed, please refer to this Guide for recommended species.

Should you require any further information on the above matter, please contact Sarah Davies on (07) 3405 9511.

Yours faithfully,



Kirsten Sellers
Town Planner
Network Development and Property Department
ENERGEX Limited

APPENDIX 2: EPBC APPROVAL CONDITIONS



APPROVAL

Lockyer Energy Project, 2.5km north of Gatton, Queensland (EPBC 2017/7994)

This decision is made under sections 130(1) and 133(1) of the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*.

Details

Person to whom the approval is granted (approval holder)	Capital Partners Australia Pty Limited
ACN or ABN of approval holder	ACN: 152 374 895
Action	To develop a natural gas-fired power generation plant, 2.5 km north of Gatton, Queensland [see EPBC referral 2017/7994].

Approval decision

My decision on whether or not to approve the taking of the action for the purposes of each controlling provision for the action are as follows.


Controlling Provisions

Listed Threatened Species and Communities	
Section 18	Approve
Section 18A	Approve

Period for which the approval has effect

This approval has effect until Wednesday, 30 January 2047

Decision-maker

Name and position	James Barker Assistant Secretary Assessments and Governance Branch
Signature	
Date of decision	29 January 2018

Conditions of approval

This approval is subject to the conditions under the EPBC Act as set out in ANNEXURE A.

ANNEXURE A – CONDITIONS OF APPROVAL

Part A – Conditions specific to the action

Project site

1. The **approval holder** must not **clear** vegetation outside of the **project site** and the **approval holder** must not **clear** more than 18.38 hectares of vegetation within the **project site**.

Management measures

2. The **approval holder** must ensure a pre-clearance survey is undertaken by a **suitably qualified person** within 24 hours before any **clearing** of vegetation within the **project site**, to identify any **koalas** present.
3. The **approval holder** must not **clear** any vegetation supporting any **koalas** until such time that any present **koalas** vacate the vegetation or are relocated by a **suitably qualified person**. Veterinary care, or assistance from a wildlife refuge, must be sought if any **koalas** are found injured within the **project site** while **clearing** and/or **construction** occurs within the **project site**.
4. Prior to the **commencement of the action**, the **approval holder** must develop a Construction Environment Management Plan. The Construction Environment Management Plan must incorporate all of the management objectives, performance criteria and management controls described in Attachment A of these **conditions** and be implemented until the **end date**.

Compensation measures

5. The **approval holder** must, prior to the **commencement of the action**, **legally secure** a minimum of 41.58 hectares of **koala habitat** at the **offset site**. Within 20 **business days** of **legally securing** the **offset site**, the **approval holder** must provide the **Department** with evidence of when the **offset site** was **legally secured**, and what mechanism was used to **legally secure** the **offset site**.
6. Prior to the **commencement of the action**, the **approval holder** must develop an Offset Management Plan. The Offset Management Plan must incorporate all of the aspects described in Attachment B of these **conditions** and be implemented until the **end date**.
7. The **approval holder** must, from the date of approval until the **end date**, ensure there is no decline in the extent, or **habitat quality** of **baseline condition**, at the **offset site**.
8. If, at any time before the **end date**, the **approval holder** identifies that the outcomes specified in **condition 7** are not being, or unlikely to be achieved, the **approval holder** must report to the **Department** in writing within 20 **business days** of becoming aware. The report must state the cause, the response measures (including timeframes for reporting the success of those measures to the **Department**) and the actions to prevent further occurrences.

Preparation and publication of management plans

9. The **approval holder** must ensure that **management plans** are prepared in accordance with the **Environmental Management Plan Guidelines**. Each **management plan** must also:
 - a. include details on how the **management plan** is consistent with the **Environmental Management Plan Guidelines** and the conservation advice for **koalas**.
 - b. provide a statement signed by the **approval holder** declaring that the information is true and has been prepared in accordance with the **Environmental Management Plan Guidelines**.

10. The **approval holder** must publish all **management plans** on its website prior to **commencement of the action**. The **approval holder** may choose to revise a **management plan** provided the revised **management plan** is consistent with the requirements listed in either **condition 4** (for the Construction Environment Management Plan) or **condition 6** (for the Offset Management Plan). The revised **management plan** must be published on the **approval holder's** website at least 10 **business days** before being implemented. All **management plans** must remain on the **approval holder's** website until the **end date**.

Part B – Standard administrative conditions

11. Within 20 **business days** after the **commencement of the action**, the **approval holder** must advise the **Department** of the actual date of **commencement of the action**.
12. The **approval holder** must maintain accurate records substantiating all activities associated with or relevant to the **conditions**, including measures taken to implement any **management plans** required by this approval, and make them available upon request to the **Department**. Such records may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the **EPBC Act**, or used to verify compliance with the **conditions**. Summaries of audits will be posted on the **Department's** website. The results of audits may also be publicised through the general media.
13. Within 60 **business days** of every 12 month anniversary of the **commencement of the action**, the **approval holder** must publish a report on its website addressing compliance with each of the **conditions**, including implementation of any **management plans** as specified in the **conditions**. Documentary evidence providing proof of the date of publication and non-compliance with any of the **conditions** must be provided to the **Department** at the same time as the compliance report is published. The **Minister** may provide written consent to the **approval holder** to cease reporting if satisfied additional reports are not warranted.
14. The **approval holder** must report any potential or actual contravention of the **conditions** to the **Department** in writing within 5 **business days** of the **approval holder** becoming aware of the potential or actual contravention.
15. Upon the direction of the **Minister**, the **approval holder** must ensure that an independent audit of compliance with the **conditions** is conducted and a report submitted to the **Minister**. The independent auditor and criteria must be approved by the **Minister** prior to the commencement of the audit. The audit report must address the criteria to the satisfaction of the **Minister**.
16. If, at any time after 5 years from the date of this approval, the **approval holder** has not **commenced the action**, then the **approval holder** must not **commence the action** without the written agreement of the **Minister**.

Part C - Definitions

In these **conditions**, except where contrary intention is expressed, the following definitions are used:

Approval holder: means the name of the person to whom the approval is granted;

Baseline condition: means a **habitat quality** score of 8;

Business days: means a day that is not a Saturday, a Sunday or a public holiday in the location of the **action**;

Clear: means the cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning of native vegetation;

Commencement of the action: means the point at which **clearing** of vegetation and/ or **construction** for the purposes of the action begins;

Conditions: means the conditions in Annexure A of this approval;

Construction: means the erection of a building or structure that is or is to be fixed to the ground and wholly or partially fabricated on-site; preliminary site preparation work which involves breaking of the ground (including pile driving); the laying of pipes and other prefabricated materials in the ground, and any associated excavation work; but excluding the installation of fences and signage;

Department: means the Commonwealth Department of Environment and Energy or any other agency that administers the **EPBC Act** from time to time and includes, where the context permits, the officers, delegates, employees and successors of the **Department**;

End Date: means the date after which the approval ceases to have effect;

Environmental management plan guidelines: means Department of the Environment (2014) *Environmental Management Plan Guidelines*. Commonwealth of Australia, Canberra, or subsequent published versions of that document.

EPBC Act: means the *Environment Protection and Biodiversity Conservation Act 1999* (Cth);

Habitat quality: means the habitat quality score as calculated by biocondition surveys in accordance with Queensland's *Biocondition: A condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual (Version 2.2)* (Eyre et al., 2015), or any subsequent revised version;

Koala: the koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (*Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)*) listed as a threatened species under the **EPBC Act**;

Koala habitat: any habitat, including forest or woodland, which contains species that are known food trees (being species of tree whose leaves are consumed by **koalas**), including *Eucalyptus*, *Corymbia* and *Angophora* species;

Legally secure: means ongoing protection under a legal mechanism that is either establishing a conservation covenant under the *Land Title Act 1994* (Qld) or establishing a Nature Refuge under the *Nature Conservation Act 1992* (Qld);

Management plans: means the following listed management plans and subsequent revised versions of those management plans, including the:

- a. Construction Environment Management Plan (required at **condition 4**); and
- b. Offset Management Plan (required at **condition 6**).

Minister: means the Minister administering the **EPBC Act** including any delegate of the Minister;

Offset site: includes Offset Area A and Offset Area B on the map at Attachment C of this approval;

Project site: the area defined as 'Impact Area' on the map at Attachment C of this approval;

Suitably qualified person: a person who has professional qualifications, training, skills and/or experience relevant to **koalas** who can give authoritative assessment, advice and analysis in

relation to the identification, safe capture and release and management of **koalas** using the relevant protocols, standards, codes of conduct, methods or literature;

In these **conditions**, unless contrary intention is expressed:

- a. the singular includes the plural and vice versa, and a gender includes other genders;
- b. another grammatical form of a defined word or expression has a corresponding meaning;
- c. a reference to a **condition** or attachment is to a **condition** of or attachment to, the approval; and
- d. a reference to time is to the time in the place where the obligation is to be performed.

ATTACHMENTS

1. **Attachment A** – Koala management objectives, performance criteria and management controls
2. **Attachment B** - Offset aspects
3. **Attachment C** - Map – Project offset site and impact areas

Koala/Grey-headed Flying-Fox Management Framework

Management Objective

- Avoid or effectively mitigate direct and indirect impacts on the koala/grey-headed flying-fox and their habitat within the project footprint.

Performance Criteria

1. No vegetation clearing outside the specified boundaries.
2. Laydown areas placed within previously cleared areas or on project pad.
3. No evidence of erosion or sedimentation of waterways as a result of the project.
4. Fauna spotter/catcher present during all clearing works.
5. No injury or death of the koala/grey-headed flying-fox as a result of the project.
6. No new weed species are introduced and existing weed infestations are controlled so as not to increase in habitat areas.
7. No possible predators are introduced to the site.
8. No new disease or pathogen is introduced.
9. Koala exclusion fencing is clear of vegetation on the habitat side and no holes or gaps are present.
10. Disturbed areas are stabilised and rehabilitated sequentially and as soon as possible following disturbance.
11. All site personnel undertake environmental induction prior to commencing work.

Management Controls

Table 12 Design Management Controls

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
2, 3, 10	Environmental contract documentation to address specific erosion and sediment control and landscape and revegetation requirements to be	Owner's Engineer, Proponent	This will assist in minimising indirect impacts to habitat through a reduction in sediment loss and associated water quality impacts.	Minimisation of indirect impacts on the koala/grey-headed flying-fox	Audit prior to request for tender release. Auditing of contract documentation will be undertaken in accordance with the

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
	managed during the construction and post-construction phase of the project.				Construction Environmental Management Plan (CEMP)
All	Incorporate into the CEMP appropriate measures (including the below provisions) for fauna management, vegetation management, weed management, rehabilitation management	Construction Contractor, Proponent	This will reduce impacts on the koala/grey-headed flying-fox and habitat through appropriate management of rehabilitation areas and inclusion of procedures for vegetation clearing, fauna management and general environmental management.	Minimisation of direct and indirect impacts on the koala/grey-headed flying-fox	CEMP to be audited for completeness prior to mobilisation, as well as auditing for compliance during and post-construction
1, 2, 3	Vegetation clearing limits will be defined under the contract documentation, to minimise the extent of vegetation clearing whilst allowing construction to occur, taking into account erosion and sediment control devices.	Owner's Engineer, Proponent	Vegetation clearing limits will ensure minimisation of clearing required for the project and reduce impacts on the koala/grey-headed flying-fox supporting habitat.	Avoid unnecessary removal of fauna habitat.	Audit prior to request for tender release. Auditing of contract documentation will be undertaken in accordance with the CEMP
1, 2, 3	Additional workspace areas (laydown areas) are to be placed in previously cleared areas or on the project pad, where possible.	Construction Contractor	This will minimise the vegetation clearing required for the project.	Avoid unnecessary removal of fauna habitat.	CEMP to be audited for completeness prior to mobilisation, as well as auditing for compliance during and post-construction
1, 2, 5	Incorporation of No-Go Zones and vegetation clearing limits with specific vegetation clearing requirements and methodologies within the contract documentation. All vehicles and plant will stay on pre-determined routes and adhere to site construction and operation rules relating to speed limits. Speed limits would be clearly signposted to minimise the potential for fauna impact.	Owner's Engineer, Proponent	Implementation of No-Go Zones and restricted access routes will prevent inadvertent disturbance within habitat to be retained.	Avoid fauna collisions mortality from construction equipment and enable the relocation of MNES away from the working areas as appropriate.	Audit prior to request for tender release. Auditing of contract documentation will be undertaken in accordance with the CEMP. A register of wildlife incidents (fauna strike and mortality) will be established and maintained as part of the CEMP.

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
5, 9	<p>Locations and design of koala exclusion fencing to be incorporated into contract documentation and construction schedule to ensure appropriate structures, placement and timing. Replacement of all cattle fencing with wildlife friendly fencing to the site's eastern, western and northern boundaries. Koala exclusion fencing will be installed along the southern boundary in accordance with Road and Traffic Authority (NSW) Standard Drawing and include the following specifications:</p> <ul style="list-style-type: none"> - Galvanised wire 50 mm chain-link fence, with additional 0.5 m overhang "floppy top" (outward of road formation). - 3 m buffer free of vegetation (excluding grasses) on habitat side of the fence. 	Owner's Engineer, Proponent	Fauna exclusion fencing is an effective management measure to reduce vehicle collisions with koalas (and other native fauna). This fencing is also dog-proof, therefore helping reduce predator movements onto the site.	Prevent increased fauna mortality from the project and guide and direct fauna movement between retained/rehabilitated bushland habitat and away from the road.	Audit prior to request for tender release. Auditing of contract documentation will be undertaken in accordance with the CEMP

Table 13 Construction Management Controls

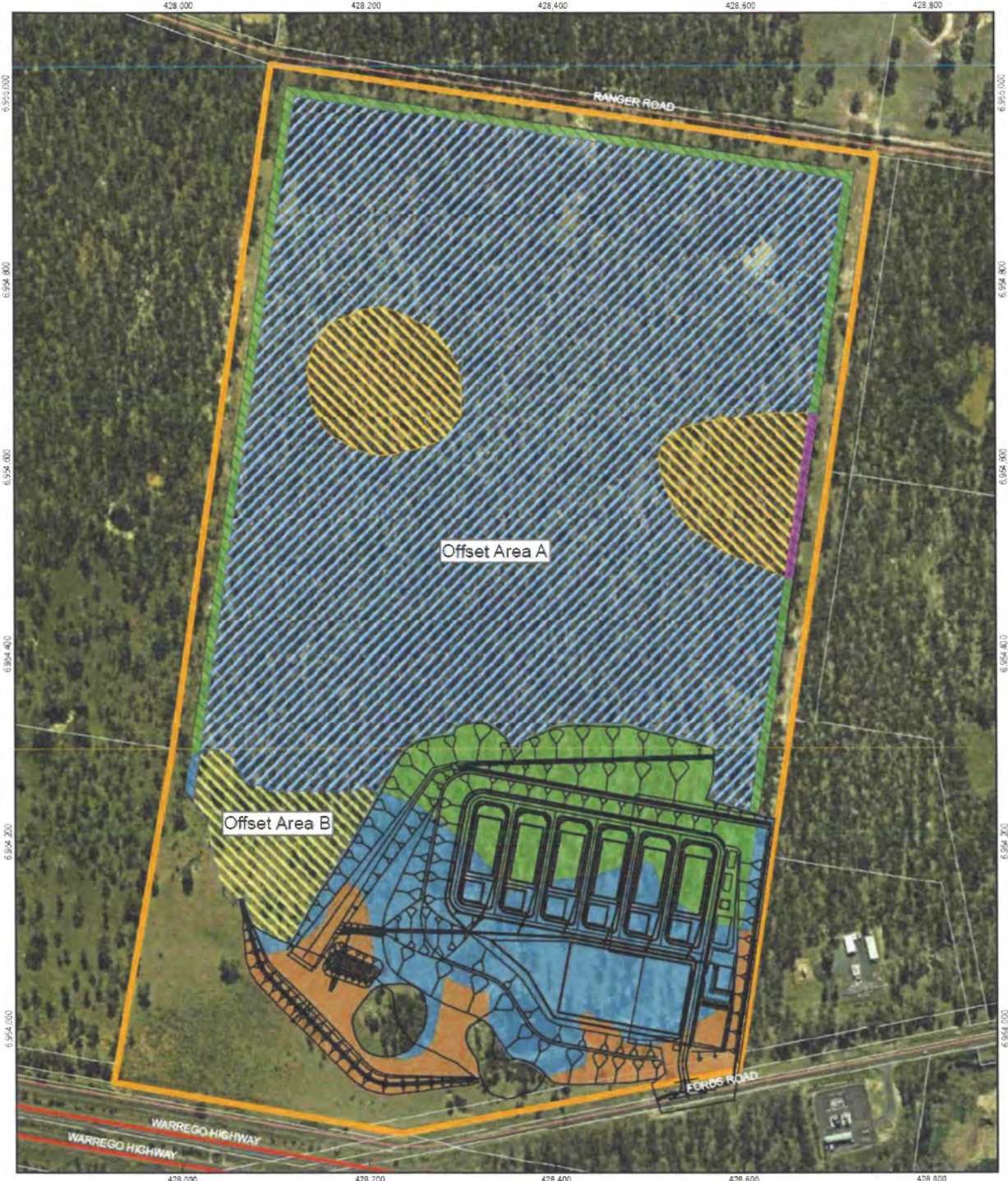
Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
10	Undertake an environmental induction to all site personnel to outline responsibilities in relation to the koala.	Construction Contractor	This will assist in training all onsite personnel in regards to the koala and their environmental obligations where MNES are found onsite.	Avoid any unnecessary and avoidable fauna collisions and mortalities as all personnel will be trained on their appropriate obligations.	Review CEMP prior to mobilisation. Audit implementation shortly after mobilisation and then quarterly for the duration of construction

Table 2 Offset Strategy Details

Aspect	Description
Type of offset	Direct offset
Location	Lot 191 on CSH2361 – vegetated extent including remnant and regrowth areas of lot to be retained as an offset described as Offset Area A (remnant) and Offset Area B (regrowth) (refer to Figure 5).
Suitability	Suitable habitat known to be present on-site for koala
Land tenure	Freehold, owned by the proponent
Method of securing	Conservation covenant placed on the land title in perpetuity in accordance with the Queensland <i>Land Title Act 1994</i> (as per the EPBC Act Environmental Offset Policy)
Management	<p>The offset (Areas A and B) will be managed by the proponent (or a related entity on behalf of The Australian Clean Power Trust). An Offset Management Plan will be prepared that outlines the management of the offset area and will include measures, reporting, corrective actions and responsibilities for the following activities to be undertaken:</p> <ul style="list-style-type: none"> • Annual monitoring of the offset to assess koala usage of the site, evidence of predators, evidence of plant pathogens or fauna disease, and habitat condition aspects such as extent of weed infestations, eroding land, and presence of water. • Monitoring of wildlife friendly boundary fencing (including koala exclusion fencing around the project infrastructure and along the southern boundary of the lot) on a 6-monthly basis to identify maintenance requirements, such as trimming regrowth within 3 m of koala exclusion fence and repairing fences to assist in excluding predators. • Monitoring and management of weed infestations to maintain free movement of koalas and regeneration of food trees. • Restriction of livestock of a species and number that is incompatible to maintaining or improving koala habitat. • Should predators, such as wild dogs, be observed on-site, a management program of baiting may be undertaken and assessment of fencing for their future exclusion. • Monitoring and management of the two small farm dams located in Offset Area A and the ephemeral creek lines to reduce siltation and control erosion in this area as part of

Aspect	Description
	<p>general land management and improvement of the habitat condition for the koala.</p> <ul style="list-style-type: none"> • Controlled fire management to maintain eucalypt species diversity and health, as appropriate to koala habitat, season and ecosystem. • Offset Area B will include revegetation in accordance with Landscape Management and Revegetation Plan including incorporation of eucalypt species suitable for providing koala food trees and winter/spring foraging habitat for the grey-headed flying-fox.
Estimated cost	\$500,000 - \$800,000
Outcomes	<p>The outcomes proposed to be achieved for the duration of the offset for koala are:</p> <ul style="list-style-type: none"> • The habitat for koala is maintained or improved • The on-site threats to koala and its habitat are monitored and managed <p>These outcomes were based on priority objectives within the below conservation advice and recovery plan documents.</p>
Risks	<p>Risks associated with achieving the outcomes include:</p> <ul style="list-style-type: none"> • Other development in connected habitat areas having an impact on the local koala population • Weed infestations that are not controlled may impact the habitat quality and condition for koalas • If pathogens are introduced, they may be difficult to eradicate or prevent from spreading between individuals (fauna or flora) • Extreme weather events cause damage to the habitat within the offset area, therefore reducing its use by koala
Measurability of outcome	<p>The Offset Management Plan will include monitoring schedules and recording requirements for habitat conditions, on-site koala usage, evidence of weeds and evidence of threats such as predators and pathogens/disease. Specific performance and management measures and reporting will be included in the Plan.</p>
Baseline data	<p>These outcomes are derived from baseline data collected during field surveys, particularly relating to habitat characteristics and conditions, vegetation community descriptions, koala utilisation rates (using Spot Assessment Technique surveys) and dominant food species for koalas and grey-headed flying-fox. Baseline data can also be sourced from local community/action groups regarding local sightings of koalas and desktop sources such as Atlas of Living Australia and Wildlife Online for historical records. The Offset Management Plan will detail the monitoring and reporting schedule and methods.</p>
Conservation gains	<p>Conservation gains to be achieved include the maintenance of high quality habitat for the species, information relating to the abundance of the local koala population, and engaging in strategies that actively protect the species from the introduction or spread of threats (the management of which aids in the overall recovery of the species).</p>
Conservation advice	<p>The outcomes above are consistent with the following conservation advice for the koala:</p>

Aspect	Description
	<ul style="list-style-type: none"> • Priority Management Actions within the Approved Conservation Advice for <i>Phascolarctos cinereus</i> (combined populations of Queensland, New South Wales and the Australian Capital Territory) (TSSC, 2012) • Recovery objectives of the Recovery plan for the koala (<i>Phascolarctos cinereus</i>) (DECC, 2008)
Audit	The Offset Management Plan will include an auditing schedule that assesses the performance of the monitoring and management strategies in achieving the outcomes.
Assessment of level of control	The project proponent will have total control over the offset area and the implementation of monitoring and maintenance in accordance with the Offset Management Plan.
Management measures	<p>Monitoring:</p> <ul style="list-style-type: none"> • Baseline data is collected annually during Stage 1 construction of the project, and thereafter for the duration of the offset. One monitoring event will be undertaken prior to the offset commencing in order to establish the monitoring locations and provide an initial baseline for the monitoring program within the offset site. <p>Milestones:</p> <ul style="list-style-type: none"> • At 5 years after the start of the offset, the habitat has been maintained or improved and no increase in threats have occurred. <p>Performance indicators:</p> <ul style="list-style-type: none"> • Density and abundance of koala food trees is maintained or increased. • Threats that have been identified have not spread or increased. <p>Further details of monitoring, adaptive management/corrective actions, record keeping, publication and reporting procedures will be included in the Offset Management Plan. Offset Area B will also be monitored and managed in accordance with the Project's Landscape Management and Revegetation Plan with the aim of establishing and improving koala habitat value to a level which is consistent with Offset Area A.</p>



LEGEND

Highway	Impact Area 1 (7.24Ha)	Impact Area 3 (3.51Ha)	Offset Area A 4 (7.46Ha)	Offset Area A 5 (35.47Ha)	Offset Area B 7 (2.13 Ha)	Fire break 10m clearing
Street/Local Road	Impact Area 2 (0.17Ha)	Impact Area 6 (3.98Ha)	Offset Area A 6 (3.98Ha)	Subject Site (70.15 Ha)		
Design						
Cadastre						

Based on or contains data provided by the State of QLD (DNRM) 2017. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

Paper Size A4
 0 25 50 100 150 200 Metres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Gnd: GDA 1994 MGA Zone 58

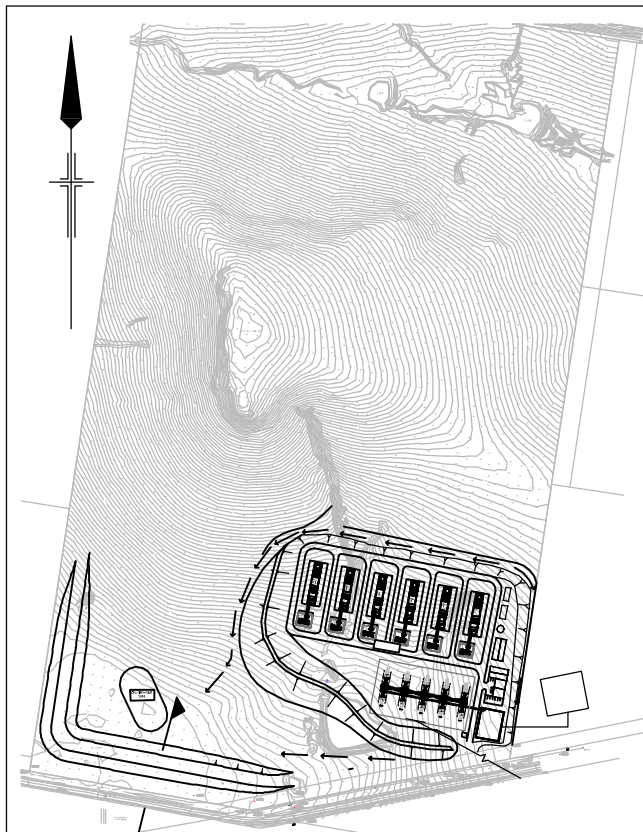
Quinbrook Infrastructure Partners Pty Ltd
 Lockyer Energy Project

Job Number: 91-10341
 Revision: 4
 Date: 27 Nov 2017

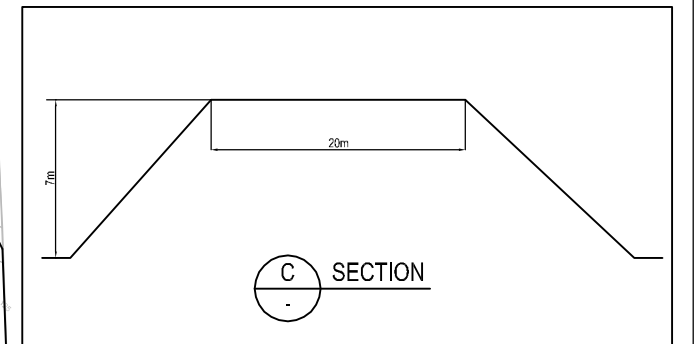
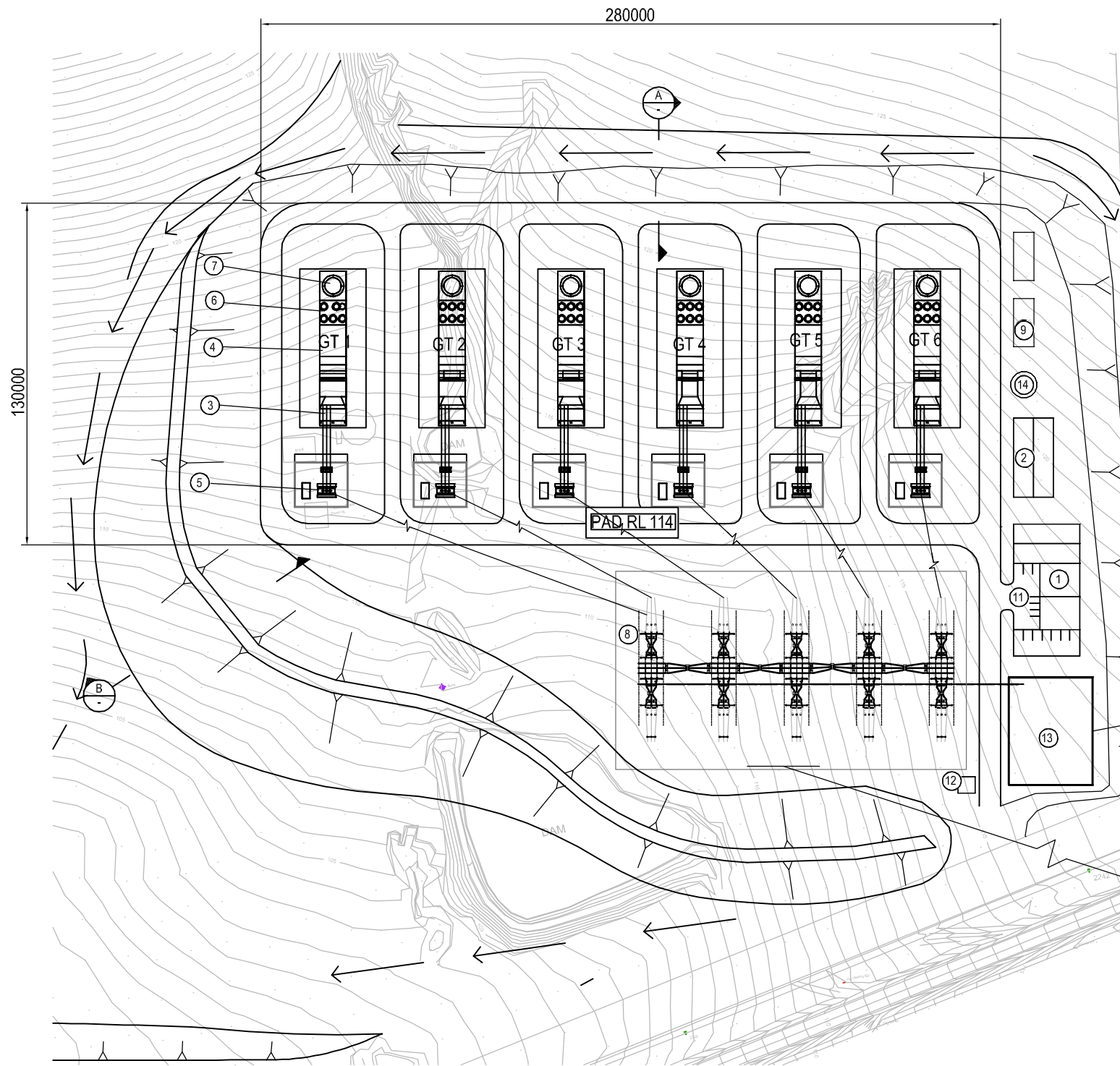
Offset area and assessment units Figure 5

g:\ghd\AU\Melbourne\Projects\91-10341\GIS\Maps\MXD\9110341_005_Rev4.mxd 145 Ann Street Brisbane QLD 4000 Australia T 91 7 3316 3000 F 91 7 3316 3333 E brenmail@ghd.com W www.ghd.com
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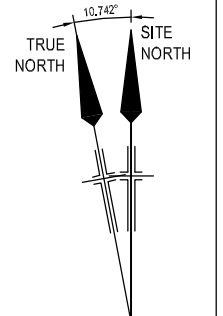
**APPENDIX 3: PLANT LAYOUT VIEW 41-21379-SK004 MCU APPROVAL
CONDITIONS**



SITE LOCATION
SCALE 1:5000



C SECTION



EXTENT OF EARTHWORKS

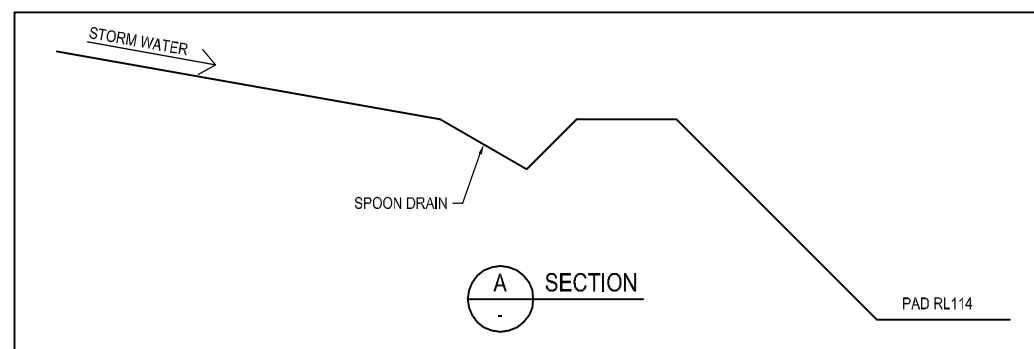
GATTON COMPRESSOR STATION

GAS PIPELINE

TO GATTON SUBSTATION (ENERGEX)

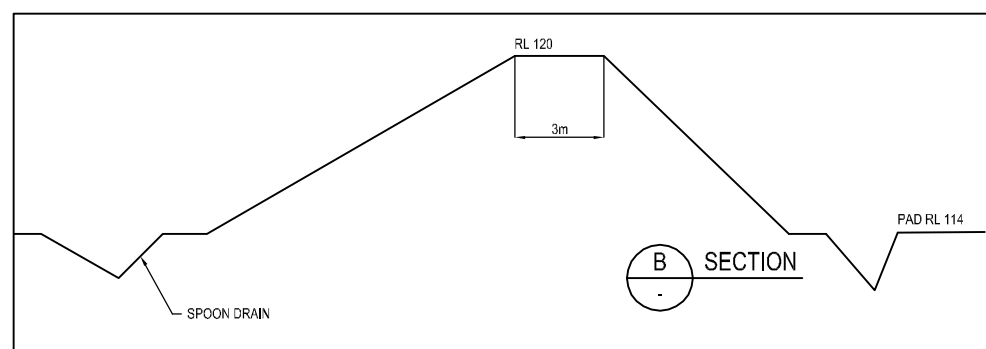
DESCRIPTION	HEIGHT (m)
① CONTROL AND ADMIN BUILDING	7.0
② WAREHOUSE AND WORKSHOP	14.0
③ GAS TURBINE AIR INTAKE	26.0
④ GAS TURBINE ENCLOSURE	8.5
⑤ TRANSFORMER	5.0
⑥ COOLING FANS	13.0
⑦ EXHAUST STACK	30.0
⑧ SWITCHYARD	11.0
⑨ OTHER TANKS & PUMPS	7.0
⑩ FIRE SYSTEM	4.0
⑪ CAR PARK	-
⑫ SECURITY HOUSE	4.0
⑬ GAS SKID (IF REQUIRED)	6.0
⑭ FIRE TANK	9.0

- NOTES:**
- SITE LOCATION, SIZING AND LAYOUT INDICATIVE ONLY.
 - EXISTING DAM TO BE FILLED IN.
 - ARROWS INDICATE STORMWATER FLOW



A SECTION

SITE LAYOUT
SCALE 1:1000



B SECTION

PRELIMINARY

E	BUND MODIFIED	GHD		03/12/09
D	BUND & STORMWATER ADDED	GHD		24/11/09
C	EXTERNAL INFRASTRUCTURE INCLUDED	GHD		25/08/09
B	CLIENT COMMENTS INCORPORATED	GHD		17/07/09
A	ISSUED FOR CLIENT REVIEW	GHD		

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Drafting Check			Design Check
Approved			
Date			
Scale	AS SHOWN		This Drawing must not be used for Construction unless signed as Approved

Client	WESTLINK PTY. LTD.
Project	WESTLINK POWERSTATION DEVELOPMENT ASSISTANCE
Title	PLANT LAYOUT OPTION 1
	PLAN VIEW
Original Size	A1
Drawing No:	41-21379-SK004
Rev:	E

APPENDIX 4: PERSONNEL REGISTER

APPENDIX 5: CONTACTS LIST

Internal Contacts	Name / Company	Phone Number
Fauna Spotter Catcher	Litoria Consulting	07 3852 4855
Site Environmental Manager	Litoria Consulting	07 3852 4855
Project Manager	TBA	TBA
External Contacts	Name / Company	Phone Number
Ambulance/Police/Fire Brigade	N/A	000
RSPCA Animal Emergency Hotline	N/A	1300 264 625

**APPENDIX 6: FINAL PRELIMINARY DOCUMENTATION (EPBC
2017/7994)**



**Capital Partners Australia Pty Ltd (ATF the
Australian Clean Power Trust)**
Final Preliminary Documentation (EPBC 2017/7994)

November 2017

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Appendices

Appendix A - Koala/Grey-headed Flying Fox Management Framework

Appendix B - Offset Assessment Guide Spreadsheet

1. Introduction

Capital Partners Australia Pty Limited (as trustee for the Australian Clean Power Trust) is the proponent for the Lockyer Energy Project, which was referred to the Minister for the Environment and Energy on 14 August 2017 (reference EPBC 2017/7994).

On 11 October 2017, the Minister's Delegate decided that the proposed action is a Controlled Action as it is likely to have a significant impact on listed threatened species and communities (with sections 18 and section 18A the relevant controlling provisions), and that the action will be assessed on Preliminary Documentation.

Since the preparation of the referral the overall project footprint was revised and is shown in Figure 1 in Section 2.8.

A Draft Preliminary Documentation Response was prepared by the proponent and GHD and provided to the Minister's Delegate (delegate) in response to the 25 October 2017 request for additional information required to assess the relevant impacts of the proposed action. This report was publicly notified between Wednesday 15th November and 28th November 2017 as directed by the delegate in accordance with section 95A(3) of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

2. Avoidance and Mitigation

2.1 Information Request 1.1

Confirm whether dewatering will be required during either the construction or operation of the gas-fired power plant. If dewatering is required, provide an assessment of the potential impacts to the koala and grey-headed flying-fox food trees within the project site and the region.

2.1.1 Response

The project will not involve dewatering of existing groundwater resources during construction or operation.

Section 2.1 of the referral refers to 'dewatering and filling in two farm dams', which will be undertaken in accordance with an approved Species Management Program for handling/relocating any aquatic species present that are listed under the Queensland *Nature Conservation Act 1992*. We confirm that this activity will have no impact on groundwater, or groundwater dependant ecosystems.

2.2 Information Request 1.2

Provide further information regarding potential impacts to the grey-headed flying fox. This discussion should describe and quantify impacts to spring/winter flowering forage for the grey-headed flying fox both within the project site and detail the availability of these species in the vicinity of the project site.

2.2.1 Response

In response to this request, we have provided the documented winter/spring flowering forage below, and assessed the extent of these species on the project site (using field survey data) and in the surrounding habitats (using mapped regional ecosystems that have been verified on the project site).

We consider that there are substantial areas of foraging habitat to be retained on the site, revegetated within the project footprint, and present in the areas surrounding the site, so that there is no residual significant impact to the availability of foraging habitat for the grey-headed flying-fox.

Winter/spring flowering diet species

The Draft National Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus* (DECCW, 2009) lists the important winter and spring habitats as those vegetation communities that contain:

- *Eucalyptus tereticornis*, *E. albens*, *E. crebra*, *E. fibrosa*, *E. melliodora*, *E. paniculata*, *E. pilularis*, *E. robusta*, *E. siderophloia*, *Banksia integrifolia*, *Castanospermum australe*, *Corymbia citriodora citriodora*, *C. eximia*, *C. maculata* (south from Nowra), *Grevillea robusta*, and *Melaleuca quinquenervia*.

The study of feeding habitats for the grey-headed flying-fox by Eby and Law (Eby and Law, 2008) lists the flowering (blossom) diet as including the following documented winter/spring flowering species:

- Significant food plants: *C. citriodora citriodora*, *C. maculata*, *C. variegata*, *E. camaldulensis*, *E. deanei*, *E. moluccana*, *E. pilularis*, *E. robusta*, *E. siderophloia*, *E. tereticornis*, *M. quinquenervia*, *Syncarpia glomulifera*, *Castanospermum australe*, *Banksia integrifolia* and *Grevillea robusta*

- Additional diet species: *E. propinqua*

On-site winter/spring flowering species

The dominant canopy tree species recorded on-site during surveys (GHD 2017 field survey and Conics 2009 field survey) include the following winter/spring flowering species:

- *Corymbia citriodora* subsp. *variegata* (Syn. *C. maculata*), *C. tessellaris*, *Eucalyptus crebra*, *E. fibrosa* subsp. *fibrosa*, *E. propinqua* and *E. tereticornis*

Approximately 46.87 ha of mixed eucalypt woodland dominated by these canopy species is present on the project site (refer to Figure 2 showing high and medium value habitat areas, where koala habitat values are considered to provide the same value for grey-headed flying-fox foraging habitat). Approximately 7.41 ha of this foraging habitat will be directly impacted by the project (refer to Figure 3), however approximately 39.45 ha of this foraging habitat will be retained on the site and legally secured and protected from being cleared in the future.

In addition, approximately 9.81 ha of the impact area will be revegetated (refer to Figure 4), including areas with a species mix that includes eucalypt species suitable for grey-headed flying-fox winter/spring foraging, such as *E. tereticornis*, *C. citriodora* and *C. tessellaris*. Therefore there will not be a substantial net loss of winter/spring flowering trees from the site.

Surrounding foraging habitat

The eucalypt woodland present on the site is part of a large patch (approximately 180 ha) of mapped regional ecosystem 12.9-10.2 (70%) / 12.9-10.5 (30%) described in the Queensland Herbarium's Regional Ecosystem Description Database as containing the following winter/spring flowering species:

- RE 12.9-10.2: *Corymbia citriodora* subsp. *variegata*, *Eucalyptus crebra*, *E. tereticornis*, *E. moluccana* and *E. siderophloia*
- RE 12.9-10.5: *Corymbia citriodora* subsp. *variegata*, *Eucalyptus crebra*, *E. fibrosa* subsp. *fibrosa* and *E. pilularis*

Calculations done using GIS mapping have found there is approximately 209 ha of similar regional ecosystem habitat mapped within a 1 km buffer (equating to approximately 24 % of a total 865 ha area) around the on-site regional ecosystem (not including the regional ecosystem on the site). The remainder of this 1 km buffer area includes areas of regrowth vegetation (as apparent on aerial photographs), as well as cleared or developed land.

There is an extensive area of potential foraging habitat approximately 3 km north of the project site which is associated with Lockyer National Park (total of 7790 ha in size) and contains the same regional ecosystems as well as others that contain winter/spring foraging species, such as 12.3.3 that contains *E. tereticornis*, *E. crebra* and *E. moluccana*.

Therefore we consider that there is sufficient availability of year-round foraging habitat both locally and regionally surrounding the project site.

2.3 Information Request 1.3

Provide further details about pre-clearance procedures to ensure that individual koalas are detected and managed appropriately to minimise mortality, stress, injury or introduction of disease.

2.3.1 Response

A range of pre-clearance procedures will be incorporated in to the project Construction EMP including:

- a pre-clearance survey 24 hours prior to vegetation clearing by a terrestrial fauna specialist
- quarantine procedures will be implemented for any translocations of individual fauna species
- vehicle speed limits and restriction / exclusion zones, and
- sequential staging of clearing activities in the presence of a fauna specialist to minimise potential mortality, stress or injury to individual koalas or grey-headed flying-fox, as well as other fauna species or breeding places.

The pre-clearance procedures are designed to effectively detect and manage any individual koalas that may be present prior to or during clearing works on-site for the project. Refer to Appendix A: Koala/Grey-headed Flying-fox Management Framework, which provides specific avoidance and mitigation measures to protect individual koalas prior to and during clearing activities.

The performance criteria and management measures provided in Appendix A will be incorporated within the fauna management section of the Construction EMP and will be implemented on-site by the Construction Contractor.

2.4 Information Request 1.4

Provide further details about strategies that will be employed both during and post construction to minimise mortality, stress, injury or introduction of disease.

2.4.1 Response

Management strategies including erection of fauna fencing, weed and dust controls, restrictions on vehicles and site access by pets as well as revegetation and enhancement of habitats surrounding the project have been designed to effectively avoid or mitigate potential impacts to individual koalas and the viability of the local population during and post-construction works. These strategies are detailed in Appendix A: Koala/Grey-headed Flying-fox Management Framework, which provides specific avoidance and mitigation measures to protect individual koalas during and post construction of the project.

The performance criteria and management measures provided in Appendix A will be incorporated within the fauna management section of the Construction EMP and will be implemented on-site by the Construction Contractor.

2.5 Information Request 1.5

Provide a description of any avoidance or mitigation measures, additional to those described in the referral, which could be adopted to reduce the impact on the koala, grey-headed flying fox and habitat for both species.

2.5.1 Response

Mitigation measures developed for the project include avoiding unnecessary habitat loss, avoiding direct and indirect impacts to individuals through appropriate pre-clearance and construction methods and fauna management procedures. This will include removal of the existing cattle fencing and replacement with wildlife friendly fencing and restoration of degraded and cleared habitat through revegetation using appropriate food trees for both species. Appendix A: Koala/Grey-headed Flying-fox Management Framework provides specific avoidance and mitigation measures to protect koalas and their habitat (and concurrently grey-headed flying-fox and their habitat).

The performance criteria and management measures provided in Appendix A will be incorporated within the fauna management section of the Construction EMP and will be implemented on-site by the Construction Contractor.

2.6 Information Request 1.6

Provide an assessment of the expected or predicted effectiveness of each proposed avoidance or mitigation measures. The Koala Referral Guidelines should be considered in determining whether the measures will be effective.*

**Department of the Environment (2014). EPBC Act Referral Guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory), Commonwealth of Australia, Canberra. Available from:*

<http://www.environment.gov.au/biodiversity/threatened/publications/epbc-act-referral-guidelinesvulnerable-koala>

2.6.1 Response

The proposed avoidance and mitigation measures have been designed with consideration of suitable measures within the following documentation (as a minimum):

- EPBC Act Referral Guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (DEE, 2014)
- Environmental Management Plan Guidelines (DEE, 2014)
- Nature Conservation (Koala) Conservation Plan 2017 (Koala Plan), Part 3 Clearing in particular areas (requirements for sequential clearing and koala spotter presence)
- Recovery plan for the koala (*Phascolarctos cinereus*) (DECC, 2008).

The effectiveness of each proposed avoidance or mitigation measure is assessed in Appendix A: Koala/Grey-headed Flying-fox Management Framework. Overall, the mitigation measures proposed are considered to be standard practice, as a minimum, and will result in effective management of individual koalas and adjacent habitat areas during construction and operation of the project. The proposed measures are considered to be reasonable, practical, proven as effective, and readily achievable considering the limited scale and localised impacts of the project.

Wherever possible for the project, measures that are rated as having “high” effectiveness in the Impact Mitigation Tables in the EPBC Act Referral Guidelines for the vulnerable koala were

adopted as a first priority. In order to address additional mitigation requirements for the project, relevant management actions included in the Queensland Koala Plan and the Recovery plan for the koala (DECC, 2008) were also considered to be effective.

2.7 Information Request 1.7

If you are proposing to use a management plan to manage impacts to listed threatened species, provide a management plan that details the proposed avoidance and mitigation measures and how those measures will mitigate impacts to the koala and/or grey-headed flying fox, including clear, measurable and time specific:

- a. performance criteria;
- b. environmental outcomes to be achieved; and
- c. auditing regime to measure the implementation and effectiveness of the management plan

Detail all limitations of any managements prepared for the proposed action.

2.7.1 Response

Appendix A: Koala/Grey-headed Flying-fox Management Framework includes specific avoidance and mitigation measures to protect koalas and their habitat (and concurrently grey-headed flying-fox and their habitat). Appropriate performance criteria, measurement and auditing methods have also been included. The proposed measures are considered to be reasonable, practical, proven as effective, and readily achievable considering the limited scale and localised impacts of the project.

The performance criteria and management measures provided in Appendix A will be incorporated within the fauna management section of the Construction EMP (as well as other relevant plans and procedures, such as operational procedures) and will be implemented on-site by the Construction Contractor. The Construction EMP will be prepared in accordance with the Environmental Management Plan Guidelines (DEE, 2014), as a minimum, but will also comply with standard procedures and best practice mitigation as well as relevant Queensland legislation and policies. The implementation of these measures through the Construction EMP will minimise the risks to koalas and their habitat.

2.8 Information Request 1.8

Describe how the residual impacts to the koala and/or grey-headed flying fox have changed, from conclusions described in the referral, once the mitigation and/or avoidance measures have been considered.

2.8.1 Response

Since the lodgement of the referral, the project's residual impacts to the koala and grey-headed flying fox have changed. These changes arose as a result of changes to the project footprint following recent local government operational works approval and use of a more detailed koala habitat mapping classifications. These changes are discussed further in the sections below.

In summary, we consider that the reduced project footprint, avoidance and mitigation measures during design, construction and operation have reduced the potential for impacts to the koala (and similarly to the grey-headed flying-fox), such that the residual impacts have been reduced.

Project footprint

The project footprint (i.e. the extent of the action) has been refined based on more detailed design and an operational works development approval, which was obtained after the referral was prepared. This process has reduced the total project footprint to 18.38 ha from the original concept plan footprint of 25.3 ha (as stated in the referral). The changes to the project footprint include:

- The operational works application has resulted in a reconfiguration of batters, the sediment basin and earthworks bunds which has resulted in a reduced footprint. This has included changes to the southern-most earth bund, which has been reduced in size and moved closer to the project infrastructure.
- The two patches of existing vegetation to be retained in the southern extent of the site are no longer included in the revised project footprint (i.e. they will not be cleared).
- The revised project footprint includes the required additional 10 m of clearing to extend the existing 20 m firebreak around the northern vegetated extent of the lot. Aerial photography was used to identify the existing 20 m firebreak around the site as an estimated average width, as demonstrated in the site photographs provided below (Plate 1). The additional 10 m was derived from site assessments of tree heights being up to 20 m in the ecologically dominant canopy layer at the edges of the remnant vegetation community, therefore requiring a 30 m total firebreak width in accordance with State development approval conditions (30 m being 1.5 times the height of the tallest trees).
- A limit of 2 m additional extent of disturbance was applied to the proposed batters and diversion drains, as required to undertaken operational works.



Plate 1 Site photographs of existing 20 m firebreak

The revised project footprint is shown on Figure 1 (which also shows the clearing boundary previously approved in the State development approvals process, for reference).

Koala habitat

In order to further refine the extent of habitat and usage across the project site by koalas, the koala habitat values were mapped based on the following standard assessment methods:

- Habitat assessments that refer to the dominant stratum and species, landform, presence and abundance of habitat features, and evidence of disturbance (in accordance with the Terrestrial Vertebrate Fauna Survey Assessment Guidelines for Queensland (Eyre et al., 2014) and other standard classifications
- Vegetation assessments with reference to the structural vegetation characteristics from Specht (1970) and Quaternary methods for assessing Regional Ecosystems (Neldner et al., 2017)

- Spot Assessment Technique (SAT) (Phillips and Callaghan, 2011) as a standard measure of koala activity or utilisation
- Koala Habitat Assessment Tool in the EPBC Act referral guidelines for the vulnerable koala (DEE, 2014) and
- Analysis of GIS mapping of vegetation and habitats and interpretation of aerial photography.

The koala habitat values have been mapped on Figure 2 with reference to the habitat types (as originally included in the referral Figure 2 Habitat values map) and evidence of koala usage derived from Spot Assessment Technique (SAT) site surveys. The relative koala habitat value of all vegetation currently present on the site was assessed using a combination of habitat assessments (to identify and map areas of similar habitat value) and koala utilisation assessments (to determine the level of recent koala utilisation within each habitat type based on the relative density of koala faecal pellets). Within each of the habitat types that contain non-juvenile koala food trees, targeted searches for koala faecal pellets were undertaken at nine representative locations using the Spot Assessment Technique (SAT) (Phillips and Callaghan, 2011). Levels of utilisation were rated using the criteria defined in Phillips and Callaghan (2011) for low density koala populations on the east coast. These classify koala utilisation into three classes: low use (<3.33% trees sampled with faecal pellets), medium use (3.33% - 12.59% trees sampled have koala faecal pellets) and high use (>12.59% trees sampled have koala faecal pellets). The results of the SAT assessment were extrapolated across the habitat types in which they were undertaken. Where the level of koala utilisation varied within habitat types, the level of utilisation was extrapolated conservatively to include areas within a local 100 m radius of that assessment. Opportunistic searches for evidence of koalas (i.e. faecal pellets and scratches) were undertaken within the remaining non-koala habitat types but did not identify evidence of koalas.

The above method was used to complement the Koala Habitat Assessment Tool in the EPBC Act referral guidelines for the vulnerable koala (DEE, 2014) due to the limitations in providing differentiation between habitat types on the site in terms of evidence of koala usage, provision of shelter and forage resources, and safe movement within and between habitats.

As a result, the categories of koala habitat values mapped on the site are as follows:

- No koala habitat value: Isolated, juvenile koala food trees present and no evidence of utilisation. Includes habitat types of open grazing land and periodically inundated grassland. Koala Habitat Assessment Tool score of 4 (+1, +0, +2, +1, +0), therefore not habitat critical to the survival of the koala.
- Low koala habitat value: 1 or less out of 30 trees (<3.33%) had koala pellets beneath them in the SAT assessment. Includes habitat types of open woodland, open grazing land, permanent waterbody and existing firebreak. Koala Habitat Assessment Tool score of 8 (+2, +2, +2, +1, +1), therefore habitat critical to the survival of the koala.
- Medium koala habitat value: 2-4 out of 30 trees assessed (3.33% - 12.59%) had koala pellets beneath them in the SAT assessment. Includes habitat type of mixed eucalypt woodland. Koala Habitat Assessment Tool score of 9 (+2, +2, +2, +1, +2), therefore habitat critical to the survival of the koala.
- High koala habitat value: >4 out of 30 trees assessed (>12.59%) had koala pellets beneath them in the SAT assessment. Includes habitat types of mixed eucalypt woodland and ephemeral watercourse. Koala Habitat Assessment Tool score of 9 (+2, +2, +2, +1, +2), therefore habitat critical to the survival of the koala.

Key differences in the scoring of habitat types using the Koala Habitat Assessment Tool were due to lack of evidence of koala usage and lack of vegetation structure and species diversity in the areas with no koala habitat value, and the unlikely or uncertainty around recovery value of the habitat for no and low koala habitat value areas.

The areas of mapped no, low, medium and high koala habitat values are also considered to provide the same values as foraging habitat for the grey-headed flying-fox.

Residual impact changes

We consider the residual impacts to habitat for the koala/grey-headed flying-fox to have been significantly reduced overall from the referral stage.

Table 1 provides the existing koala and grey-headed flying-fox habitat areas for each value description (no, low, medium, and high value) across the whole lot (including the existing firebreak around the northern vegetated area and part of the existing powerline and pipeline easement along the southern boundary to Fords Road). The total area of the whole property is 70.15 ha. Table 1 also provides the disturbance areas relevant to each habitat value, which are shown on the map in Figure 3.

Table 1 Koala and grey-headed flying-fox habitat area calculations

Description	Total area (ha)	Disturbance area (ha)
No habitat value	8.89	3.51
Low habitat value	14.37	7.46
Medium habitat value	4.15	0.17
High habitat value	42.72	7.24
Total	70.13	18.38
Rehabilitation / Enhancement Area	9.81	N/A

As discussed in Section 2.2.1, the availability of sufficient foraging habitat for grey-headed flying-fox on and around the site and the rehabilitation of disturbed areas using suitable winter/spring forage species will result in no significant residual impact to this species.

The potential impacts to koala habitat have been reduced through the reduction of the overall project footprint (from 25.3 ha in the referral down to 18.38 ha), which has resulted in avoidance of impacts to some areas of high, low and no habitat value. This total project footprint of 18.38 ha also includes approximately 3.51 ha considered to have no habitat value for the koala or grey-headed flying-fox due to the lack of non-juvenile food trees, and 7.46 ha of low value habitat, which had low utilisation rates (1 or less out of 30 trees with only old faecal pellets present). However, the inclusion of the additional 10 m width clearing required for a firebreak within the project footprint has resulted in a minor increase in the remnant habitat (high and medium value habitat) clearing area (from 6.5 ha in the referral to 7.41 ha).

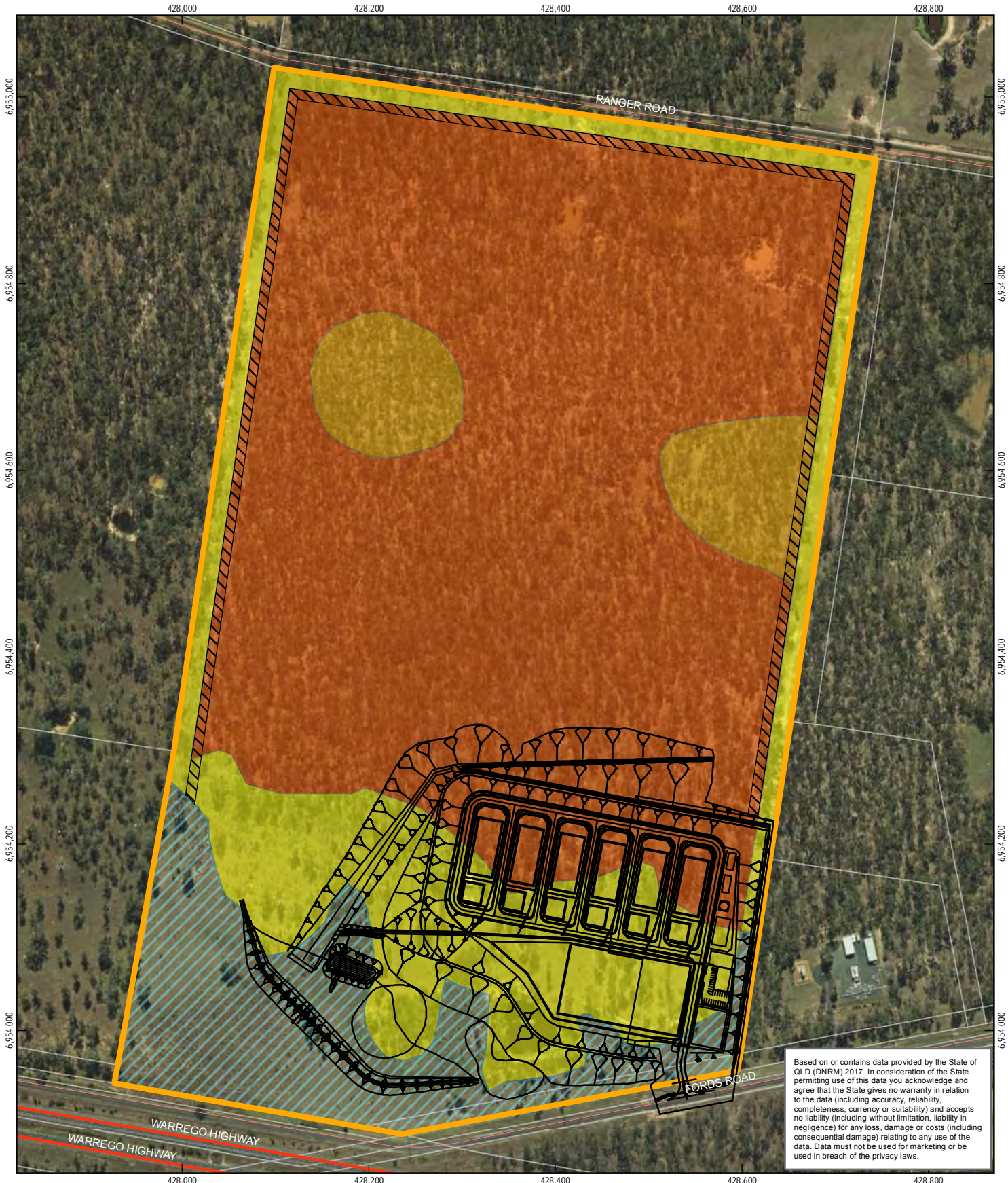
Mitigation measures described in Appendix A (Koala/Grey-headed Flying-fox Management Framework) will effectively address potential impacts to these species during clearing, construction and post-construction activities on the site. With these procedures in place, it is considered that stress or harm to individuals of these species, unnecessary direct impacts to habitat areas, or any indirect impacts, will be effectively avoided or negligible. Appropriate koala exclusion fencing at the southern boundary of the site and around hazardous infrastructure within the project footprint will assist in protecting individuals from mortality and injury both on and off the site. Replacement of the existing cattle fencing with wildlife friendly fencing along the remaining boundaries of the site will maintain the east-west and north-south koala movements within and between existing habitat areas.

Approximately 9.81 ha of the 18.38 ha (or 53%) of the project footprint will be rehabilitated/enhanced (for habitat to be retained) (refer to Figure 4). Rehabilitation areas include areas to be revegetated with a mix of locally endemic eucalypt species that will provide habitat for koalas and foraging habitat for grey-headed flying-fox.

An assessment against the significant impact criteria in the EPBC Act significant impact guidelines 1.1 (2013) has been undertaken with consideration of the reduced project footprint and proposed avoidance and mitigation measures. The project will clear approximately 14.87 ha of low, medium and high value habitat, being habitat critical to the survival of the koala (at a score of 8-9), with the remaining 3.51 ha being no value to koala (at a score of 4). Therefore the residual impact to koala is considered to be approximately 14.87 ha.

Other impacts to koala individuals, populations and adjacent habitat will be avoided or mitigated as per the measures provided in Appendix A. Furthermore, it is considered unlikely that the following potential impacts to koala will occur as a result of the project:

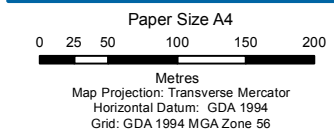
- Lead to a long-term decrease in the size of an important population of a species
- Reduce the area of occupancy of an important population
- Fragment an existing important population into two or more populations
- Disrupt the breeding cycle of an important population
- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- Introduce disease that may cause the species to decline
- Interfere substantially with the recovery of the species.



Based on or contains data provided by the State of QLD (DNRM) 2017. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

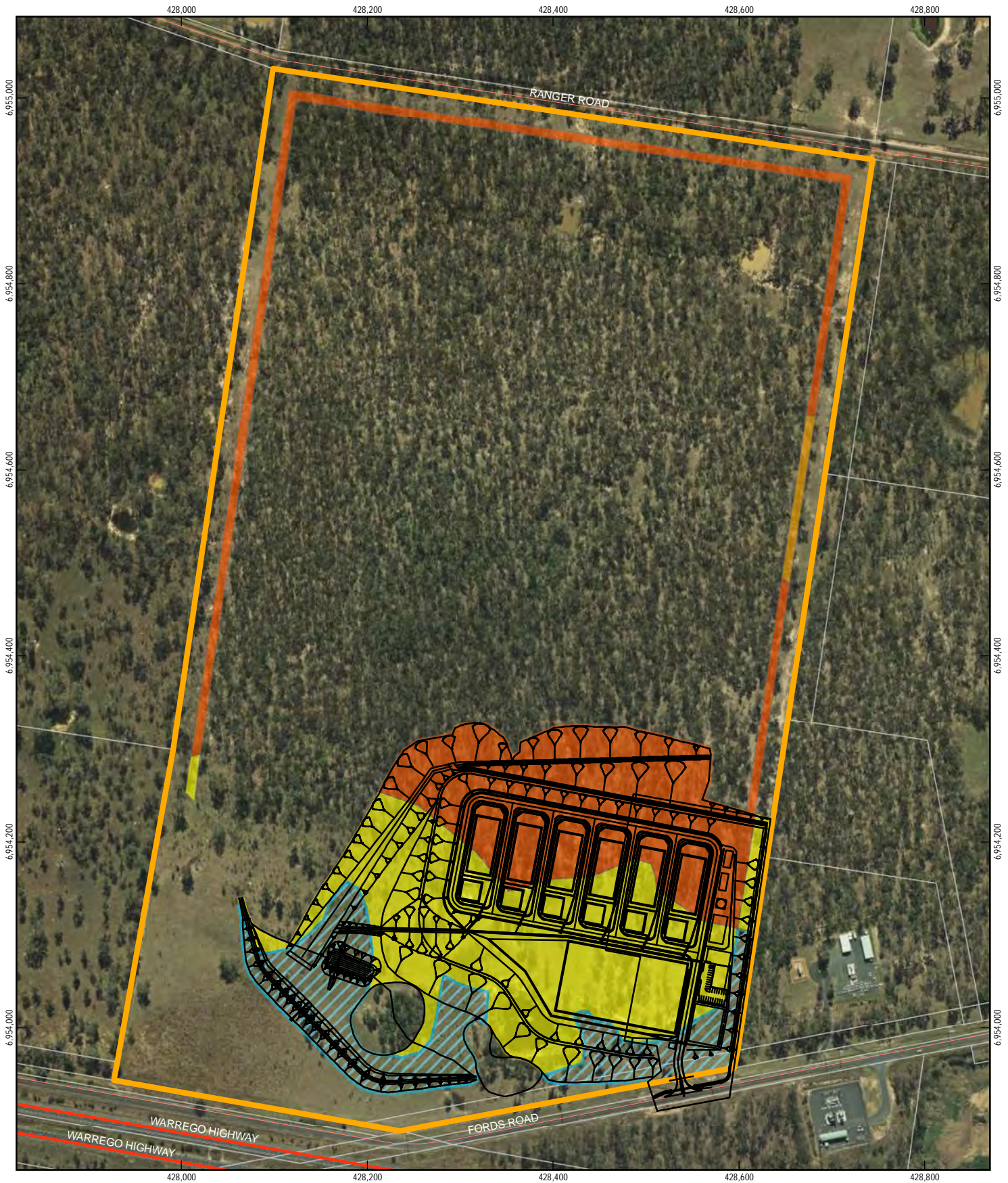
LEGEND	
Highway	Koala Habitat High (42.72Ha)
Street/Local Road	Medium (4.15Ha)
Design	Low (14.37Ha)
Cadastre	No Koala habitat value (8.89Ha)
Fire break 10m clearing (2.07 Ha)	Subject Site (70.15 Ha)

— No koala habitat value: Isolated, juvenile koala food trees present and no evidence of utilisation. Includes habitat types - open grazing land, periodically inundated grassland
 — Low koala use: 1 or less out of 30 trees (<3.33%) had koala pellets beneath them in the SAT assessment. Includes habitat types – open grazing land, open woodland, permanent waterbody and existing fire break
 — Medium koala use: 2 - 4 out of 30 trees assessed (3.33% -12.59%) had koala pellets beneath them in the SAT assessment. Includes habitat types – mixed Eucalypt woodland
 — High koala use: >4 out of 30 trees assessed (>12.59%) had koala pellets beneath them in the SAT assessment. Includes habitat types – mixed Eucalypt woodland and ephemeral watercourse



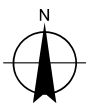
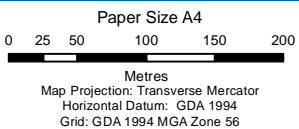
Quinbrook Infrastructure Partners Pty Ltd Job Number | 91-10341
 Lockyer Energy Project Revision | 3
 Date | 03 Nov 2017

Koala habitat values **Figure 2**



LEGEND		
Highway	Koala Habitat High (7.24Ha)	Low (7.46Ha)
Street/Local Road	No Koala habitat value (3.51Ha)	Subject Site (70.15 Ha)
Design	Medium (0.17Ha)	
Cadastre		

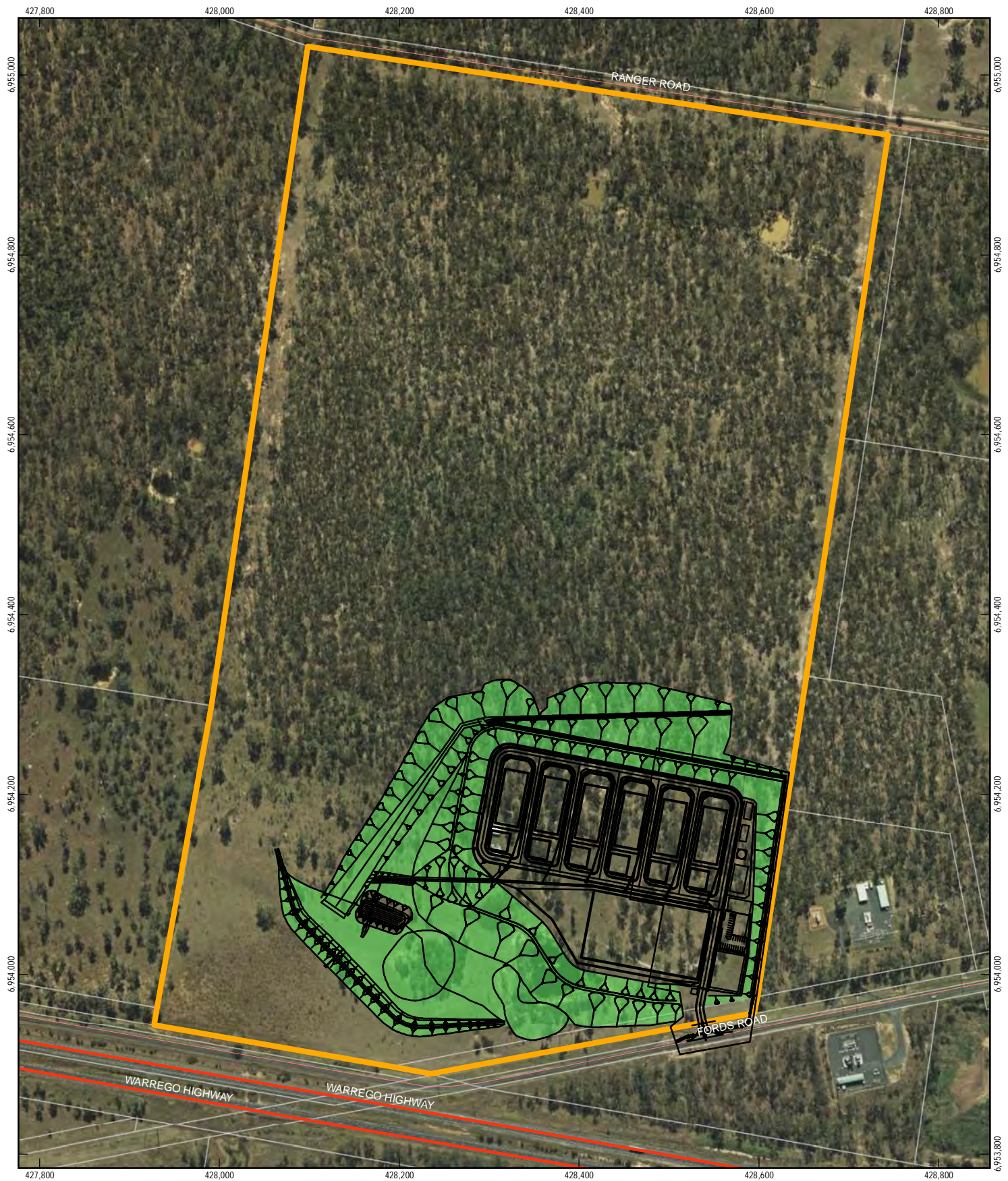
Based on or contains data provided by the State of QLD (DNRM) 2017. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



Quinbrook Infrastructure Partners Pty Ltd	Job Number	91-10341
Lockyer Energy Project	Revision	0
	Date	03 Nov 2017

Habitat impact areas

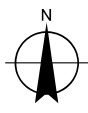
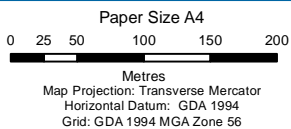
Figure 3



LEGEND

- Highway
- Street/Local Road
- Design
- Cadastre
- Rehabilitation Area
- Rehabilitation/Enhancement (9.81Ha)
- Subject Site (70.15 Ha)

Based on or contains data provided by the State of QLD (DNRM) 2017. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



Quinbrook Infrastructure Partners Pty Ltd	Job Number	91-10341
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	Date	03 Nov 2017

Rehabilitation area **Figure 4**

2.9 Information Request 1.9

Detail all limitations in the methodologies, results, technologies, information and work done to complete items 1.1 to 1.8 of this information request.

2.9.1 Response

Limitation and assumptions:

- Representative survey sites were chosen during field surveys based on the size of the habitat areas and the site overall.
- There are limitations in using the SAT survey method in that site activity levels in low use areas should only be interpreted in the context of location-specific habitat utilisation data and any determination of the importance of activity levels should be informed by a broader soil-based understanding of tree preference and of ecological history (Phillips and Callaghan, 2011).
- There are limitations in using the koala habitat assessment tool scoring guide to differentiate habitats within a site.
- Desktop information was derived from databases and mapping available at the time that assessments were made.
- Assessments used species profile information and recovery plans available for the target species.
- Assessment using GIS data involves errors relating to the scale that mapping data was created at.
- Avoidance and mitigation measures have been determined based on site characteristics and constraints, proposed project activities, identified potential direct and indirect impacts to koala and habitat, and species-specific management measures identified in accordance with guidelines, standard operating procedures and environmental management plans.

3. Offsets

3.1 Information Request 2.1

In the event residual significant impacts upon habitat critical to the survival of the koala and/or foraging habitat for the grey-headed flying fox cannot be avoided or mitigated, please provide details for an offset strategy to compensate for the residual significant impact of the proposed action. The offset strategy should include:

- a. The type of offsets proposed (direct/indirect);*
- b. The location (including a geo-referenced map) and suitability of proposed direct offsets for koalas and/or grey-headed flying foxes.*
- c. Current land tenure of any proposed offset and the method of securing enduring protection of the offset site and managing the offset for the life of the impact;*
- d. Whether the offset will be managed by the proponent or a third party. If a third party will manage the offset, how the proponent ensure that the offset is delivered; and*
- e. Outcomes that will be achieved for matters of national environmental significance if the offset strategy is implemented. The outcomes need to be specific, measurable and achievable, and should be based on robust baseline data. Outcomes should be developed in consideration of the Department's Outcomes-based Conditions Policy (2016) and Outcomes-based Conditions Guidance (2016), with suitable justification for considerations identified in the policy and guidance.*

Details about each proposed environmental outcome should include:

- i. The risks associated with achieving the outcome;*
- ii. The measurability of the outcome, including all suitable performance measures;*
- iii. Appropriate baseline data upon which the outcome has been defined and justified. The baseline data should be measured using the same framework and monitoring sites that will be utilised to monitor the offsets;*
- iv. Conservation gains to be achieved by each outcome, including, positive management strategies that will:*
 - a) avert future loss and degradation or damage to the protected matter; and/or*
 - b) provide a net gain in environmental value to the koala and/or greyheaded flying fox;*
- v. How the proposed outcomes align with the conservation advice for the koala+;*
- vi. Commitments to independent and periodic audits of performance towards achieving outcomes;*
- vii. Assessment of the likely level of control that the proponent will have over achieving the outcome; and*
- viii. Details of proposed management measures to achieve the outcome, including, but not limited to performance indicators, periodic milestones, proposed monitoring and adaptive management, and record keeping, publication and reporting procedures.*

+Threatened Species Scientific Committee (2012). Approved Conservation Advice for *Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory)(koala Northern Designatable Unit). Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/197-conservation-advice.pdf>.

3.1.1 Response

A description of the proponent's capacity to satisfy a condition (if required) to develop an Offset Management Plan for an offset for koala prior to commencement of the action is provided in Table 2 and shown on Figure 5. It is anticipated that the offset strategy will be further refined and detailed prior to the project commencing, as a condition of approval, and an appropriate Offset Management Plan prepared and implemented.

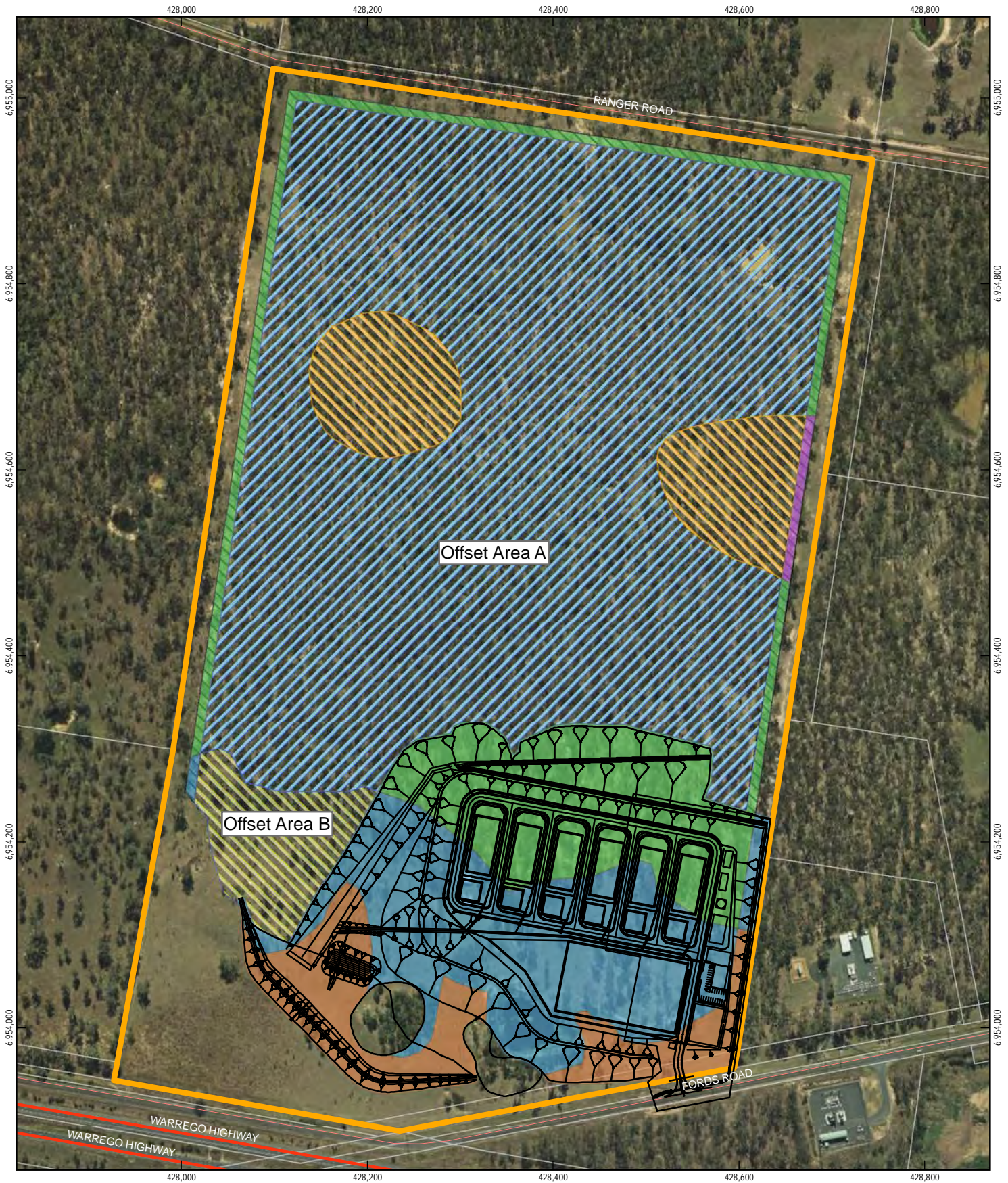
Based on presence of winter/spring forage species within and surrounding the project site, and the proposed revegetation using such species, no significant impact to grey-headed flying-fox was considered likely as a result of the project. Therefore, while the below offset strategy does not specifically need to consider or provide an offset for grey-headed flying-fox foraging habitat, the provision of an offset for koala habitat will also concurrently provide and protect habitat for the grey-headed flying-fox.

Table 2 Offset Strategy Details

Aspect	Description
Type of offset	Direct offset
Location	Lot 191 on CSH2361 – vegetated extent including remnant and regrowth areas of lot to be retained as an offset described as Offset Area A (remnant) and Offset Area B (regrowth) (refer to Figure 5).
Suitability	Suitable habitat known to be present on-site for koala
Land tenure	Freehold, owned by the proponent
Method of securing	Conservation covenant placed on the land title in perpetuity in accordance with the Queensland <i>Land Title Act 1994</i> (as per the EPBC Act Environmental Offset Policy)
Management	<p>The offset (Areas A and B) will be managed by the proponent (or a related entity on behalf of The Australian Clean Power Trust). An Offset Management Plan will be prepared that outlines the management of the offset area and will include measures, reporting, corrective actions and responsibilities for the following activities to be undertaken:</p> <ul style="list-style-type: none"> • Annual monitoring of the offset to assess koala usage of the site, evidence of predators, evidence of plant pathogens or fauna disease, and habitat condition aspects such as extent of weed infestations, eroding land, and presence of water. • Monitoring of wildlife friendly boundary fencing (including koala exclusion fencing around the project infrastructure and along the southern boundary of the lot) on a 6-monthly basis to identify maintenance requirements, such as trimming regrowth within 3 m of koala exclusion fence and repairing fences to assist in excluding predators. • Monitoring and management of weed infestations to maintain free movement of koalas and regeneration of food trees. • Restriction of livestock of a species and number that is incompatible to maintaining or improving koala habitat. • Should predators, such as wild dogs, be observed on-site, a management program of baiting may be undertaken and assessment of fencing for their future exclusion. • Monitoring and management of the two small farm dams located in Offset Area A and the ephemeral creek lines to reduce siltation and control erosion in this area as part of

Aspect	Description
	<p>general land management and improvement of the habitat condition for the koala.</p> <ul style="list-style-type: none"> Controlled fire management to maintain eucalypt species diversity and health, as appropriate to koala habitat, season and ecosystem. Offset Area B will include revegetation in accordance with Landscape Management and Revegetation Plan including incorporation of eucalypt species suitable for providing koala food trees and winter/spring foraging habitat for the grey-headed flying-fox.
Estimated cost	\$500,000 - \$800,000
Outcomes	<p>The outcomes proposed to be achieved for the duration of the offset for koala are:</p> <ul style="list-style-type: none"> The habitat for koala is maintained or improved The on-site threats to koala and its habitat are monitored and managed <p>These outcomes were based on priority objectives within the below conservation advice and recovery plan documents.</p>
Risks	<p>Risks associated with achieving the outcomes include:</p> <ul style="list-style-type: none"> Other development in connected habitat areas having an impact on the local koala population Weed infestations that are not controlled may impact the habitat quality and condition for koalas If pathogens are introduced, they may be difficult to eradicate or prevent from spreading between individuals (fauna or flora) Extreme weather events cause damage to the habitat within the offset area, therefore reducing its use by koala
Measurability of outcome	<p>The Offset Management Plan will include monitoring schedules and recording requirements for habitat conditions, on-site koala usage, evidence of weeds and evidence of threats such as predators and pathogens/disease. Specific performance and management measures and reporting will be included in the Plan.</p>
Baseline data	<p>These outcomes are derived from baseline data collected during field surveys, particularly relating to habitat characteristics and conditions, vegetation community descriptions, koala utilisation rates (using Spot Assessment Technique surveys) and dominant food species for koalas and grey-headed flying-fox. Baseline data can also be sourced from local community/action groups regarding local sightings of koalas and desktop sources such as Atlas of Living Australia and Wildlife Online for historical records. The Offset Management Plan will detail the monitoring and reporting schedule and methods.</p>
Conservation gains	<p>Conservation gains to be achieved include the maintenance of high quality habitat for the species, information relating to the abundance of the local koala population, and engaging in strategies that actively protect the species from the introduction or spread of threats (the management of which aids in the overall recovery of the species).</p>
Conservation advice	<p>The outcomes above are consistent with the following conservation advice for the koala:</p>

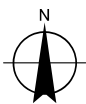
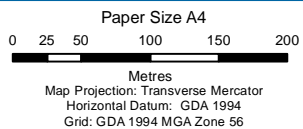
Aspect	Description
	<ul style="list-style-type: none"> • Priority Management Actions within the Approved Conservation Advice for <i>Phascolarctos cinereus</i> (combined populations of Queensland, New South Wales and the Australian Capital Territory) (TSSC, 2012) • Recovery objectives of the Recovery plan for the koala (<i>Phascolarctos cinereus</i>) (DECC, 2008)
Audit	The Offset Management Plan will include an auditing schedule that assesses the performance of the monitoring and management strategies in achieving the outcomes.
Assessment of level of control	The project proponent will have total control over the offset area and the implementation of monitoring and maintenance in accordance with the Offset Management Plan.
Management measures	<p>Monitoring:</p> <ul style="list-style-type: none"> • Baseline data is collected annually during Stage 1 construction of the project, and thereafter for the duration of the offset. One monitoring event will be undertaken prior to the offset commencing in order to establish the monitoring locations and provide an initial baseline for the monitoring program within the offset site. <p>Milestones:</p> <ul style="list-style-type: none"> • At 5 years after the start of the offset, the habitat has been maintained or improved and no increase in threats have occurred. <p>Performance indicators:</p> <ul style="list-style-type: none"> • Density and abundance of koala food trees is maintained or increased. • Threats that have been identified have not spread or increased. <p>Further details of monitoring, adaptive management/corrective actions, record keeping, publication and reporting procedures will be included in the Offset Management Plan. Offset Area B will also be monitored and managed in accordance with the Project's Landscape Management and Revegetation Plan with the aim of establishing and improving koala habitat value to a level which is consistent with Offset Area A.</p>



LEGEND

- | | | | | | |
|-------------------|------------------------|------------|---------------------------|---------------------------|-------------------------|
| Highway | Impact Area 1 (7.24Ha) | 3 (3.51Ha) | Offset Area A 5 (35.47Ha) | Offset Area B 7 (2.13 Ha) | Fire break 10m clearing |
| Street/Local Road | 2 (0.17Ha) | 4 (7.46Ha) | 6 (3.98Ha) | Subject Site (70.15 Ha) | |
| Design | | | | | |
| Cadastre | | | | | |

Based on or contains data provided by the State of QLD (DNRM) 2017. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



Quinbrook Infrastructure Partners Pty Ltd	Job Number	91-10341
Lockyer Energy Project	Revision	4
	Date	27 Nov 2017

Offset area and assessment units **Figure 5**

3.2 Information Request 2.2

Provide an analysis about how the offset(s) meets the requirements in the Department's Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy[^].

In order for the Department to consider whether any offset proposal meets the Department's Offset Policy, provide a table detailing the proposed offset's 'score' for each attribute of the Offsets assessment guide, an evidence-based justification for the score for each attribute, and literature references to support the evidence-based justification. If the offset involves improving habitat quality, the same methodology for measuring habitat quality must be used at both the impact and offset sites. Should the offset proposal be acceptable and the project be approved, please note that the information provided will be used in conditions to ensure that environmental outcomes are achieved.

[^] Department of Sustainability, Environment, Water, Population and Communities (2012). Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy. Commonwealth of Australia, Canberra. Available from: <http://www.environment.gov.au/epbc/publications/epbc-actenvironmental-offsets-policy>.

3.2.1 Response

Methods

This offset assessment complies with the EPBC Act Environmental Offsets Policy and has been undertaken in accordance with the following guidelines:

- How to use the Offsets assessment guide (DEE, 2012)
- Matters of National Environmental Significance: Significant impact guidelines 1.1 (DEE, 2013)
- EPBC Act Referral Guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (DEE, 2014)
- Guide to determining terrestrial habitat quality. A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy (EHP, 2017)

The following scoring guides were used to rate the habitat quality of the impact and offset areas for input into the Offsets Assessment Guide. Scores have not been weighted due to insufficient baseline knowledge of specific ecological requirements and interactions for the koala within the local area as well as the broader landscape. Habitat quality has been assessed consistently on both the impact and offset sites using both desktop and site assessments and the scoring guides provided. Impact and offset areas were divided into Assessment Units (AUs) based on the habitat values mapped across the site.

The site condition scoring guide is provided in Table 3, which was derived through species profile knowledge and site and desktop assessments.

Table 3 Site Condition Scoring Guide

Score	Habitat Condition
1	No suitable habitat. No koala food trees present. Vegetation completely degraded (the structure of the vegetation is no longer intact and the area is completely or almost completely without native species). Highly impacted by clearing, weeds, logging, grazing, cultivation or bushfire impacts.
2	Little or no suitable habitat. Only isolated, juvenile koala food trees. Vegetation degraded (basic vegetation structure severely impacted by disturbance). Evidence of weeds, logging, grazing, cultivation or bushfire impacts.
3	Some suitable habitat present as regrowth vegetation. Only isolated, juvenile koala food trees. Vegetation degraded (basic vegetation structure severely impacted by disturbance). Evidence of weeds, logging, grazing, cultivation or bushfire impacts.

Score	Habitat Condition
4	Some suitable habitat present as regrowth vegetation. Only isolated, juvenile koala food trees. Vegetation degraded (basic vegetation structure severely impacted by disturbance). Minor evidence of weeds, logging, grazing, cultivation or bushfire impacts.
5	Suitable habitat present as regrowth or disturbed remnant vegetation. Koala food trees sparse or dominated by 1 species. Vegetation structure significantly altered by obvious signs of multiple disturbances. Evidence of weeds, logging, grazing, cultivation or bushfire impacts.
6	Suitable habitat present as remnant vegetation. Koala food trees sparse or dominated by 1 species. Vegetation structure significantly altered by obvious signs of multiple disturbances. Evidence of weeds, logging, grazing, cultivation or bushfire impacts.
7	Suitable habitat present as remnant vegetation. Koala food trees sparse or dominated by 1 species. Vegetation structure altered (obvious signs of disturbance to vegetation structure caused by repeat fires, the presence of some more aggressive weeds, dieback, logging and grazing).
8	Suitable habitat present as remnant vegetation. Koala food trees abundant with >2 species present. Vegetation structure altered (obvious signs of disturbance to vegetation structure caused by repeat fires, the presence of some more aggressive weeds, dieback, logging and grazing).
9	Suitable habitat present as remnant vegetation. Koala food trees abundant with >2 species present. Vegetation structure intact (disturbance affecting individual species and weeds are non-aggressive species). Minor evidence of weeds, logging, grazing, cultivation or bushfire impacts.
10	Suitable habitat present as remnant vegetation. Koala food trees abundant with >2 species present. Vegetation structure intact (disturbance affecting individual species and weeds are non-aggressive species). No evidence of weeds, logging, grazing, cultivation or bushfire impacts.

The site context scoring guide is provided in Table 4. The method within the Queensland EHP's Guide to determining terrestrial habitat quality (version 1.2 April 2017) was used as a basis for determining site context scoring method. This method involved a desktop-based assessment (using GIS analysis) that considered total remnant patch size, connectedness (proportion, as a percentage, of a site's boundary that is connected to remnant vegetation), context (percentage of remnant vegetation within a 1 km buffer), and proximity to mapped State, bioregional, regional or sub-regional corridors (terrestrial or riparian).

Table 4 Site Context Scoring Guide (based on EHP, 2017)

Attribute	Scoring Categories					
	Score	0	2	5	7	10
Size of Patch	Score	0	2	5	7	10
	Description	<5 ha	5-25 ha	26-100 ha	101-200 ha	>200 ha
Connectedness	Score	0	2	4	5	
	Description	0-10 %	10-<50 %	50-75 %	>75 % or >500 ha	
Context	Score	0	2	4	5	
	Description	<10 % remnant	>10-30 % remnant	>30-75 % remnant	>75 % remnant	
Ecological Corridors	Score	0	4	6		
	Description	Not within	Sharing a common boundary	Within (whole or part)		

The species stocking rate scoring guide is provided in Table 5. The species stocking rate score was determined using the confirmed or apparent (based on previous surveys and habitat mapping) presence of the koala on-site. The utilisation rate derived from site surveys using the Spot Assessment Technique (SAT) can be a basis for a species stocking rate score (based on Phillips and Callaghan, 2011). The utilisation ranges are based on the koala activity category of East Coast (low), which generally has a naturally occurring low density population. Phillips and Callaghan (2011) state that koala densities for the east coast, low density category are arbitrarily defined at less than or equal to 0.1 koalas/ha. Within this low density category, low use activity is less than 3.33% utilisation, medium (normal) use is between 3.33% and 12.59% utilisation, and high use is greater than 12.59% utilisation. The recentness of evidence was also used as a factor in the species stocking rate, where more recent evidence and a higher utilisation was rated higher than older evidence (e.g. older faecal pellets) and lower utilisation.

Table 5 Species Stocking Rate Scoring Guide

Score	Evidence of Presence
1	No evidence of koalas recorded, no habitat value
2	No evidence of koalas recorded, suitable habitat present
3	Low use (less than 3.33% utilisation), evidence of koalas not recent
4	Low use (less than 3.33% utilisation), recent evidence
5	Medium use (3.33-12.59% utilisation), evidence of koalas not recent
6	Medium use (3.33-12.59% utilisation), recent evidence
7	High use (12.59-22.52% utilisation), evidence of koalas not recent
8	High use (12.59-22.52% utilisation), recent evidence
9	High use (greater than 22.52% utilisation), evidence of koalas not recent
10	High use (greater than 22.52% utilisation), recent evidence

In identifying the risk of loss % without the offset, a likelihood scoring guide was developed in accordance with the document EPBC Act *How to use the offset assessment guide* and is provided in Table 6. The risk of loss assessment considered the relevant pressures with the potential to influence the risk of the site being cleared in the future for other existing rural or agricultural activities, new infrastructure, or an intensification of rural residential purposes consistent with surrounding land uses. Some of these clearing pressures would not necessarily trigger protections of koalas and their habitat under legislation.

Table 6 Risk of Loss Likelihood Ratings

Likelihood	Description
Highly likely	Is expected to occur in most circumstances (e.g. 90%)
Likely	Will probably occur during the 20 year period (e.g. 75%)
Possible	Might occur during the 20 year period (e.g. 50%)
Unlikely	Could occur but considered unlikely or doubtful (e.g. 25%)
Rare	May occur in exceptional circumstances (e.g. 10%)

Results

A summary of the scoring for impact areas is provided in Table 7 and offset areas in Table 8, with the corresponding assessment units and areas shown on Figure 5. In order to provide one habitat quality score for the impact and offset areas for input to the offset assessment guide spreadsheet, scores were weighted according to the area of each habitat type in proportion to the total area to be impacted or offset. While the significant residual impact was determined to be 14.87 ha of habitat critical to the survival of the koala, the below scoring and calculations

were based on an impact area of 18.38 ha to demonstrate that the area of offset provides a greater area that what is required by the Offset Assessment Guide.

Table 7 Impact area habitat quality scoring

Impact AU and habitat value	Area (ha)	Site condition	Site context	Species stocking rate	Combined Score	Percent of Impact Area	Weighted Score
1 High	7.24	9	6.2	8	7.7	39	3.0
2 Medium	0.17	9	6.2	6	7.1	1	0.1
4 Low	7.46	5	5.0	3	4.3	41	1.8
3 No	3.51	2	4.2	1	2.4	19	0.5
Total	18.38						5.3

Table 8 Offset area habitat quality scoring

Impact AU and habitat value	Area (ha)	Site condition	Site context	Species stocking rate	Combined Score	Percent of Offset Area	Weighted Score
Offset Area A							
5 High	35.47	9	6.2	8	7.7	85	6.6
6 Medium	3.98	9	6.2	6	7.1	10	0.7
Offset Area B							
7 Low	2.13	5	5.0	3	4.3	5	0.2
Total	41.58					100	7.5

The Offsets Assessment Guide indicates that the proposed offset site provides a 165 % direct offset, based on:

- Total impact area of 18.38 ha with a habitat quality score of 5 (rounded down from 5.3), giving an adjusted quantum of impact of 9.19 ha
- Legally secured offset site of 41.58 ha (comprising Offset Area A and B) with a current and expected future habitat quality of 8, and
- An assumption that if the offset site was not legally secured, the risk of loss of the site is 50% (due to potential future clearing should the proposed development not go ahead, based on a likelihood assessment defined in Table 6) but with a maintained habitat quality of 8 (if not cleared).

Table 9 provides the descriptions and justification of inputs to the offset assessment guide for the koala (and therefore also providing a suitable offset for grey-headed flying-fox foraging habitat). A copy of the offset assessment guide spreadsheet is provided as Appendix B.

Table 9 Koala Offset Assessment Guide

Components	Description of Input	Calculator Input
Time over which loss is averted (max. 20 years)	A 20 year period has been applied as the land will be legally secured	20 years
Time until ecological benefit	A 0 year period has been applied as the habitat value at this site is already present	0 years
Start area (hectares)	41.58 ha	41.58 ha
Start quality (scale of 0-10)	<p>A total weighted habitat quality score of 7.5 has been derived for the offset site, as per the below quality scores for each area.</p> <p>Offset Area A:</p> <ul style="list-style-type: none"> For the area of high habitat value: Site context score was 6.2; Site condition score was 9; and Species stocking rate was 8. For the areas of medium habitat value: Site context score was 6.2; Site condition score was 9; and Species stocking rate was 6. <p>Offset Area B:</p> <ul style="list-style-type: none"> For the area of low habitat value: Site context score was 5; Site condition score was 5; and Species stocking rate was 3. 	8 (rounded up from 7.5)
Risk of loss (%) without offset	<p>If the offset site is not legally secured it will be at risk of being cleared in the future for existing agricultural, new infrastructure over small areas, or rural residential purposes, consistent with surrounding land uses. There are pressures on the land that would not necessarily trigger an approval process resulting in protection of koalas and their habitat, thereby not result in offsets for the offset area itself.</p> <p>Risk of loss was considered to not be higher than 50% due to the existing protections afforded under the EPBC Act, <i>Nature Conservation Act 1992</i> (NC Act) and <i>Vegetation Management Act 1999</i> (VM Act) (and <i>Planning Act 2016</i>) regarding the known occurrence of vulnerable koala and the mapped regulated vegetation, therefore making the offset area unlikely to be able to be clear-felled for one particular development in the future.</p> <p>Risk of loss was considered to not be lower than 50% because of the existing rural use that would be continued (without the need for an approval) if the project does not proceed. These activities could likely be increased in intensity and extent in accordance with the local and regional planning intent and surrounding land uses. Other influencing factors include the lower status of the remnant vegetation on-site (Least Concern Regional Ecosystem, which does not trigger offsets); the proximity to major transport routes (Warrego Highway, Gatton-Esk Road, and inland rail corridor) making the site attractive to a range of rural business activities (logistically and for advertising);</p>	50 %

Components	Description of Input	Calculator Input
	and nearby major town centre (Gatton) with expansion of urban and rural residential areas via the local government planning scheme and the urban footprint under the SEQ Regional Plan. The risk of loss assessment is described further in the Risk of Loss Assessment section below.	
Future quality without offset (scale of 0-10)	The habitat quality is considered likely to be maintained similar to the existing condition and species usage (if not cleared), although there may be some impacts due to disturbances through increased access, clearing, fragmentation, edge effects etc. However if it were to be incrementally cleared or degraded through increased intensity or extent of rural uses, then this future quality without offset would be less than 8. As a conservative approach, this score has been left as 8.	8
Risk of loss (%) with offset	The site will be legally secured therefore will not be lost.	0 %
Future quality with offset (scale of 0-10)	The site will be legally secured, therefore the habitat quality will not be at risk of future clearing or major disturbances. Due to connectivity to larger areas of koala habitat, the ability for koalas to move into and through the offset site and the removal of disturbing factors such as additional human activities, the condition and species stocking rate will, at a minimum, be maintained. Due to the proposed offset management measures and the rehabilitation of Offset Area B, it is likely that this future quality will be increased. However as a conservative approach, this quality score has been left as 8.	8
Confidence in result	There is a high degree of confidence in this assessment due to repeated survey efforts covering large areas of the impact and offset sites that have provided adequate data on habitat quality and koala presence. Assessment methods are consistent and undertaken at representative locations. Impact extents are clearly defined and offsets will be in place prior to any construction impacts occurring.	95 %

The offset area is on a freehold lot currently zoned Rural General under the local government planning scheme (Gatton Planning Scheme) with no existing land clearing covenants. An assessment of the potential pressures considered likely to contribute to the risk of loss of existing koalas and koala habitat was undertaken, should the offset site not be legally secured. This assessment included a likelihood of occurrence assessment, which considered the following factors that were found to increase the risk of loss of the offset area (without the offset in place):

- Continuing use rights and grazing activities would continue to exist without the offset in place, where there would be a likely increase in extent and intensity of agricultural activities that reduce the areas of koala habitat gradually over time without triggering the need for referral, therefore increasing the risk of loss. **HIGHLY LIKELY**
- The Rural General zoning provides for agricultural production, other rural activities and the maintenance of landscape quality important to the overall character of the Shire. A material change of use development (i.e. new activity or increased intensity of an existing activity) for agriculture (e.g. cropping, pastures, plantation and horticulture) or animal husbandry

(e.g. keeping, depasturing or stabling of any animal) are currently exempt from assessment against the planning scheme in this zone. **HIGHLY LIKELY**

- Mapped Least Concern Regional Ecosystem, which has a number of exemptions for clearing for agricultural and grazing purposes on freehold land, including necessary built infrastructure, to source timber for infrastructure, fence, road or track to 10 m width, fire management line or firebreak, to reduce hazardous fuel load, to maintain infrastructure or to reduce imminent risk to people or infrastructure. If the purpose fits the exemption under the Planning Regulation 2017, then no further assessment would be triggered for these activities under the Planning Act or *Environmental Offsets Act 2014*. Such incremental or selective clearing purposes undertaken by a private landholder would not trigger referral for koala under the EPBC Act (e.g. with reference to the Figure 2 of the Referral guidelines for the vulnerable koala, if 5 ha of habitat scoring a 9 or 10 was selectively cleared, then a significant impact would not be expected), however are likely to reduce the extent and suitability of habitat for koalas over a 20 year period. **HIGHLY LIKELY**
- Being a freehold property containing native hardwood forest (identified as Regional Ecosystem 12.9-10.2/12.9-10.5), a landholder can undertake an ongoing native forestry practice in accordance with the 'Managing a native forest practice' self-assessable vegetation clearing code made under the VM Act without further approval assessment being triggered. **POSSIBLE**
- Although the local government planning scheme limits the lot size to 100 ha minimum in rural zoned areas, there are lots subdivided down to 2 ha size within the rural general and rural agricultural zoned areas surrounding the offset area (the closest being 1.2 km from the offset area). Some of these lots contain very little remaining vegetation. Encroaching residential development and land use will increase the threats to this habitat area and to individual koalas in connected habitat. **HIGHLY LIKELY**
- Should a future proposed development of the offset area be assessable under the Planning Act, an offset would only be required if a significant residual impact to habitat for koalas was considered likely, which may not be the case for separate smaller developments with incremental impacts. **POSSIBLE**
- Should clearing be proposed within the mapped Essential Habitat for squatter pigeon (*Geophaps scripta scripta*) within part of the offset area, the regulatory protection of this mapped habitat under the VM Act would not apply due to the mandatory essential habitat factors for this species not including the existing Regional Ecosystem 12.9-10.2/12.9-10.5. **LIKELY**
- The offset area is outside the South East Queensland Koala Protection Area (SEQ KPA), which provides additional protection to mapped koala habitat under the Planning Act and NC Act. There is no mapped koala habitat over this lot, therefore no approval requirements relating to mapped koala habitat. A State government supported infrastructure project outside of this SEQ KPA, which is otherwise exempt from assessment against State legislation such as the VM Act, is not required to undertake a self-assessment or provide offsets for removing individual non-juvenile koala habitat trees, which could encroach on the offset area where upgrades or new alignments to transport, electricity or utility pipeline corridors are proposed. **POSSIBLE**
- No protected plants or mapped high risk flora survey trigger areas present under NC Act that would trigger further survey prior to clearing, therefore clearing within the offset area could be undertaken without notification to the State or without a clearing permit. **LIKELY**
- Minor operational work (earthworks less than 50 m³) in the Rural General zone is exempt development against the planning scheme. **HIGHLY LIKELY**

- The lot is located at an intersection of several gas supply pipelines and adjacent to other gas and electricity infrastructure, therefore is likely to be a desirable location for other power supply infrastructure or related developments in the future. While a major development within the offset area would itself require an offset for koalas, development adjacent the offset area may not have a significant impact on koalas and therefore not require an offset but still have threatening consequence on the offset area. **LIKELY**
- A local utility or low impact telecommunications facility in the Rural General zone is exempt development against the planning scheme. **POSSIBLE**
- Calculations done using GIS mapping have identified there is approximately 1506.6 ha of non-remnant areas (developed, cleared/disturbed or regrowth vegetation) within a 2 km buffer surrounding (but not including) the on-site regional ecosystem (equating to approximately 77.6 % non-remnant areas of a total 1940.3 ha). The remainder of this 2 km buffer area includes areas of remnant vegetation (approximately 433.7 ha or 22.4 % of the total area). The extensive clearing within the 2 km buffer area means that there is increased risk of loss of the offset area (in terms of its carrying capacity and values for koala) due to increased development pressure, incompatible land uses, increased fragmentation and isolation of habitat areas, reduced safe movement opportunities, reduced water sources, increased competition, and increased threats to koala individuals through vehicle strike, predators and disease. **POSSIBLE**
- Most of the regional area is mapped as Priority Living Area under the *Regional Planning Interests Act 2014* (established to safeguard areas required for the growth of towns from incompatible resource activities), not as a Strategic Environmental Area that would protect the ecological integrity as a priority. The SEQ Regional Plan provides the expected dwelling growth for the Lockyer Valley local government area, indicating that new dwellings will expand significantly in this region (an additional 9,600 dwellings by 2041) and this will occur completely outside the urban footprint. This demonstrates the regional intent for residential growth outside the urban zoned areas, which can impact the offset area through future zoning changes and planning scheme changes. **LIKELY**
- There were previously coal exploration permits over the site (historically and as recently as 2014), which indicates that future resource exploration permits could be granted and potentially allow exploration activities on or adjacent the offset area. **POSSIBLE**

Compliance with Environmental Offsets Policy

The proposed offset has been developed in accordance with the overarching principles and aims of the EPBC Act and EPBC Act Environmental Offsets Policy (DEE, 2012), as outlined in Table 10.

Table 10 Offset Proposal Compliance with EPBC Act Environmental Offsets Policy

Offset Principles	Compliance
Suitable offsets must:	
1. deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action	The proposed offset site will be legally secured and contain suitable habitat for the target MNES that will be maintained and improved through removal of major threats (i.e. clearing, access to major roads, pest fauna)
2. be built around direct offsets but may include other compensatory measures	The proposed offset site achieves greater than 100 % of the direct offset requirements.

Offset Principles	Compliance
3. be in proportion to the level of statutory protection that applies to the protected matter	The offset proposal has been defined based on the EPBC Act Offsets Assessment Guide with regard to the vulnerable koala, and therefore is considered consistent with the statutory protection that applies to the koala as well as the vulnerable grey-headed flying-fox
4. be of a size and scale proportionate to the residual impacts on the protected matter	The offset proposal has been defined based on the EPBC Act Offsets Assessment Guide, and therefore is considered to be of a size and scale proportionate to the residual impacts on the MNES
5. effectively account for and manage the risks of the offset not succeeding	<p>The offset site contains suitable habitat for the MNES, is owned by the proponent, and will be legally secured prior to the impacts occurring, therefore there is a low risk of the offset not succeeding.</p> <p>The Offset Management Plan will detail monitoring and management actions to be implemented with timeframes and performance objectives. Management measures will include maintenance of fauna passage between habitats, restriction of access and fencing to hazardous locations, weed control and invasive fauna pest control.</p>
6. be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action)	<p>The proposed offset site is privately-owned freehold and is not otherwise protected or conserved. The State development approval for the project requires a covenant to be placed over the remaining vegetation within the offset site in perpetuity under the Land Title Act 1994, which provides the mechanism for legally securing the site.</p> <p>The Queensland Environmental Offsets Policy recognises that requirements for offsets for MNES under the EPBC Act do not need to be duplicated where the same impact and prescribed matter have been subject to assessment under the EPBC Act as a controlled action.</p>
7. be efficient, effective, timely, transparent, scientifically robust and reasonable	The proposed offset site has been assessed using established and scientifically robust methods and will be delivered prior to the impacts occurring to the MNES.
8. have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced	An Offset Management Plan will be developed for the offset site, including management actions, performance indicators, monitoring schedules, auditing and reporting mechanisms.

3.3 Information Request 2.3

Detail all limitations in the methodologies, results, technologies, information and work done to complete items 2.1 through 2.2 of this information request.

3.3.1 Response

Limitation and assumptions:

- Assumptions made for the assessment of habitat quality and the derivation of scores and categories have been based on available data, studies and mapping of species, habitats, vegetation communities and imagery interpretation.

- Vegetation condition was assessed at a point in time and in representative locations and can change rapidly in response to events such as fire.
- Where mapping processes have been used, these may be subject to minor error in area calculations due to the scale and limitations of available mapping layers and imagery used.
- The habitat quality scores can only be entered as whole amounts in the offset assessment guide calculator, therefore habitat quality scores have been rounded up or down to the nearest integer accordingly.
- The existing 20 m firebreak around the offset area was not included as part of the disturbance footprint for the project because it is existing to the site and therefore does not form part of the proposed disturbance area. The additional 10 m clearing was included in the disturbance area calculation. However, should the department require the existing firebreak area to be included, the impact area would change to 23.11 ha with the existing firebreak included as low value habitat, consistent with the assessment method and mapping provided in Figure 2. The overall size-weighted habitat quality score would still be 5. With these inputs to the offset assessment guide, the offset area provides 124 % of the direct offset requirement.
- Further details of the provision and management of the offset area will be provided in an Offset Strategy document to be prepared as a condition of the approval, and through the Offset Management Plan to be implemented on-site.

4. Economic and Social Matters

4.1 Information Request 3.1

Provide details on the social and economic costs and/or benefits of undertaking the proposed action, including the:

- a. Need for additional peak load power in South-east Queensland;
- b. Population size that the project would benefit;
- c. Potential employment opportunities expected to be generated during development of the proposed action; and
- d. If economic benefits and employment opportunities are in addition to what would have been expected if the action were not to take place;
- e. Details of any further public stakeholder consultation activities not provided in the referral.

4.1.1 Response

Need for additional peak load power in South-east Queensland

“Queensland faces a chaotic summer with sky-high power prices and the threat of brownouts as southern states drain our electricity supplies. Disruptions could hit aged care and retirement homes, electric trains and other essential services while soaring prices send Queensland businesses to the wall with thousands of jobs at risk”¹.

There is no shortage of press pointing towards Australia’s “power crisis” such as the above quotation from the Courier Mail (10 September 2017). Power bills are rising and security of supply is reducing as the Australian power sector struggles to provide sufficient reliable and controllable (dispatchable) power generation. In the meantime, base load, dispatchable plant is retiring and not being replaced as intermittent solar and wind plant impact the grid.

Without new, dispatchable power generation, there will be additional blackouts and the cost of power will increase as the supply/demand balance tips out of control. This will result in small businesses and families being forced to pay more, for a less reliable system. This significantly impacts the economy as businesses close and household budgets are stretched to pay the power bill and to pay for an increase in the cost of almost everything that uses electricity in its production. The proposed power station is highly efficient and meets the most stringent Australian regulatory requirements in terms of emissions. Typical operating regimes based on market forecasts predict that the plant will only need to operate for up to 5% of the year during peak electricity demand periods. Furthermore, having a fast response, gas fired power station ready to respond to peak demand event is the least carbon intensive solution to ensuring electricity is available when electricity users require it.

It is estimated that the direct cost to businesses of the South Australia blackout in September 2016 was \$367M and that the cost to the average small business was \$5,000². In addition to this, the State-wide blackout created enormous indirect costs, such as delayed surgery, loss of transport infrastructure (traffic lights and trains for example). Queensland’s peak demand occurs on the hottest of days, during heat waves. It is well recognised that elderly and vulnerable

¹ <http://www.couriermail.com.au/news/queensland/concerns-soaring-power-prices-and-shortages-could-disrupt-economy-and-essential-services/news-story/7aa86b82c4478757ba6913377112475e>

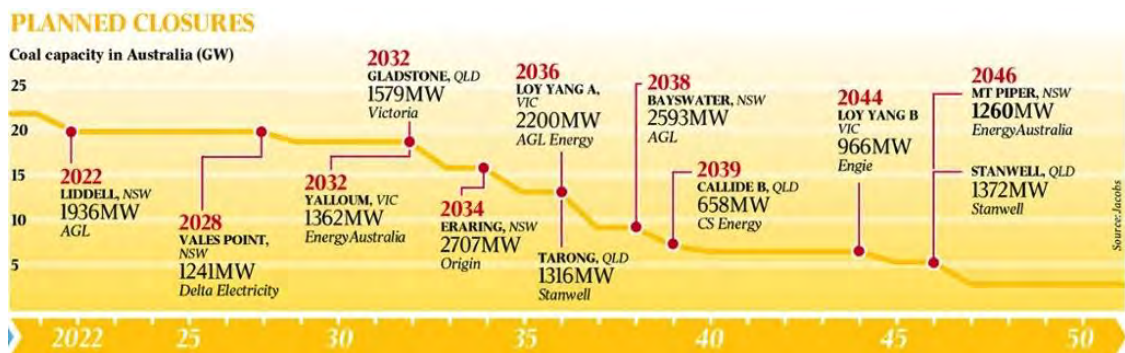
² <http://www.abc.net.au/news/2016-12-09/sa-blackout-costs-could-have-been-worse-business-sa-says/8106600>

people can die during heat waves and that this can be mitigated somewhat by these people having access to reliable air-conditioning.

The Lockyer project will help to provide security of supply in south-east Queensland and to place downward pressure on power pricing by providing an efficient and cost-effective means of providing power during periods of peak demand. The project is ideally located to provide power security to the Lockyer Valley; adjacent to the existing Roma to Brisbane gas pipeline compressor station and across the road from the Gatton Sub-station which is part of the Energex electricity system. By locating the proposed plant adjacent to existing infrastructure with excess capacity and within the south east Queensland population zone the project delivers the most efficient use of existing system capacity in the most secure location to help keep the lights on for residents in Lockyer as well as south east Queensland.

The Lockyer project also allows additional renewable energy penetration in the Queensland grid, because the proposed power station is fast start and flexible enough to firm intermittent renewables when the sun is not shining and/or the wind is not blowing. The project will reduce the chance of extremely high wholesale power prices by increasing the supply of peak power generation; this increase in completion benefits all electricity users by driving wholesale prices down. The Lockyer project reduces the chance of blackouts and increases grid security in the Lockyer Valley by providing an additional means of supplying power.

The Lockyer Energy Project will help keep the lights on in the Lockyer Valley and in south-east Queensland.



COAL-FIRED POWER STATION CLOSURES

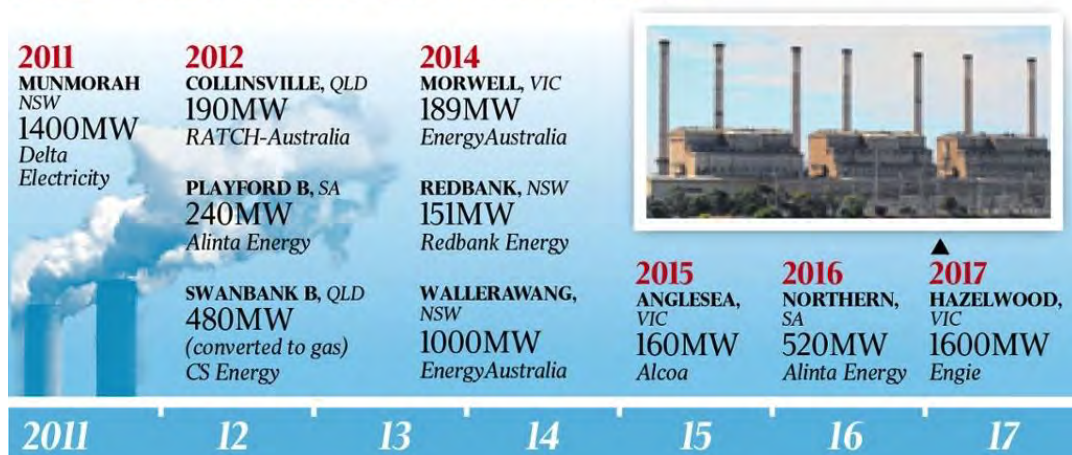


Figure 6 Planned and actual base load plant closures (source: The Australian 5 September 2017)³

³ <http://www.theaustralian.com.au/business/mining-energy/bill-shock-looms-amid-baseload-power-crisis/news-story/d64617bd271dd4b5d29cf371a93a185b>

The Lockyer project will supply peak load power into the National Electricity Market's (NEM) Queensland zone. The plant's value proposition is that it will provide reliable, flexible, fast start capacity to provide power when intermittent renewable generators cannot. The plant will support the large-scale adoption of renewable power in Queensland by providing an efficient, reliable plant that will 'firm up' supply from renewable plant by filling the gaps when the sun is not shining or the wind is not blowing.

Much of the generation fleet in Queensland today is ill-equipped to provide the flexible support needed to balance a higher intermittency of power supply from solar photovoltaic (PV) in particular.

Exposure to higher peak period prices in the wholesale electricity market has increased considerably in Queensland in recent years. Peak prices and intraday price volatility are forecast to increase as peak demand continues to grow, solar PV penetration increases, and older and less efficient base load capacity is mothballed or withdrawn from service.

Generation of daytime solar power (both small-scale rooftop and large-scale utility solar projects) has increased intraday price volatility, caused a degree of network management stress and altered bidding behaviour for less flexible baseload power plants. These base load plants will be forced to recover an ever increasing share of their revenue from the evening peak and shoulder periods of the day as growing solar generation with low marginal cost suppresses daytime peak prices.

Figure 7, below, shows some of the interesting changes that have occurred in Queensland demand since 2010.

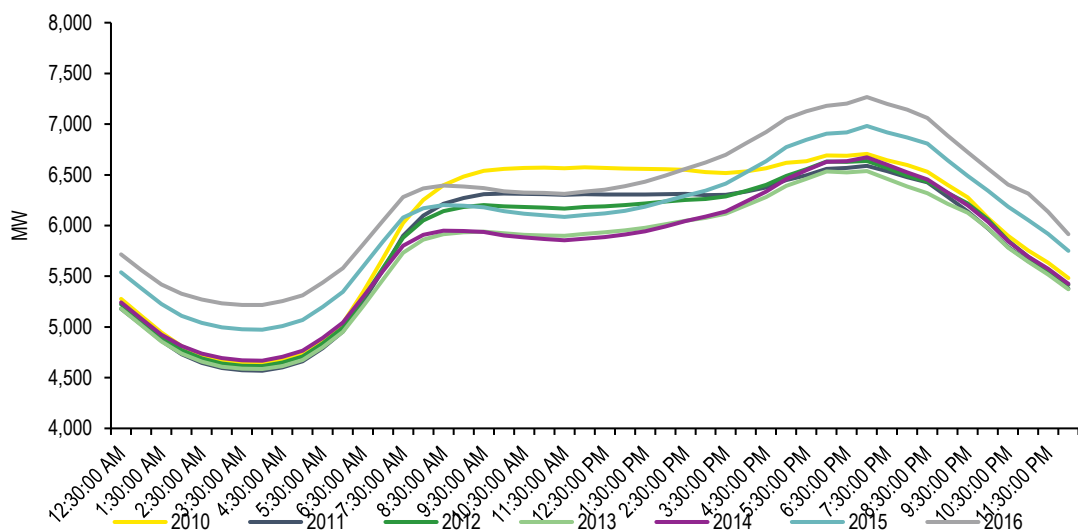


Figure 7 Queensland metered demand profile in 2010-2016 (source: Australian Energy Market Operator (AEMO), 2017)

The years 2010 to 2014 show no growth in peak demand (as power demand increase from economic growth in Queensland was almost entirely offset by demand side efficiency measures); however, during this same period, penetration of roof top solar (behind the meters) reduced daytime demand (scalping out day time demand — known as the “duck’s belly” — was observable in the 2013 and 2014 curves).

In 2015 and 2016 there was a broad increase in base load power demand as the gas fields were developed in regional Queensland to supply the Gladstone LNG export facilities. This general increase in demand lifted the peak well above 2010 levels; however daytime demand remained below 2010 levels due to further rooftop solar penetration.

The key point regarding these changes to the demand profile in Queensland is that while power demand has remained relatively stable, capacity demand has significantly increased. Since 2010, daytime metered demand is dropping as solar penetration increases; however, evening peak demand has continued to increase. Increased solar PV penetration will continue to exacerbate this trend and continue to create significant upwards pricing pressure during the evening peak price period.

The Lockyer Project addresses this particular change in the Queensland power market by providing a flexible, efficient power plant that can generate during the evening peak events or at any other time when demand is high or intermittent renewables are not available.

More solar PV will not shave the peak demand issues during the evening peak. Flexible and fast response gas peaking plant such as Lockyer can therefore play a critical role in maintaining energy security despite the increased grid constraints from higher intermittency in power supply as solar PV and wind penetration increases.

AEMO forecast that the summer maximum demand will increase in the range of 850 to 1,000MW over the forecast period (see Figure 8 below).

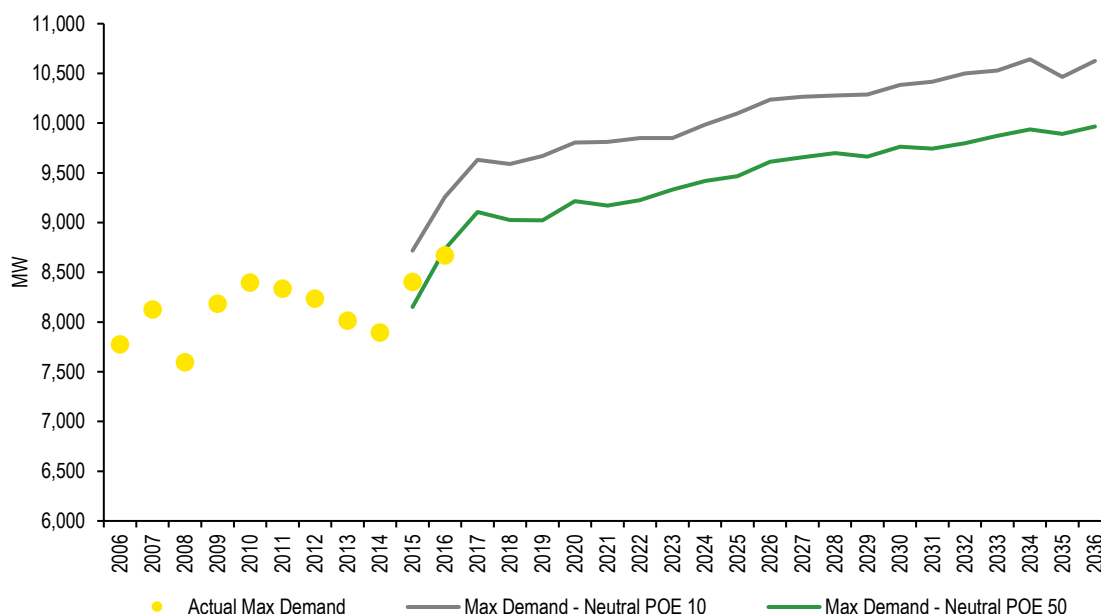


Figure 8 Summer maximum demand in Queensland (actual and forecast) (source: AEMO, 2016)

Increasing peak demand in the evening will not be met by solar PV. New, dispatchable, flexible, low carbon capacity from projects like Lockyer is required.

AEMO forecast a decrease in surplus scheduled and semi-scheduled generation capacity (Figure 9) as peak demand continues to grow. The recently announced restarting of Swanbank E (385MW single shaft unit) is less than the forecast increase in peak demand between calendar year 2016 and 2017.

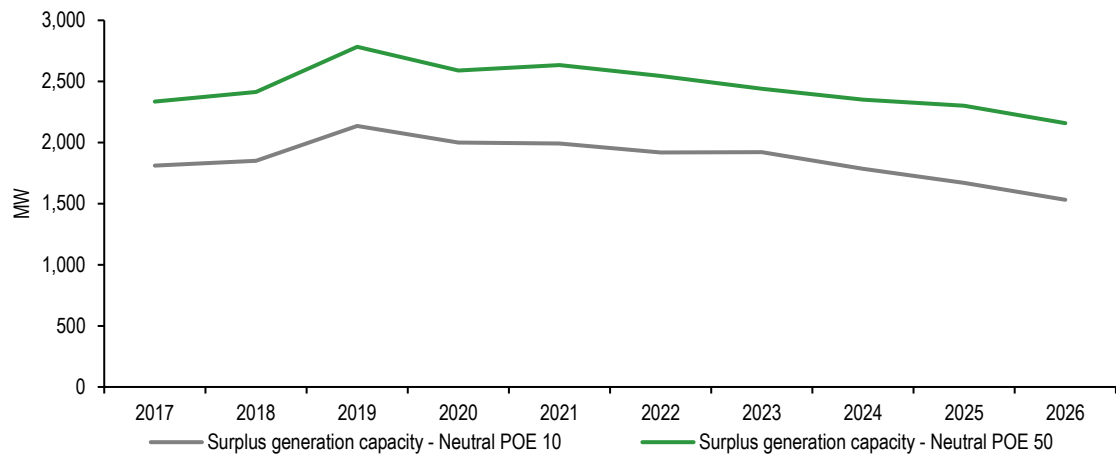


Figure 9 Forecast surplus scheduled and semi-scheduled generation capacity in Queensland (source: AEMO 2016, 2017)

AEMO's Generation Information⁴ (AEMO, 2017) indicates that there is ~970-990MW of proposed wind generation projects in Queensland.

AEMO also forecast that Queensland is expecting a significant increase in the capacity of large-scale solar projects, with 17 projects listed in the Generation Information as of 27 February 2017; these projects have a total nameplate capacity of approximately 1,000MW.

Reduction in surplus scheduled generation capacity coupled with higher renewables penetration and increased volatility in electricity prices, creates a critical need for a new dispatchable, yet efficient gas turbine.

Population size that the plant would benefit

All generators connected to the National Electricity Market work together to provide power to all energy consumers connected to the grid, as such, the project will benefit all electricity users.

Electricity users closer to the plant, in particular those located in the Lockyer Valley, will benefit from localised benefits such as:

- the provision of an additional source of supply which improves localised energy security,
- the deferral of future network upgrades which defers and reduces future distribution and transmission location charges,
- changes in localised energy flow that will reduce transmission and distribution location charges and reduce loss factors (placing further downward pressure on the cost of supplying wholesale power to the Lockyer Valley),
- additional voltage support and reactive power capability allowing the local quality of power delivered to the Lockyer Valley to be controlled more precisely by the Powerlink and Energex.

The population of the Lockyer Valley Local Government area was 38,609 in 2016 (2016 Census); however, the population supplied through the relevant sub-transmission system includes some residents of the Somerset, Ipswich and Toowoomba local government areas.

Residents of the load centres of South East Queensland benefit through increased energy security (as another source of power supply enters the grid) along with downward influences on

⁴ As of 27 February 2017

transmission location charges and transmission loss factors. The population of South East Queensland⁵ was 3,336,831 in 2016 (2016 Census).

The plant's output will trade in the Queensland NEM zone, placing downward pressure on the Queensland wholesale power price. The plant's ability to 'firm' renewables will also allow additional solar capacity to be connected to the Queensland grid, thus facilitating even more downward pricing pressure (free from the burden of fuel costs) on wholesale power prices in Queensland.

As the Queensland NEM Zone is a single, synchronous grid the contribution that the Lockyer project will make to energy security (and in particular frequency control) will reduce the probability of blackouts caused by load shedding over the entire Queensland NEM zone.

The vast majority of Queensland residents (other than remote areas and the Mt Isa Grid) are connected to the Queensland NEM zone. The population of Queensland was 4,703,193 in 2016 (2016 Census).

As surplus power generated in Queensland is exported to New South Wales and the New South Wales Grid is connected with Victoria and thence South-Australia and Tasmania, the Lockyer project will add further downward pressure on peak power prices over all five NEM zones and contribute to the energy security of the entire NEM. An example of this is the recent closure of the Hazelwood power station in Victoria, which has increased power exports from New South Wales to Victoria and Queensland to New South Wales. The vast majority of the population of Queensland, New South Wales, the Australian Capital Territory, Victoria, South Australia, Tasmania and Jervis Bay Territory are connected to the NEM. The population of these States and Territories was 20,694,451⁶ in 2016 (2016 Census).

Potential employment opportunities expected to be generated during development of the proposed action

The information provided in Table 11 is our estimate of the skills required for the duration of Phase 1 of the construction project.

Table 11 Estimate of skills required during Phase 1

Skill	Jobs	Duration
Project Manager/Director	2	12-18 months
Site Managers	2	12- 18 months
Project Engineers	4	12-18 months
Project controllers	2	9-12 months
Earthworks operators	10	3-5 months
Civil works crew	20	4-5 months
Mechanical install crew	20	4-5 months
Electrical install crew	30	6-9 months
Commissioning technicians	10	3-6 months
Commissioning engineers (electrical)	2	3-6 months
Commissioning engineers (gas turbine)	2	3-6 months
Equipment vendor supervisors	4	6-9 months
TOTAL	108	-

The project is expected to generate 108 jobs during the construction phase. There are 3-4 permanent full time roles expected to be generated for the operations phase, along with indirect

⁵ Comprising the Greater Brisbane Capital City Statistical Area (2,270,800) and the following Level 4 Statistical Areas: Gold Coast (569,997), Sunshine Coast (346,522), Toowoomba (149,512)

⁶ Queensland (4,703,193), NSW (7,480,228), ACT (397,397), Victoria (5,926,624), South Australia (1,676,653), Tasmania (509,965), Jervis Bay (391)

employment opportunities for contracted services (e.g. security, grounds keeping, cleaning, overhauls and major outages). It is anticipated that at least one of the above permanent roles will be an apprentice role.

If economic benefits and employment opportunities are in addition to what would have been expected if the action were not to take place

The above economic benefits might be achieved by competing projects; however, there are limited feasible locations for the connection of peaking power plant to the NEM. In our experience, there are few (if any) project locations in South East Queensland that would allow the development of a peaking power project without generating some form of impact on MNES.

Details of any further public stakeholder consultation activities not provided in the referral

Quinbrook Infrastructure Partners is the controlling entity for the project.

Quinbrook is committed to engage with its various stakeholders and the communities that surround and may be impacted by the project at the right stages during the development, construction and operational stages. Quinbrook control two existing power stations in Australia known as Cape Byron Power on the north coast of NSW.

Quinbrook historically has shown its commitment to the local community in its operations of Cape Byron. These are expected to be similar to management of Lockyer and include initiatives such as:

- voluntary capital investment in equipment that minimises the environmental or polluting impacts on the local community;
- water management plans to support local access and supply;
- working with local unions to support internal promotion of staff;
- implementing government funded training programs to assist the long-term training and development of staff;
- supporting local charities through team member initiatives, backed by the company; and
- providing direct and public mechanisms on the company website for anyone in the community to voice any issues that they have.

The project will require significant community communication, engagement and support during the development, construction and operational phases of the project. We plan to continue to work with the local councils, stakeholders and community, provide ongoing updates and channels of communication for the community to better understand the project, voice their thoughts and understand what can be done to address any concerns. We will also work closely with local businesses in an effort to increase local business participation and contribution to the project.

As the project develops, the Stakeholder Engagement Plan will be finalised. It will include such actions a project website, a social media presence, drop by opportunities in local shopping centres to facilitate face to face interactions, discussions and briefings with councillors and local members.

The project team intend to work hard to ensure that all stakeholders understand that the project delivers an essential service to residents not only in Lockyer but also in South East Queensland. Helping to keep the lights on in Lockyer and also Queensland.

5. Public Notification and Submission

5.1 Public Notification

On the 13th November 2017 the proponent was directed to publish the draft preliminary documentation for 10 business days. As instructed, the following occurred:

- A notice was published in the Courier Mail on 15th November 2017 pursuant to Section 95A(3) of the EPBC Act,
- Hard copies of the draft preliminary documentation, project referral and supporting documents were available for viewing at the following locations:
 - Lockyer Valley Library at 34 Lake Apex Dr, Gatton QLD 4343
 - Queensland State Library at Stanley place, South Bank, QLD, 4101
- Electronic copies of the draft preliminary documentation, project referral and supporting documents were available for viewing online at the following websites:
 - <http://www.ghd.com/lockyer-energy-project/>
 - <http://www.ghd.com/global/projects/Lockyer-Energy-Project/>

Interested persons were invited to comment on the draft preliminary documentation from Wednesday 15th of November, 2017 to Tuesday 28th of November, 2017 by way of written submission addressed to Capital Partners Australia, PO Box 394, Surfers Paradise, QLD 4217.

Persons with special needs (e.g. for whom English is a second language or who has vision impairment) were directed to contact GHD for assistance on 1800 423 411.

The closing date for all submissions was 5.00pm (Queensland time) on Tuesday 28th of November 2017.

5.2 Submission

During the public notification period, no calls were made to the free call number 1800 423 411 and no written submissions were received via Australia Post to Capital Partners Australia, PO Box 394, Surfers Paradise, QLD 4217.

However, the proponent did receive a single written response via email, which has been accepted and included as a valid comment on the project as part of the formal consultation process.

5.3 Summary of comments received and how those comments have been addressed

We have reviewed the single written submission and have only referred to matters that are relevant to matter of national environmental significance under the EPBC Act. The EPBC Act is very clear that it only considers aspects of the project with the potential to impact matters protected under the jurisdiction of the EPBC Act. Other matters, such as those which have already been considered as part of local and/or state level planning approvals, are not taken into consideration in the EPBC Act consideration.

The following is both a summary of and a response to each of the key points raised including how the proponent has considered the comments in the development of the project.

Comment (1a) on Subsection 2.8.1

“(1a) the existing cattle fencing is a threat to koalas and other wildlife and must be replaced by koala-friendly fencing to prevent injury to koalas and other wildlife, including grey-headed flying foxes and gliders”

Response

The Final Preliminary Documentation has been amended to commit to the replacement of the existing property boundary fence with wildlife friendly fencing as per Condition No.15 of Annexure A (Appendix D of the Referral) and now included within section 2.5.1 and Appendix A: Koala/Grey-headed Flying-fox Management Framework.

Comment (1b)

“(1b) the Condition of Approval requiring fencing that allows macropod movement through it to adjacent properties puts koalas at risk and should be modified”

Response

The proponent is unable to modify the existing development approval conditions; however, they are able to replace the existing cattle fencing with wildlife friendly fencing as per Condition No.15 of Annexure A (Appendix D of the Referral) and now included within section 2.5.1 and Appendix A: Koala/Grey-headed Flying-fox Management Framework.

Comment (1c)

“(1c) the proponent ignores the north-south movements between the subject property and the property on the other side of Ranger Road”.

Response

The Final Preliminary Documentation has been amended to note the movement of koalas between the subject property and properties north of Rangers Road and to clarify that this movement will not be blocked by the development. The northern property boundary fencing will be replaced with wildlife friendly fencing as noted in section 2.8.1.

The issue of speed limits and signage on Ranger Road is an issue for further consultation between the submitter and the Lockyer Valley Regional Council and separate to this EPBC assessment process.

Comment (2a) on Subsection 3.1.1

“(2a) The Offset Strategy Details do not refer to any corrective actions, monitoring and/or management of the two permanent water bodies and the ephemeral watercourse in the offset area”.

Response)

The two farm dams located in the Offset Area A and the ephemeral creek lines will be managed in accordance with an Offset Management Plan. The proponent intends to desilt the two dams and undertake monitoring measures to control erosion in this area as part of general land management and improvement of the habitat condition for the koala as noted in section 3.1.1.

Comment (2b)

“(2b) The Offset Strategy Details do not include any reference to the need for implementation of a fire regime that is appropriate for the Regional Ecosystems on the site”.

Response

The ongoing land management of the Offset Area A and Area B will consider controlled fire management to maintain species diversity and heath in accordance with an Offset Management Plan as noted in section 3.1.1.

Comment (3) on Subsection 4

We have attempted to collate the comments contained in comments on Section 4 in the below extracts and overview of issues:

- *“The material in Section 4 is highly repetitive, lacking in evidence and substance and almost totally lacking in detailed references to industry or peer reviewed sources for assertions made.”;*
- *“A significant part of the material is not only irrelevant but somewhat hysterical in its tone”;*
- *“The Economic and Social Matters section also ignores recent developments that would seem likely to impact on the proponent’s business model. For example, there is no reference to the decision by Stanwell and the Queensland Government to bring the Swanbank E Power Station (gas-fired, 385MW) back online in the first quarter of 2018”;*
- The submitter purports that there is no underlying need for the project from a demand and supply perspective;
- The submitter believes that pumped hydro is a better technology that is cheaper than gas fired power stations and that has no operational emissions;
- That Section 4 is *“confused and poorly informed”*.

Response

The material in Section 4 draws on the experience of the proponent operating in the power sector in Australia and globally over many decades. It is consistent with informed market commentary as well as government policy at a State and Federal level. The role that the proposed power station can play as part of the energy mix has been outlined in Section 4. A flexible, fast start gas fired power station located near the load centre of Queensland will form an integral part of the energy mix in Queensland keeping the lights on for all Queenslanders and putting downward pressure on power prices at the same time.

Gas fired power stations are a valuable part of the energy mix in every energy market around the world that has gas available. It has been and will continue to be an important part of the Queensland energy mix which includes solar PV, wind, biomass, pumped hydro, coal, gas and diesel power generation. The Proponent believes that informed energy market participants do not talk in context of one form of technology replacing another technology. Informed market participants around the world refer to an energy mix because an effective energy market is truly an energy mix as opposed to a single technology solution.

Ultimately the market will decide the most cost effective solution to electricity supply in Queensland. The proponent has explained the project will positively contribute to the social and economic vibrancy of the region. The capital investment and job creation from the proposed project is detailed in Section 4.

Informed market participants understand the real cost of each technology in terms of dollars per MWh and emissions per MWh of each technology. We reiterate our submission in Section 4 in the knowledge that it is an important part of any first world economy’s energy mix and will continue to be within the life of the project.

We do note though that the Final Preliminary Documentation has now included all foot notes within the references section as well as at the bottom of each page.

6. References

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- Phillips, S. and Callaghan, J. 2011. *The Spot Assessment Technique: a tool for determining localised levels of habitat use by Koalas Phascolarctos cinereus*. Australian Koala Foundation, Brisbane.
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Australian Capital Territory). Department of the Environment, Canberra. Available from:
<http://www.environment.gov.au/biodiversity/threatened/species/pubs/197-conservation-advice.pdf>

Appendices

Appendix A - Koala/Grey-headed Flying Fox Management Framework

Koala/Grey-headed Flying-Fox Management Framework

Management Objective

- Avoid or effectively mitigate direct and indirect impacts on the koala/grey-headed flying-fox and their habitat within the project footprint.

Performance Criteria

1. No vegetation clearing outside the specified boundaries.
2. Laydown areas placed within previously cleared areas or on project pad.
3. No evidence of erosion or sedimentation of waterways as a result of the project.
4. Fauna spotter/catcher present during all clearing works.
5. No injury or death of the koala/grey-headed flying-fox as a result of the project.
6. No new weed species are introduced and existing weed infestations are controlled so as not to increase in habitat areas.
7. No possible predators are introduced to the site.
8. No new disease or pathogen is introduced.
9. Koala exclusion fencing is clear of vegetation on the habitat side and no holes or gaps are present.
10. Disturbed areas are stabilised and rehabilitated sequentially and as soon as possible following disturbance.
11. All site personnel undertake environmental induction prior to commencing work.

Management Controls

Table 12 Design Management Controls

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
2, 3, 10	Environmental contract documentation to address specific erosion and sediment control and landscape and revegetation requirements to be	Owner's Engineer, Proponent	This will assist in minimising indirect impacts to habitat through a reduction in sediment loss and associated water quality impacts.	Minimisation of indirect impacts on the koala/grey-headed flying-fox	Audit prior to request for tender release. Auditing of contract documentation will be undertaken in accordance with the

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
	managed during the construction and post-construction phase of the project.				Construction Environmental Management Plan (CEMP)
All	Incorporate into the CEMP appropriate measures (including the below provisions) for fauna management, vegetation management, weed management, rehabilitation management	Construction Contractor, Proponent	This will reduce impacts on the koala/grey-headed flying-fox and habitat through appropriate management of rehabilitation areas and inclusion of procedures for vegetation clearing, fauna management and general environmental management.	Minimisation of direct and indirect impacts on the koala/grey-headed flying-fox	CEMP to be audited for completeness prior to mobilisation, as well as auditing for compliance during and post-construction
1, 2, 3	Vegetation clearing limits will be defined under the contract documentation, to minimise the extent of vegetation clearing whilst allowing construction to occur, taking into account erosion and sediment control devices.	Owner's Engineer, Proponent	Vegetation clearing limits will ensure minimisation of clearing required for the project and reduce impacts on the koala/grey-headed flying-fox supporting habitat.	Avoid unnecessary removal of fauna habitat.	Audit prior to request for tender release. Auditing of contract documentation will be undertaken in accordance with the CEMP
1, 2, 3	Additional workspace areas (laydown areas) are to be placed in previously cleared areas or on the project pad, where possible.	Construction Contractor	This will minimise the vegetation clearing required for the project.	Avoid unnecessary removal of fauna habitat.	CEMP to be audited for completeness prior to mobilisation, as well as auditing for compliance during and post-construction
1, 2, 5	Incorporation of No-Go Zones and vegetation clearing limits with specific vegetation clearing requirements and methodologies within the contract documentation. All vehicles and plant will stay on pre-determined routes and adhere to site construction and operation rules relating to speed limits. Speed limits would be clearly signposted to minimise the potential for fauna impact.	Owner's Engineer, Proponent	Implementation of No-Go Zones and restricted access routes will prevent inadvertent disturbance within habitat to be retained.	Avoid fauna collisions mortality from construction equipment and enable the relocation of MNES away from the working areas as appropriate.	Audit prior to request for tender release. Auditing of contract documentation will be undertaken in accordance with the CEMP A register of wildlife incidents (fauna strike and mortality) will be established and maintained as part of the CEMP.

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
5, 9	<p>Locations and design of koala exclusion fencing to be incorporated into contract documentation and construction schedule to ensure appropriate structures, placement and timing. Replacement of all cattle fencing with wildlife friendly fencing to the site's eastern, western and northern boundaries. Koala exclusion fencing will be installed along the southern boundary in accordance with Road and Traffic Authority (NSW) Standard Drawing and include the following specifications:</p> <ul style="list-style-type: none"> - Galvanised wire 50 mm chain-link fence, with additional 0.5 m overhang "floppy top" (outward of road formation). - 3 m buffer free of vegetation (excluding grasses) on habitat side of the fence. 	Owner's Engineer, Proponent	Fauna exclusion fencing is an effective management measure to reduce vehicle collisions with koalas (and other native fauna). This fencing is also dog-proof, therefore helping reduce predator movements onto the site.	Prevent increased fauna mortality from the project and guide and direct fauna movement between retained/rehabilitated bushland habitat and away from the road.	Audit prior to request for tender release. Auditing of contract documentation will be undertaken in accordance with the CEMP

Table 13 Construction Management Controls

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
10	Undertake an environmental induction to all site personnel to outline responsibilities in relation to the koala.	Construction Contractor	This will assist in training all onsite personnel in regards to the koala and their environmental obligations where MNES are found onsite.	Avoid any unnecessary and avoidable fauna collisions and mortalities as all personnel will be trained on their appropriate obligations.	Review CEMP prior to mobilisation. Audit implementation shortly after mobilisation and then quarterly for the duration of construction

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
1, 3, 5, 7, 9	Undertake a pre-clearing weed survey and report areas of existing weed infestation. Identify treatment and management requirements if required. A weed management plan will be incorporated into the CEMP.	Construction Contractor	This will assist in minimising indirect impacts to the koala/grey-headed flying-fox habitat through a reduction in weed invasion and habitat degradation.	Avoid weed invasion and therefore habitat degradation of the koala habitat.	Audit prior to mobilisation. Audit implementation of weed management plan in accordance with CEMP
4, 5	A terrestrial fauna specialist will be appointed and approved for the handling, capture and release of native fauna (e.g. a spotter catcher license issued under the Nature Conservation (Administration) Regulation 2006), for the assessment and/or removal of native fauna, with experience in koala detecting, handling and hygiene/quarantine protocols.	Construction Contractor, Terrestrial Fauna Specialist	This will assist in identifying koalas that are present within the clearing area and allow these species to be moved away from the impacted area, where possible.	Avoid fauna injury and mortalities from fauna remaining within the clearing area during the construction phase.	Audit prior to mobilisation. The terrestrial fauna specialist will prepare and submit a post-clearing report. This will allow for records to be kept of koala that have been moved from within the project area.
4, 5	The terrestrial fauna specialist will undertake a pre-clearance survey 24 hours prior to vegetation clearing to detect koalas or grey-headed flying-fox presence, as well as other fauna species, breeding places (including flying-fox roosts) and habitat features such as hollow-bearing trees. These trees will be marked on-site for further inspection and potential action. If koalas are present within the vicinity of the clearing works, they will be given time to move out of the clearing site without human intervention. If the individual has not moved within a 24 hr period, then the fauna spotter catcher may relocate them into adjacent habitat away from the impact area. Should a grey-headed flying-fox roost be identified on the site, an assessment of impacts will be	Construction Contractor, Terrestrial Fauna Specialist	This will assist in identifying koalas that are present within the clearing area directly prior to vegetation clearing and allow these species to move away from the area.	Avoid fauna injury and mortalities from individuals remaining within the clearing area during the construction phase.	Audit prior to clearing commencing and daily during clearing works. The terrestrial fauna specialist will prepare and submit a post-clearing report. This will allow for records to be kept of koalas that have been moved from the project area.

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
	undertaken and measures implemented to mitigate any potential impacts to the grey-headed flying-fox from noise, light or vibration-generating activities that are planned to occur.				
8	An appropriate quarantine procedure will be implemented for any translocations of individual fauna species, particularly targeting Chlamydia virus in koalas. Hygiene protocols will be included in the CEMP targeting management of plant pathogens known to affect koala and grey-headed flying-fox food trees, such as Phytophthora cinnamomi and myrtle rust.	Construction Contractor, Terrestrial Fauna Specialist	Enforced quarantine and biosecurity procedures are effective in preventing the spread of disease	Avoid the introduction and spread of disease and plant pathogens	Audit procedure in place prior to mobilisation. Audit during clearing works and then quarterly, in accordance with the CEMP. Translocations of koalas will be documented to record compliance with the quarantine procedure.
1, 2, 4, 5	<p>Staged and sequential clearing method to be implemented as follows:</p> <ul style="list-style-type: none"> - Sequential vegetation clearing is to occur from disturbed areas towards areas of vegetation to be retained. - No more than 3 ha will be cleared in any one stage, with a period of no clearing for 12 hours between 6pm and 6am the following day between each stage. - No tree will be cleared in which a koala is present, or with a canopy overlapping a tree in which a koala is present. - Non-hollow bearing trees will be cleared before hollow bearing trees, to allow fauna to move away and allow time to concentrate rescue efforts on the trees that are most likely to be inhabited. Hollow bearing trees will be felled after a 	Construction Contractor, Terrestrial Fauna Specialist	Staged and sequential clearing approaches minimise harm to fauna, including koalas.	Avoid injury and mortality of fauna individuals remaining within the clearing area during the construction phase.	Audit procedure prior to mobilisation. Daily monitoring during clearing works. The terrestrial fauna specialist will prepare and submit a post-clearing report. This will allow for records to be kept of koalas that have been moved from the project area.

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
	<p>minimum 24 hr delay after clearing non-habitat trees.</p> <ul style="list-style-type: none"> - The terrestrial fauna specialist will be on site for all clearing works including individual clearing of hollow bearing trees. - Individual hollows of felled hollow bearing trees will be inspected using a torch or similar by the terrestrial fauna specialist and the relevant fauna contingency actions initiated. Once the trees are deemed clear by the terrestrial fauna specialist, further processing can occur. - If more than one machine clearing vegetation is used, more than one terrestrial fauna specialist will be required. - Additional firebreak clearing must ensure trees are felled into the existing firebreak clearings and not into habitat areas. 				
6	Undertake the management of weed species and pests, including implementing weed management strategies during construction (monitoring, treatments and reporting), wash-downs of vehicles prior to entering the project area if required, and conducting weed inspections as part of the rehabilitation monitoring and reporting.	Construction Contractor	Will assist in minimising indirect impacts to the koala/ grey-headed flying-fox and its habitat through a reduction in weed invasion and habitat degradation.	Weed management will assist in the reduction of habitat degradation and will minimise the indirect impacts on the koala.	Daily and weekly inspections of project area to include evidence of weeds. Weed audit undertaken quarterly during construction, in accordance with the CEMP.
1, 2, 3	Grubbing and removal of groundcover and understory will be delayed until	Construction Contractor	This will assist in minimising erosion and sediment control,	Avoid any unnecessary	Audit prior to and immediately following

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
	immediately prior to earthworks occurring.		thereby protecting the land and water quality and ultimately the habitat	damage to the habitat areas.	clearing works in accordance with the CEMP
5	Implement a construction vehicle speed limit within the site.	Construction Contractor	This will assist in minimising direct impact on the koala.	Avoid injury and mortality of fauna individuals	Daily monitoring of all site vehicle and plant movements. Incident reporting to be undertaken in accordance with the CEMP
5	Where possible, avoid positioning direct artificial lighting towards retained bushlands.	Construction Contractor	This will assist in minimising indirect impact on the koala/grey-headed flying-fox.	Prevent increased stress and injury to koala/grey-headed flying-fox	Audit during construction including monitoring of light infiltration into adjacent habitat
5	Dust and noise impacts will be managed in accordance with standard procedures (e.g. installing vehicle noise reducing equipment, regular maintenance of machinery, applying water to exposed surfaces as required during dry and windy conditions).	Construction Contractor	This will assist in reducing indirect noise and air quality impacts on the koala/grey-headed flying-fox and their habitat.	Prevent increased stress and injury to koala/grey-headed flying-fox	Daily inspections to include dust and noise generation adjacent to habitat areas. Audit in accordance with the CEMP.
9	Erection of fauna fencing (koala exclusion fencing) along the southern boundary of the site and to the west and east of the plant to reduce koala access to the road and hazardous infrastructure areas. To be erected as soon as possible following clearing and earthworks, with temporary fencing to be provided during such works as required to effectively exclude koalas from the areas of construction.	Construction Contractor	Fauna fencing is an effective management measure to reduce vehicle collisions with fauna on linear infrastructure. This fencing is also dog-proof, therefore helping reduce predator movements onto the site.	Prevent increased fauna mortality from the project and guide and direct fauna movement between retained/rehabilitated bushland habitat and away from the road.	Inspection on completion of fence construction and 6-monthly during construction, in accordance with CEMP.
5, 7	Implementation of a no-dog policy to ensure that no domestic dogs are brought onto the site and any dogs observed on site are removed immediately.	Construction Contractor	This management measure will ensure that no domestic dogs will affect the koalas in the area.	Avoid fauna injury or mortality due to domestic dogs on the site.	Daily monitoring by all staff. Incident reporting to be undertaken in accordance with the CEMP

Table 14 Post-construction Management Controls

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
10	Revegetation in accordance with Landscape Management and Revegetation Plan including incorporation of koala food trees. Revegetation of the project footprint will include eucalypt species suitable for providing koala food trees and winter/spring foraging habitat for the grey-headed flying-fox.	Construction Contractor	By incorporating revegetation into the areas where previous clearing was undertaken (including areas of previously low or no habitat value), fauna habitat will be increased.	Revegetating areas of disturbance to rehabilitate the habitat available for the koala/grey-headed flying-fox.	Monitor and audit in accordance with the Landscape Management and Revegetation Plan, including inspections of plant survival and restocking requirements

Table 15 Operation Management Controls

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
5, 9	Undertake regular maintenance and inspections of fauna exclusion fencing, to preserve or restore the effectiveness of fauna fencing.	Operator	Fauna fencing is an effective management measure to reduce vehicle collisions with fauna on linear infrastructure.	Prevent increased fauna mortality from the project and guide and direct fauna movement between retained bushland habitat and on either side of nominated fauna connectivity structures.	Annual inspection in accordance with operational procedures
All	Undertake required maintenance of firebreak around the property and around infrastructure to prevent bushfires from causing mortality and injury to koalas. Undertake annual assessment of fuel hazard loads prior to the local bushfire season (winter/spring) to determine whether a reduction in fuel loads is needed (i.e. through reduction of understorey regrowth and weeds). Prescribed burns will only be undertaken	Operator	Effective hazard load reduction reduces the potential for bushfires to affect the local koala population.	Prevent increased fauna mortality.	Annual inspection prior to high risk bushfire season, and otherwise if necessary in accordance with operational procedures

Performance Criteria	Management Control / Activity	Responsibility	Effectiveness of Management Action	Environmental Outcomes	Measure, Monitor, Audit Activity & Frequency
	as required to reduce fire hazard and as appropriate to the koala habitat areas.				

Appendix B - Offset Assessment Guide Spreadsheet

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Phascolarctos cinereus
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	0.2%

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator						
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
<i>Ecological communities</i>						
Area of community	No		Area			
			Quality			
			Total quantum of impact	0.00		
<i>Threatened species habitat</i>						
Area of habitat	Yes	Habitat critical to the survival of the koala	Area	18.38	Hectares	Desktop data, field surveys, habitat quality assessments, standard methods
			Quality	5	Scale 0-10	
			Total quantum of impact	9.19	Adjusted hectares	
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
<i>Threatened species</i>						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g. Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator																					
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source	
<i>Ecological Communities</i>																					
Area of community	No				Risk-related time horizon (max. 20 years)		Start area (hectares)		Risk of loss (%) without offset	0.0	Risk of loss (%) with offset	0.0									
									Future area without offset (adjusted hectares)		Future area with offset (adjusted hectares)										
									Time until ecological benefit		Start quality (scale of 0-10)										Future quality without offset (scale of 0-10)
<i>Threatened species habitat</i>																					
Area of habitat	Yes	9.19	Adjusted hectares	Direct offset (Offset Areas A and B) on same freehold property within habitat to be retained and protected through a conservation covenant	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	41.58	Risk of loss (%) without offset	50%	Risk of loss (%) with offset	0%	20.79	95%	19.75	18.98	15.18	165.20%	Yes	50000-80000	Preliminary Documentation Response, desktop and field survey data, guidelines and standard methods
									Future area without offset (adjusted hectares)		Future area with offset (adjusted hectares)										
									Time until ecological benefit		Start quality (scale of 0-10)										
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start value		Future value without offset		Future value with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source	
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
<i>Threatened species</i>																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g. Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary							
Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost (\$)		
					Direct offset (\$)	Other compensatory measures (\$)	Total (\$)
Birth rate	0				\$0.00		\$0.00
Mortality rate	0				\$0.00		\$0.00
Number of individuals	0				\$0.00		\$0.00
Number of features	0				\$0.00		\$0.00
Condition of habitat	0				\$0.00		\$0.00
Area of habitat	9.19	15.18	165.20%	Yes	50000-80000	N/A	\$0.00
Area of community	0				\$0.00		\$0.00
					\$0.00	\$0.00	\$0.00

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Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
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1	S Potts	P Bradley		P Bradley		30/11/17

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APPENDIX 7: FLORA AND FAUNA SURVEY REPORT



Quinbrook Infrastructure Partners Pty Ltd

Lockyer Energy Project Flora and Fauna Survey Report

July 2017

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Appendix E – Framework guideline for referral of koala

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Appendix G – Fauna species list

1. Introduction

1.1 Project background

Quinbrook Infrastructure Partners (Quinbrook) is currently undertaking preliminary investigative works for the Westlink Power Project (the project), a staged development of a new natural gas-fired power station at Gatton, in south-east Queensland. The proposed project site is located on Lot 191 on Plan CSH2361 on Fords Road, Gatton, approximately 75 km west of Brisbane (Figure 1).

Quinbrook is currently engaging long-lead time activities to develop the project and identify key constraints and opportunities to streamline the development approvals process. In April 2017, GHD was engaged by Quinbrook to assist with the negotiation of Commonwealth environmental approvals for the project. Key items included the preparation of a referral under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and an assessment of ecological values of the site, including the potential occurrence and impact on flora and fauna species listed under the EPBC Act.

Ecological surveys were previously undertaken for the project by Conics in 2008 and 2009. To provide a more current assessment, GHD was commissioned to review the results of that assessment and undertake an additional ecological site assessment. This report presents a summary of the results of that ecological assessment. Details of the scope of this assessment are presented in Section 1.2 below.

1.2 Scope

This report details the methods and results of an ecological survey undertaken in May 2017 to document the existing environment on and adjacent to the proposed project. The scope included:

- A brief review of background information, including the ecological assessment report prepared by Conics (2009)
- A desktop assessment of environmental values on and adjacent to the project site
- A flora and fauna site survey to assess the value of habitats and likelihood of occurrence of flora and fauna species listed under the EPBC Act
- An assessment of the potential impact on species listed under the EPBC Act that are considered likely to occur, in accordance with the relevant guidelines

1.3 Description of the Study Area and project site

The Study Area for the ecological assessment incorporated all areas within the boundary of Lot 191 on Plan CSH2361. This was consistent with the area assessed by Conics in 2008 and 2009. The Study Area is approximately 70.2 ha in size and located within a semi-rural landscape immediately adjacent to the busy Warrego Highway. Much of the Study Area retains native eucalypt woodland vegetation. Approximately 18.8 ha of the property (along the southern boundary) has been historically cleared for grazing livestock. Although the remaining areas retain native woodland, many of the mature trees have been cleared for timber. To minimise impact on the environment, the project footprint is proposed to be located within the predominantly cleared area at the southern end of the Study Area.

1.4 Limitations

The current ecological survey was undertaken on a single day in May 2017, coinciding with the late wet/early dry season. The prominence and subsequent detectability of many fauna and flora species is influenced by seasonal factors that affect activity levels, calling behaviour and flowering status. The detectability of many reptile and amphibian species was likely to be low at the time of survey due to cooler temperatures. Many seasonal migrant birds are also unlikely to have been detected and would utilise the study area at other times of the year. In assessing the likelihood of occurrence of species listed under the EPBC Act, this study has utilised the existing data previously collected in other seasons (Conics, 2009), historical data collected in government databases and relied on an assessment of the value and condition of potentially suitable habitats observed in the field.

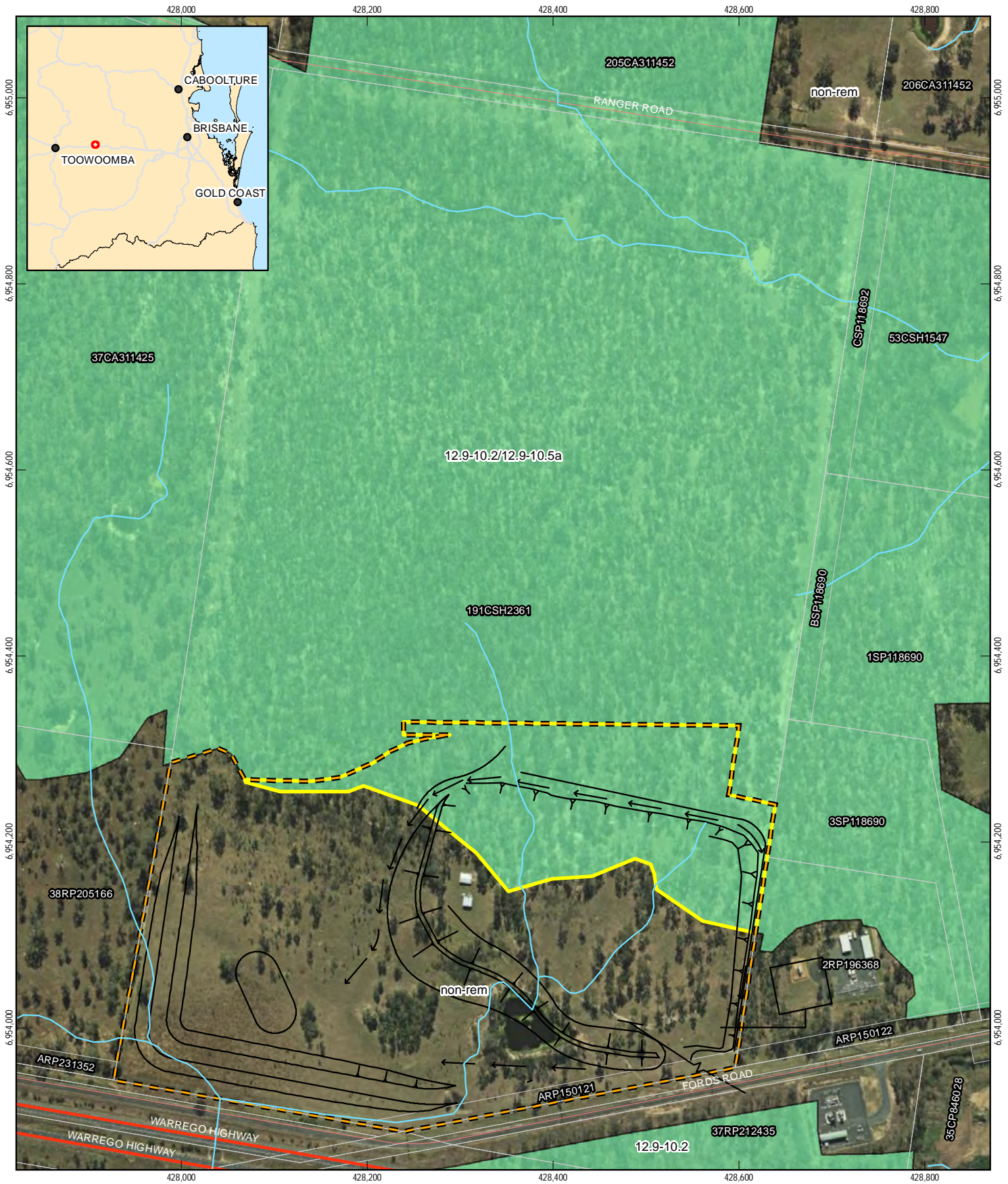
This report has been prepared by GHD for Quinbrook Infrastructure Partners Pty Ltd and may only be used and relied on by Quinbrook Infrastructure Partners Pty Ltd for the purpose agreed between GHD and the Quinbrook Infrastructure Partners Pty Ltd as set out in section 1 of this report.

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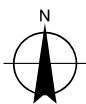
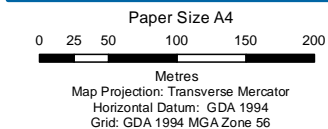
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LEGEND

- Minor Watercourse
- Highway
- Street/Local Road
- Extent of concept design
- Cadastre
- Remnant Clearing Area
- Development Footprint
- Regional Ecosystem (v8)
Category A or B area that is a least concern regional ecosystems
- Non Remnant

Based on or contains data provided by the State of QLD (DNRM) 2017. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



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 Lockyer Energy Project Revision | 0
 Date | 14 Jul 2017

Locality map

Figure 1

2. Methods

This assessment employed a combination of desktop review of existing literature and environmental databases and a field assessment combining rapid survey of terrestrial flora and fauna ecological values.

2.1 Desktop assessment

A desktop review was undertaken in order to identify and collate existing information concerning the ecological characteristics of the Study Area. The following information sources were used in the desktop assessment:

Protected Matters Search Tool: The Department of the Environment and Energy (DEE) Protected Matters Search Tool (PMST) was used to identify nationally listed species and communities that are predicted to occur in or adjacent to the Study Area, based on bioclimatic modelling, knowledge of species' distributions and habitat preferences. The search was undertaken within a 2 km radius of the approximate centre of the Study Area (-27.5345, 152.2746) (refer Appendix A).

Wildlife Online database: The Queensland Department of Science, Information Technology and Innovation (DSITI) Wildlife Online database was searched to retrieve historical records of flora and fauna species previously recorded in the vicinity of the Study Area. The search was undertaken for a 2 km radius of the approximate centre of the Study Area (-27.5345, 152.2746) (refer Appendix B).

Regulated Vegetation Map: The Queensland Department of Natural Resources and Mines (DNRM) Vegetation Management Regional Ecosystem and Remnant Map spatial layer (version 8.0) was viewed to determine the extent and type of Regional Ecosystems (REs) mapped within the Study Area. A copy of the regulated vegetation management map is included as Appendix C.

Essential Habitat Map: The DNRM Essential Habitat Map spatial layer (version 4.41) was viewed to determine if vegetation within the Study Area has been identified as essential habitat for an endangered, vulnerable or near threatened (EVNT) species of wildlife listed under provisions of the Queensland *Nature Conservation Act 1992* (NC Act). The essential habitat mapping and details are provided on the regulated vegetation management map included as Appendix C.

Protected Plants Flora Survey Trigger Map: The Queensland Department of Environment and Heritage Protection (DEHP) Protected Plants Flora Survey Trigger Map spatial layer was viewed to determine if the vegetation within the Study Area is in proximity to a record of an EVNT flora species.

Koala Habitat Areas Map: The DEHP State Planning Policy (SPP) koala habitat mapping was reviewed to identify any areas of koala habitat.

Atlas of Living Australia database: Review of database for locations and details of records of potentially occurring species of conservation significance.

Species Profile Search: The DEHP Species Profile Search was undertaken to obtain spatial data records for EVNT species responsible for generating high-risk trigger areas intersecting the Study Area. The search was also undertaken to gain an understanding of the location and collection date of any protected plant records in proximity to the disturbance footprint.

2.2 Field assessment

Two GHD ecologists, Sally Potts and Simon Hodgkison, undertook a one-day ecological assessment of the Study Area on 5 May 2017. Conditions on the day of survey were fine and mild with a maximum temperature of 24.6° C and overnight minimum of 9.6° C. A total of 12.8 mm of rainfall was recorded in the month prior to survey. No rainfall was recorded in the week prior to survey. Weather data was taken from the nearest Bureau of Meteorology weather station (University of Queensland Gatton 040082).

2.2.1 Terrestrial flora survey methods

Random meanders of the project footprint and surrounding vegetation communities were undertaken and flora species were recorded for each habitat type.

Vegetation community assessments

Rapid vegetation assessments were undertaken in accordance with the Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Neldner *et al.*, 2012). This comprised:

- Quaternary level assessments to confirm RE mapping
- Assessments of any potential Threatened Ecological Communities (TECs) listed under the EPBC Act were undertaken to determine their condition and status in accordance with survey guidelines detailed under the EPBC Act

Targeted surveys for EVNT flora species

Within suitable habitats, random meander searches were undertaken to search for flora species of conservation significance.

2.2.2 Terrestrial fauna survey methods

Rapid terrestrial fauna surveys were undertaken at 10 sites within the Study Area. The following methods were undertaken during the field survey.

Habitat assessment surveys – At each site, the value of habitats for birds, reptiles, mammals and amphibians was documented, based on the presence of key resources and microhabitats – as determined by the structural complexity of vegetation and the presence of features such as tree hollows, burrows, rocky outcrops, caves, leaf litter, woody debris. Key habitat features required by conservation significant species were recorded.

Bird census – At each sampling site, a rapid bird census was undertaken in accordance with the Birds Australia census technique (i.e. recording all birds seen or heard in a 2 ha area within a 20-minute period). This survey technique targeted a number of conservation significant bird species that have the potential to occur in the project area including squatter pigeon, red goshawk, and glossy black-cockatoo

Active searches for reptiles and frogs – Within suitable habitats, a 20-minute active search was undertaken to detect reptile and amphibian species by actively searching beneath rocks, logs, bark, leaf litter and other suitable microhabitats.

Targeted searches for traces of conservation significant species – Within suitable habitat, targeted searches were undertaken to detect characteristic traces of EVNT wildlife including platelets of the black-breasted button-quail, communal den sites of the spotted-tailed quoll, chewed orts indicating feeding by the glossy black-cockatoo and nest sites of the red goshawk.

Opportunist searches for wildlife and traces – All incidental records of fauna observed during surveys were recorded. Bones, feathers, skulls, sloughed skins, faecal pellets, tracks, burrows, scratchings and other indirect wildlife traces were also recorded.

Spot Assessment Technique – The Spot Assessment technique (SAT) devised by Phillips and Callaghan (2011) was used to survey for koala faecal pellets across the Study Area. SAT surveys were undertaken at nine locations across the Study Area.

2.2.3 Likelihood of occurrence assessment

For all conservation significant species identified in the desktop review as being previously recorded within the region, a likelihood of occurrence assessment was conducted to determine their likelihood of occurrence within the Study Area.

The likelihood of occurrence assessment was based on a review of species distribution and habitat requirements, historical records for the region, and the results of habitat assessments and field surveys undertaken within the Study Area. The likelihood of occurrence ranking was based on the following framework:

- Confirmed present: Species recorded during the field survey.
- Likely to occur: Species has been recorded in the desktop search extent or previous studies within the Study Area AND potentially suitable habitat is present within the Study Area.
- May occur: Species has not been previously recorded in the desktop search extent (although species' distribution incorporates the Study Area) AND potentially suitable habitat occurs within the Study Area.
- Unlikely to occur: Species has not been previously recorded in the desktop search extent AND/OR current known distribution does not encompass Study Area AND/OR suitable habitat is generally lacking from the Study Area.

2.2.4 Significant impact assessment

A self-assessment for the potential for significant impacts was undertaken for species listed under the EPBC Act that are confirmed or considered likely to occur within the Study Area. The self-assessment was based on the following guidelines:

- Significant impact guidelines 1.1 – Matters of national environmental significance (DotE, 2013)
- EPBC Act referral guidelines for the vulnerable koala (DotE, 2014)

The framework provided in the guidelines for assessing the need for a referral for impacts to koala habitat is included as Appendix E.

2.2.5 Animal ethics and legislative permits

The ecological field surveys were conducted in accordance with the following permits and approvals:

- Department of Employment, Economic Development and Innovation Scientific Users Registration Certificate (Registration Number 132)
- DEHP Scientific Purposes Permit (permit number WISP15723315)
- Animal Reacher Authority issued by the accredited GHD Animal Ethics Committee

3. Results

3.1 Desktop assessment

3.1.1 Review of the Conics report

Field surveys undertaken within the Study Area in October 2008 and February 2009 by Conics (2009) recorded 97 species of plants (including 14 exotic species) and 68 species of animals including eight mammals, eight reptiles, four amphibians and 48 birds.

Conservation significant flora

No conservation significant flora species were confirmed present on the Study Area. However one species, Austral toadflax (*Thesium australe*), was considered to have a possible likelihood of occurrence.

Conservation significant fauna

Four conservation significant fauna species were *confirmed present*:

- Koala (*Phascolarctos cinereus*) – vulnerable under the EPBC Act and NC Act
- Rainbow bee-eater (*Merops ornatus*) – migratory under the EPBC Act
- Cattle egret (*Ardea ibis*) – marine under the EPBC Act
- Silveryeye (*Zosterops lateralis*) – marine under the EPBC Act

Two conservation significant fauna species were considered to have a *probable* likelihood of occurrence:

- Grey-headed flying-fox (*Pteropus poliocephalus*) – vulnerable under the EPBC Act
- White-throated needletail (*Hirundapus caudacutus*) – migratory under the EPBC Act

Eight conservation significant fauna species were considered to have a *possible* likelihood of occurrence:

- Swift parrot (*Lathamus discolor*) – critically endangered under the EPBC Act, endangered under the NC Act
- Red goshawk (*Erythrotriorchis radiatus*) – vulnerable under the EPBC Act, endangered under the NC Act
- Rufous fantail (*Rhipidura rufifrons*) – migratory under the EPBC Act
- Black-faced monarch (*Monarcha melanopsis*) – migratory under the EPBC Act
- Satin flycatcher (*Myiagra cyanoleuca*) – migratory and marine under the EPBC Act
- Latham's snipe (*Gallinago hardwickii*) – migratory under the EPBC Act
- Great egret (*Ardea alba*) – migratory under the EPBC Act
- Fork-tailed swift (*Apus pacificus*) – migratory and marine under the EPBC Act

Two other species of conservation significance were considered to have a *possible* likelihood of occurrence, black-necked stork (*Ephippiorhynchus asiaticus*) and cotton pygmy-goose (*Nettapus coromandelianus*), but have since been de-listed and are now classed as least concern under the NC Act.

3.1.2 Database search results

Wildlife Online database

A search of the Wildlife Online database (refer to Appendix A) identified the following conservation significant fauna species have been historically recorded within 2 km of the Study Area:

- Koala (*Phascolarctos cinereus*)
- Squatter pigeon (southern) (*Geophaps scripta scripta*)
- Australian lungfish (*Neoceratodus forsteri*)

The following special least concern species were also identified in the Wildlife Online database:

- Short beaked echidna (*Tachyglossus aculeatus*)
- Glossy ibis (*Plegadis falcinellus*)

No flora species of conservation significance were identified by the Wildlife Online database as previously recorded within 2 km of the Study Area.

Protected matters search tool

Two critically endangered TECs were predicted as having the potential to occur in the Study Area, including:

- Lowland Rainforest of Subtropical Australia (may occur)
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (may occur)

A total of 27 threatened flora and fauna species listed under the EPBC Act were predicted to occur within 2 km of the Study Area according to the PMST (refer to report in Appendix B). This comprised:

- 11 bird species:
 - Regent honeyeater (*Anthochaera phrygia*)
 - Australasian bittern (*Botaurus poiciloptilus*)
 - Curlew sandpiper (*Calidris ferruginea*)
 - Red goshawk (*Erythrotriorchis radiatus*)
 - Squatter pigeon (*Geophaps scripta scripta*)
 - Painted honeyeater (*Grantiella picta*)
 - Swift parrot (*Lathamus discolor*)
 - Eastern curlew (*Numenius madagascariensis*)
 - Southern black-throated finch (*Poephila cincta cincta*)
 - Australian painted snipe (*Rostratula australis*)
 - Black-breasted button-quail (*Turnix melanogaster*)
- One fish species:
 - Australian lungfish (*Neoceratodus forsteri*)
- Eight mammal species:
 - Large-eared pied bat (*Chalinolobus dwyeri*)
 - Northern quoll (*Dasyurus hallucatus*)
 - Greater glider (*Petauroides volans*)

- Brush-tailed rock-wallaby (*Petrogale penicillata*)
- Koala (*Phascolarctos cinereus*)
- Long-nosed potoroo (*Potorous tridactylus tridactylus*)
- New Holland mouse (*Pseudomys novaehollandiae*)
- Grey-headed flying-fox (*Pteropus poliocephalus*)
- Two reptile species:
 - Collared delma (*Delma torquata*)
 - Dunmall's snake (*Furina dunmali*)
- Five plant species:
 - Bluegrass (*Dichanthium setosum*)
 - Macadamia nut (*Macadamia integrifolia*)
 - Mt Berryman Phebalium (*Phebalium distans*)
 - Quassia (*Samadera bidwillii*)
 - Austral toadflax (*Thesium australe*)

A total of 16 migratory bird species listed under the EPBC Act were predicted to occur within 2 km of the Study Area according to the PMST (refer to report in Appendix B).

Regulated vegetation and essential habitat mapping

The northern extent of the lot (approximately 51.4 ha) is mapped as least concern RE 12.9-10.2/12.9-10.5a (a mixed polygon mapped as 70% / 30% of each RE) (described in Section 3.2.3).

Essential habitat is mapped over part of the mapped RE for the vulnerable squatter pigeon (discussed further in Section 3.3.1). This essential habitat mapping is applied to previous records of EVNT species and is created using a 2.2 km buffer around an identified species record. There is also a record of squatter pigeon that was returned on the Wildlife Online database within 2 km of the site, however this record is from 1990 and the species is known to have declined significantly from the region and the previous records found on Atlas of Living Australia and the species profile search of the WildNet database do not include squatter pigeon at this location. Previous records in the region appear to be from 1980-90 and 1930s. In terms of the essential habitat factors, the mandatory criterion of RE type is not satisfied, as REs 12.9-10.2 and 12.9-10.5a are not listed as an essential habitat factor.

Koala habitat mapping

No koala habitat is mapped over the Study Area by the Koala Conservation SPP mapping.

High-risk flora survey trigger mapping

No high-risk flora survey trigger area is mapped over the Study Area (under the protected plants clearing permit triggers under the NC Act).

3.2 Flora survey results

3.2.1 Vegetation communities

The vegetation communities across the Study Area include:

- Remnant eucalypt open forest – Spotted gum (*Corymbia citriodora* subsp. *variegata*) dominated open forest community with associated *Eucalyptus crebra* and *E. fibrosa* subsp. *fibrosa* to 20 m.

- Non-remnant scattered mature eucalypts with cleared understorey – Spotted gum dominated woodland canopy to 16 m height with juvenile eucalypts in the understorey to 7 m height and sparse to mid-dense groundcover of native and exotic grasses and herbs
- Cleared pasture grasses or weedy groundcover
- Aquatic plants in and around constructed farm dams

Disturbances across the Study Area include past clearing for grazing purposes, selective logging of trees throughout the property, fencing, firebreaks and vehicle access tracks around the property boundary, farm house and associated cleared yard and fencing, fencing for livestock, and at least three constructed farm dams. There is also evidence of previous fires, some major gully erosion, and a number of weed species occurring across the property.

3.2.2 Threatened ecological communities

No TECs were recorded within the Study Area during the field survey.

3.2.3 Regional Ecosystems

The northern two-thirds of the Study Area (approximately 51.4 ha of the 70.2 ha lot) are mapped as least concern RE 12.9-10.2 / 12.9-10.5a (70% / 30%), which are described as:



- Least concern RE 12.9-10.2: *Corymbia citriodora* subsp. *variegata* +/- *Eucalyptus crebra* open forest on sedimentary rocks
- Least concern RE 12.9-10.5a: *Eucalyptus helidonica*, *Corymbia citriodora* subsp. *variegata* open forest +/- *C. trachyphloia* subsp. *trachyphloia*, *Eucalyptus fibrosa* subsp. *fibrosa*, *E. taurina*, *E. dura*, *E. baileyana*, *C. gummifera*, *Angophora woodsiana* and *Lysicarpus angustifolius*. Occurs on quartzose sandstone scarps and crests.

The area of mapped RE is shown on Figure 1.

The descriptions of the ground-truthed vegetation communities are provided in Table 1. The DNRM mapped REs are consistent with the vegetation communities verified in the Study Area in terms of vegetation structure, landform and geology, and dominant species. The RE 12.9-10.2 is prevalent on the lower to mid-slopes while the RE 12.9-10.5a is located along the ridgeline and upper slopes in the centre of the property.

The majority of the proposed project footprint is located in non-remnant areas, however approximately 6.5 ha of mapped remnant vegetation will be cleared as part of the works.

Table 1 Regional Ecosystem communities confirmed present within the Study Area

RE	VM Act# Status	Description	Photo
12.9-10.2	Least Concern	<p><i>Corymbia citriodora</i> subsp. <i>variegata</i> open forest to 20 m with subdominant <i>Eucalyptus crebra</i> and <i>E. fibrosa</i> subsp. <i>fibrosa</i> in the canopy and 10 m subcanopy.</p> <p>Very sparse shrub layer consists of very sparse <i>Alphitonia excelsa</i> and <i>Acacia</i> species.</p> <p>Ground layer of sparse to very sparse native and exotic grasses and herbs, including <i>Cymbopogon refractus</i>, <i>*Melinis repens</i>, <i>Aristida calycina</i> and <i>Eragrostis brownii</i>.</p> <p>Found on lower and mid-slopes in northern extent of Study Area.</p> <p>Very sparse weeds including <i>*Lantana camara</i> and <i>*Opuntia stricta</i>.</p> <p>Disturbances include tracks, selective logging, sparse weeds and past presence of cattle.</p>	
12.9-10.5a	Least Concern	<p><i>Eucalyptus fibrosa</i> subsp. <i>fibrosa</i> open forest to 16 m with <i>C. citriodora</i> subsp. <i>variegata</i> and <i>C. trachyphloia</i>. Subcanopy of <i>Allocasuarina inophloia</i> and <i>A. excelsa</i> to 8 m.</p> <p>Very sparse shrub layer of <i>Petalostigma pubescens</i>, <i>A. excelsa</i> and <i>Acacia falcata</i>.</p> <p>Ground layer of sparse to very sparse native grasses and herbs, including <i>Xanthorrhoea johnsonii</i>.</p> <p>Found on stoney ridgeline and upper slopes in central Study Area.</p> <p>Limited past disturbances or weeds, however some evidence of fire and past presence of cattle.</p>	

#VM Act – Queensland Vegetation Management Act 1999

3.2.4 Flora species

A total of 65 flora species were identified within the Study Area, including 49 species of least concern status under the NC Act and 16 exotic species. A list of species encountered in the field survey is provided in Appendix F.

In previous surveys, there were 97 flora species recorded across the Study Area, including 14 exotic species.

There were no species of conservation significance identified during the 2017 field survey. No species of conservation significance were previously recorded at the site by Conics during surveys in 2008 and 2009.

A total of 16 exotic pest flora species were identified within the Study Area. Pest species were relatively abundant and widespread in distribution, particularly in previously cleared areas or adjacent to cleared areas.

The following pest flora species recorded within the Study Area are listed as Category 3 restricted invasive plants under the *Biosecurity Act 2014*:

- Creeping lantana (*Lantana montevidensis*)
- Groundsel bush (*Baccharis halimifolia*)
- Lantana (*Lantana camara*)
- Rat's tail grass (*Sporobolus pyramidalis*)
- Prickly pear (*Opuntia stricta*)
- Velvety tree pear (*Opuntia tomentosa*)

3.3 Fauna survey results


3.3.1 Habitat assessments



The Study Area retains large areas of natural woodland that provide moderate to high value habitat for a range of birds, reptiles, mammals and amphibians. The woodland was relatively consistent in its structure and distribution across the Study Area. The site has evidently been subject to historical logging. This has reduced the abundance of mature, hollow-bearing trees. Local topography provides some variation in habitat values, with localised areas of higher ecological value associated with an ephemeral watercourse in the northern extent of the Study Area and a rocky gully and hillside in the centre. Areas within the project footprint had lower habitat values. These areas have predominantly been cleared and historically used for cattle grazing. Four small permanent dams were present across the Study Area. These provide local habitat values for a range of birds, reptiles, mammals and amphibians. Habitats within the Study Area were summarised into the following seven broad categories:

- Eucalypt woodland
- Eucalypt woodland on rocky substrate
- Open eucalypt woodland
- Ephemeral watercourse
- Permanent wetland
- Cleared agricultural land
- Periodically inundated grassland



The ecological value of each habitat type is summarised in Table 2. The distribution of habitat types is mapped in Figure 2.

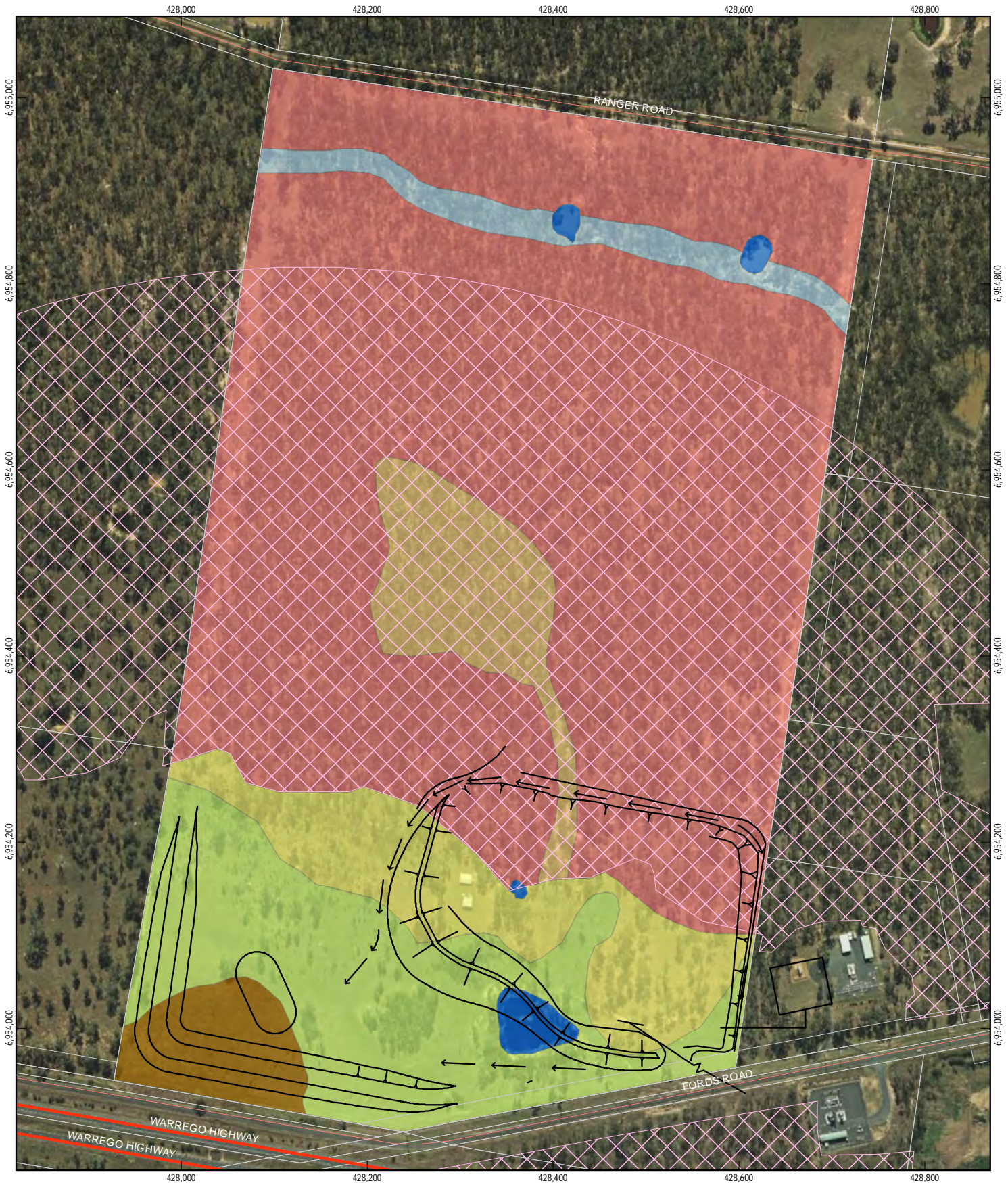
Table 2 Terrestrial habitat types observed within the Study Area

Habitat type	Characteristics	Ecological values
<p>Eucalypt woodland</p> 	<ul style="list-style-type: none"> • Tall canopy vegetation • Very few large, hollow-bearing trees • Patchy, relatively open shrub layer • Open grassy understorey • Presence of logs, woody debris, leaf litter and other complex ground-level microhabitats • Occasional termite mounds 	<ul style="list-style-type: none"> • Occasional den sites for possums, gliders, owls and other hollow-dependent species • Foraging and nesting habitat for forest-dwelling birds • Microhabitats for skinks, geckos, snakes and other reptiles • Foraging habitat for bandicoots, rodents and other ground-dwelling mammals • Moderate species diversity • Potential EVNT species habitat – koala, grey-headed flying-fox
<p>Eucalypt woodland on rocky substrate</p>	<ul style="list-style-type: none"> • Tall canopy vegetation • Very few large hollow-bearing trees • Patchy, relatively open shrub layer • Tussocky grass understorey • Abundance of woody debris and leaf litter • Abundance of rocky substrate 	<ul style="list-style-type: none"> • Occasional den sites for possums, gliders, owls and other hollow-dependent species • Foraging and nesting habitat for canopy-dwelling birds • Microhabitats for snakes, reptiles • Foraging habitat for bandicoots, rodents and macropods • Moderate to high species diversity

Habitat type	Characteristics	Ecological values
		<ul style="list-style-type: none"> • Potential EVNT species habitat – koala, grey-headed flying-fox, squatter pigeon (southern)
<p>Open Eucalypt woodland</p> 	<ul style="list-style-type: none"> • Sparse Eucalypts • Hollow-bearing trees absent • Shrub layer generally absent • Ground layer dominated by mixed grasses including native and exotic species • Low-level grazing impacts 	<ul style="list-style-type: none"> • Foraging habitat for lorikeets and cockatoos • Foraging habitat for macropods • Habitat for lapwings, pigeons and other open ground-dwelling birds • Low species diversity • Potential EVNT species habitat – koala

Habitat type	Characteristics	Ecological values
<p>Cleared grazing land</p> 	<ul style="list-style-type: none"> • Canopy and shrub layer absent • Ground-layer altered – subject to past grazing 	<ul style="list-style-type: none"> • Foraging habitat for raptors and birds adapted to open landscapes • Refuge and foraging habitat for snakes • Foraging habitat for macropods, rabbits • Low species diversity • Potential EVNT species habitat - none
<p>Permanent waterbodies</p> 	<ul style="list-style-type: none"> • Permanent wetland • Adjacent mature canopy trees • Emergent sedges and other riparian vegetation • Floating lilies and other macrophytes 	<ul style="list-style-type: none"> • Nesting and foraging habitat for wetland birds, owls and raptors • Breeding and calling sites for amphibians • Foraging habitat for frog and egg-eating snakes • Foraging and drinking sites for microbats • Drinking sites for birds and mammals • Moderate species diversity • Potential EVNT species habitat – none

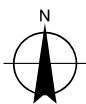
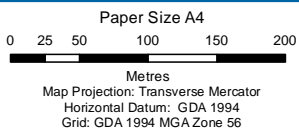
Habitat type	Characteristics	Ecological values
<p>Ephemeral watercourse</p> 	<ul style="list-style-type: none"> • Ephemeral watercourse • Mature canopy vegetation • Presence of riparian habitat • Evidence of existing erosion 	<ul style="list-style-type: none"> • Nesting and foraging habitat for forest-dwelling birds • Breeding and calling sites for amphibians • Foraging habitat for microbats • Moderate to high species diversity • Potential EVNT species habitat – koala, grey-headed flying-fox
<p>Periodically inundated grassland</p> 	<ul style="list-style-type: none"> • Mature canopy trees absent • Shrub layer generally absent • Dense grassland subject to periodic inundation • Localised melon holes with reeds, sedges and other macrophytes 	<ul style="list-style-type: none"> • Foraging habitat for macropods and microbats • Breeding and foraging habitat for amphibians and snakes • Low to moderate species diversity • Potential EVNT species habitat - none



LEGEND

- | | | |
|---------------------------------------|--|----------------------------------|
| Highway | Extent of concept design | Open Woodland |
| Street/Local Road | Ephemeral watercourse | Open grazing land |
| Cadastre | Mixed Eucalypt woodland | Periodically inundated grassland |
| Essential Habitat for squatter pigeon | Mixed Eucalypt woodland on rocky substrate | Permanent Waterbody |

Based on or contains data provided by the State of QLD (DNRM) 2017. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



Quinbrook Infrastructure Partners Pty Ltd	Job Number	91-10341
Lockyer Energy Project	Revision	0
	Date	14 Jul 2017

Habitat values map

Figure 2

3.3.2 Terrestrial fauna survey results

A total of 73 fauna species were recorded in the field survey. This comprised three species of amphibians, five species of reptiles, eight species of mammals and 55 species of birds. A description of each of the fauna groups is provided below. A list of species encountered during the field survey is provided in Appendix G. More information on EVNT species is provided in Section 3.4 and the likelihood of occurrence assessment in Appendix D.

Amphibians

No EVNT amphibian species were recorded or considered likely to occur within the Study Area.

Three amphibian species were recorded in the field survey. This included the striped marsh frog (*Limnodynastes peronii*), eastern sedge frog (*Litoria fallax*) and the feral cane toad (*Rhinella marina*). The survey was undertaken in relatively dry conditions in mid-autumn, outside the breeding season of many local amphibians. Four permanent waterbodies within the Study Area provide relatively good quality breeding habitat for common amphibians. The ephemeral watercourse on the northern extent of the Study Area would also provide habitat for a variety of amphibians. Common amphibian species not recorded in the current survey that are likely to occur based on the habitats present include the rocket frog (*Litoria nasuta*), clicking froglet (*Crinia signifera*), emerald tree frog (*Litoria gracilentata*), desert tree frog (*Litoria rubella*), beeping froglet (*Crinia parinsignifera*) and green tree frog (*Litoria caerulea*). The activity of these species was likely to be relatively low at the time of survey, which was late in the breeding season of many local amphibians.

Reptiles

No EVNT reptile species were recorded during the field survey or considered likely to occur within the Study Area.

Five reptile species were recorded within the Study Area during the field survey. Species encountered included the lively rainbow skink (*Carlia vivax*), open litter rainbow skink (*Carlia pectoralis*) (Plate 1), grass skink (*Lampropholis delicata*), zig-zag velvet gecko (*Oedura rhombifer*) (Plate 1) and elegant snake-eyed skink (*Cryptoblepharus pulcher*). Scratches belonging to the lace monitor (*Varanus varius*) were observed in numerous locations. All reptiles were recorded from within the Eucalypt woodland and Eucalypt woodland on rocky substrate. Other reptiles likely to occur include the eastern water dragon (*Physignathus lesueurii*), bearded dragon (*Pogona barbata*), tommy roundhead (*Diporiphora australis*), dark bar-sided skink (*Eulamprus martini*), Bynoe's gecko (*Heteronotia binoei*) and exotic Asian house gecko (*Hemidactylus frenatus*) and snakes including the red-bellied black snake (*Pseudechis porphyriacus*), keelback (*Tropidonophis mairii*) and yellow-faced whip snake (*Demansia psammophis*).



Plate 1 Reptiles recorded in the Study Area: *Carlia pectoralis* (left), *Oedura rhombifer* (right)

Mammals

One EVNT mammal species; the koala (*Phascolarctos cinereus*), was confirmed present in field survey of the Study Area, with faecal pellets confirmed at eight of the nine SAT search locations (Plate 2). One other EVNT mammal species, the grey-headed flying-fox (*Pteropus poliocephalus*), has the potential to occur within the Study Area. More information on the location of koala records and grey-headed flying-fox is provided in Section 3.4.

Eight mammal species were recorded within the Study Area during field surveys. In many cases, mammals were confirmed present from secondary traces (i.e. faecal pellets, tracks, bones or diggings). Species recorded from secondary traces included the common brushtail possum (*Trichosurus vulpecula*), northern brown bandicoot (*Isodon macrourus*), red-necked wallaby (*Macropus rufogriseus*), domestic dog (*Canis lupus familiaris*) and short-beaked echidna (*Tachyglossus aculeatus*). Approximately 40 eastern grey kangaroos (*Macropus giganteus*) were disturbed resting within the eucalypt woodland immediately north of the project footprint. A feral brown hare (*Lepus capensis*) was flushed along the ephemeral watercourse in the north of the Study Area. Other feral animals likely to occur include the feral cat (*Felis catus*), fox (*Vulpes vulpes*), black rat (*Rattus rattus*) and house mouse (*Mus musculus*). A number of common microbat species are likely to occur including the little broad-nosed bat (*Scotorepens greyii*), little bent-wing bat (*Miniopterus australis*), eastern bentwing-bat (*M. schreibersii oceanensis*), white-striped free-tailed bat (*A. australis*) and the yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*).



Plate 2 Koala pellets recorded during field surveys



Plate 3 Echidna diggings within the Study Area

Birds

One EPBC migratory bird species, the rainbow bee-eater (*Merops ornatus*) (Plate 4), was recorded within the Study Area during field survey. No other EVNT bird species were recorded. However, six EVNT bird species have the potential to occur within the Study Area. More information on these species is provided in Section 3.4.

A total of 54 bird species were recorded in field surveys of the Study Area including a variety of woodland species, birds adapted to open landscapes and wetland birds. Woodland areas supported a variety of forest-dwelling bird species such as the black-faced cuckoo-shrike (*Coracina novaehollandiae*), olive-backed oriole (*Oriolus sagittatus*), brown thornbill (*Acanthiza pusilla*), cicadabird (*Coracina tenuirostris*), grey shrike-thrush (*Colluricincla harmonica*), weebill (*Smicrornis brevirostris*), rufous whistler (*Pachycephala rufiventris*), variegated fairy wren (*Malurus lamberti*), white-throated treecreeper (*Cormobates leucophaeus*) and regionally common honeyeaters such as the white-throated honeyeater (*Melithreptus albogularis*), brown honeyeater (*Lichmera indistincta*) and striped honeyeater (*Plectorhyncha lanceolata*). Ironbarks were flowering at the time of survey and provided nectar sources that were utilised by large numbers of rainbow lorikeets (*Trichoglossus haematodus*), scaly-breasted lorikeets (*Trichoglossus chlorolepidotus*) and little lorikeets (*Glossopsitta pusilla*).

Open woodland areas supported species naturally adapted to open landscapes such as the Torresian crow (*Corvus orru*), peaceful dove (*Geopelia striata*), bar-shouldered dove (*Geopelia humeralis*), galah (*Cacatua roseicapilla*), Australian magpie (*Cracticus tibicen*), pied butcherbird (*Cracticus nigrogularis*), grey butcherbird (*Cracticus torquatus*), noisy miner (*Manorinus melanocephala*), little friarbird (*Philemon citreogularis*) and noisy friarbird (*Philemon corniculatus*). Common wetland bird species were observed within near permanent wetlands including the Australasian grebe (*Tachybaptus novaehollandiae*), grey teal (*Anas gracilis*), Eastern great egret (*Ardea modesta*), Pacific black duck (*Anas superciliosa*) and white-faced heron (*Egretta novaehollandiae*). A nest of an unidentified raptor species was observed immediately north of the impact footprint (Plate 4).



Plate 4 Rainbow bee-eater (left) and raptor nest (right) within the Study Area

3.4 Conservation significant species

A likelihood of occurrence assessment was undertaken as detailed in Section 2.2.3. The results of the assessment are provided in Appendix D. A summary of the likelihood of occurrence assessment is provided below.

Two conservation significant species were **confirmed present** within the Study Area:

- Koala – vulnerable under the EPBC Act and NC Act
- Rainbow bee-eater – migratory under the EPBC Act

One threatened species is considered **likely to occur**:

- Grey-headed flying-fox – vulnerable under the EPBC Act

Another seven threatened species **may occur** within the Study Area:

- Six bird species:
 - Painted honeyeater – vulnerable under the EPBC Act and NC Act
 - Australasian bittern – endangered under the EPBC Act
 - Red goshawk – vulnerable under the EPBC Act and the NC Act
 - Australian painted snipe – endangered under the EPBC Act, vulnerable under the NC Act
 - Swift parrot – critically endangered under the EPBC Act, endangered under the NC Act
 - Squatter pigeon (southern) – vulnerable under the EPBC Act and NC Act
- One plant species:
 - Austral toadflax – vulnerable under the EPBC Act and NC Act. Potential habitat exists on the site for this species, however recent and previous surveys (2008, 2009 and 2017) did not locate it within the Study Area.

Four listed migratory bird species (listed under the EPBC Act) may occur within the Study Area:

- White-throated needletail
- Latham’s snipe
- Fork-tailed swift

- Glossy ibis

Three listed marine species (under the EPBC Act) were observed within the Study Area:

- Silvereye
- Cattle egret
- Eastern great egret
- Spangled drongo

The above listed marine species are generally widespread and commonly occurring in south-east Queensland. While they are listed as marine species under the EPBC Act, they are generally terrestrial species. Habitats present within the Study Area are limited to small, isolated areas of foraging habitat and low-value nesting habitat that are relatively ubiquitous within the surrounding landscape. As such, the Study Area is likely to support small numbers of individuals of these species. No significant breeding or nesting habitats occur that would support sufficiently large numbers of individuals to constitute an important population of these species.

Information on those listed threatened or migratory species confirmed present or considered likely to occur is detailed below. More information on species that may occur is provided in the likelihood of occurrence assessment in Appendix D.

Of additional note, essential habitat for the squatter pigeon is mapped over the RE in the central part of the Study Area. The essential habitat mapping is created by applying a buffer around an identified species record. While there is suitable habitat for squatter pigeon within the Study Area, the species has experienced substantial declines from the southern parts of its range (Squatter Pigeon Workshop, 2011) and few recent records are known from the region (previous records in the region appear to be from 1980-90 and 1930s). No record or essential habitat was shown in the Conics (2009) report. While there is one record of squatter pigeon that is returned on the Wildlife Online database within 2 km of the site, this record is from 10/02/1990, with no more recent records. Previous records found on Atlas of Living Australia and the species profile search of the WildNet database do not include squatter pigeon in this location. In terms of the essential habitat factors, the mandatory criterion of RE type is not satisfied, as REs 12.9-10.2 and 12.9-10.5a are not listed as an essential habitat factor for this species.

3.4.1 Koala (*Phascolarctos cinereus*)

Koalas were confirmed present from eight of the nine SAT locations across the Study Area. Based on the density at which koala faecal pellets were observed, areas of highest koala habitat utilisation were located in eucalypt woodland on the rocky hillside in the centre of the Study Area, and along the ephemeral watercourse at the northern extent of the Study Area. Areas of eucalypt woodland on lower, flatter areas had moderate densities of koala pellets. One old koala pellet and old scratches were observed in open woodland at the southern extent of the Study Area. The distribution of koala records is shown in Figure 3. Approximately 51.1 ha of suitable koala habitat occurs in the northern extent of the Study Area.

All mapped RE communities within the Study Area represent potential foraging habitat for the koala, supporting a mix of preferred food trees including *Corymbia citriodora*, *C. intermedia*, *Eucalyptus crebra*, and *Lophostemon suaveolens*. The species is likely to be widely distributed across the Study Area and is likely to occur in areas additional to those where the species was detected. The project footprint is centred on an area with low or moderate value habitat for koala.

No koala habitat areas are mapped over the Study Area in SPP koala habitat mapping.

Key threats to the koala are predominantly loss and fragmentation of habitat, mortality by collision with vehicles and dog attacks and reduced viability through disease (TSSC, 2012).

3.4.2 Rainbow bee-eater (*Merops ornatus*)

Rainbow bee-eaters were heard calling across the woodland habitat within the Study Area. This species inhabits open forests and woodlands, shrublands and open areas, generally located near permanent water and is generally widespread in mainland Australia. It typically breeds throughout most of its range and builds nests in the banks of rivers, creeks and dams. Habitats present within the Study Area are limited to small, isolated areas of foraging habitat and low-value nesting habitat that are relatively ubiquitous within the surrounding landscape. No significant breeding or nesting habitats occur that would support sufficiently large numbers of individuals to constitute an important population of this species.

3.4.3 Grey-headed flying-fox (*Pteropus poliocephalus*)

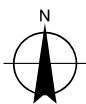
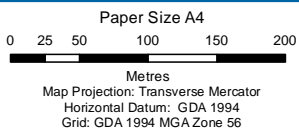
All woodland habitat within the Study Area represents suitable foraging habitat for the grey-headed flying-fox. This species forages widely throughout south-east Queensland, feeding on nectar and pollen from a range of native tree and shrub species including *Eucalyptus*, *Corymbia*, *Angophora*, *Melaleuca* and *Banksia* (Duncan *et al.*, 1999). As a consequence, habitats within the Study Area that are considered valuable for the koala are also important as foraging habitat for the grey-headed flying-fox. No roosting camps occur within or immediately adjacent to the Study Area - the nearest confirmed flying-fox roosting camp is located at Gatton, to the south of the Study Area (DEHP, 2016).



LEGEND

- | | | |
|--------------------------|---|------------------|
| Highway | Remnant Clearing Area | SAT Sites |
| Street/Local Road | Suitable habitat for koala and grey-headed flying fox | Low |
| Extent of concept design | | Medium |
| Cadastre | | High |

Based on or contains data provided by the State of QLD (DNRM) 2017. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



Quinbrook Infrastructure Partners Pty Ltd Job Number | 91-10341
 Lockyer Energy Project Revision | 0
 Date | 14 Jul 2017

Habitat for conservation significant fauna species

Figure 3

4. Potential impacts

4.1 General impacts

The proposed project has the potential for the following general impacts:

- Removal of approximately 18.8 ha of previously cleared and regrowth habitat
- Removal of approximately 6.5 ha of mapped remnant RE (including some areas previously disturbed by vehicle track and fenceline/firebreak clearing, farmhouse yard areas and a farm dam)
- Loss of approximately 6.5 ha of suitable koala habitat (see significant impact assessment below)
- Mortality or injury of wildlife during vegetation clearing and construction
- Loss of modified aquatic habitat (two farm dams)
- Changes to overland flows and hydrology regime across and adjacent the project footprint due to cut and fill to level out the project footprint and construction of bunds and drains around the site
- Increased risk of the spread or introduction of weed species
- Short-term disruption of wildlife behaviours due to exposure to light, noise, vibration and other construction impacts
- Long-term restriction on movement of wildlife through proposed fencing, however this will reduce fauna mortality from the highway traffic to the south

4.2 Significant impact assessment – koala

Impact on koala habitat has the potential to trigger an EPBC referral, depending on the quality of habitats impacted and the magnitude of impact. The EPBC referral guidelines for the vulnerable koala (DotE, 2014) provides:

- 1) A habitat assessment tool for determining the quality of koala habitat (i.e. whether a given area supports habitat critical to the survival of the koala)
- 2) A framework for identifying the magnitude of impact that would trigger the requirement for an EPBC referral (refer to Appendix E)

4.2.1 Assessment of habitat value under the EPBC Act

An assessment of koala habitat value was undertaken using the Koala habitat assessment toolkit in the EPBC referral guidelines for the vulnerable koala (DotE, 2014). The scores against those criteria are detailed below.

- **Koala occurrence +2 (high):** Evidence of one or more koalas within the last 5 years
- **Vegetation composition +2 (high):** has forest or woodland with 2 or more known koala food tree species
- **Habitat connectivity +2 (high):** area is part of a contiguous landscape > 500 ha
- **Key existing threats +1 (medium):** Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack in areas that score 1 or 2 for koala occurrence (irregular koala deaths are reported for the area due to vehicle strike on the Warrego Highway (Ipswich Koala Protection Society, 2014))

- **Recovery value +2 (high):** Habitat is likely to be important for achieving the interim recovery objectives for the relevant context

Total value + 9

The referral guidelines suggest that scores ≥ 5 represent habitat critical to the survival of the species. Habitats within the Study Area scored 9 and therefore represents habitat critical to the survival of the koala.

4.2.2 Assessment of impact significance under the EPBC Act

Assessment against the Matters of National Environmental Significance - Significant Impact Guidelines 1.1 (DotE, 2013) criteria indicated that a significant residual impact koala as a result of the proposed works is not considered likely to occur. This is documented in Table 3 below.

The guideline for assessing the significance of impact on habitat for the koala indicates that the project will fall into the category ‘impact uncertain’, given that it will result in clearance of more than 2 ha of known food trees in an area with a habitat score of 5 and less than 20 ha of koala food trees in an area with habitat score of 8 or more (refer to framework in Appendix E). In this instance, the significance of impact depends on the nature of the action. Factors considered in such instances include:

- Habitat score
- Area of impact
- Method of clearing (i.e. selective clearing or clear-felling)
- The density of koala occurrence
- Level of fragmentation caused

The project will result in clear-felling of approximately 6.5 ha of habitat scoring 9 in the koala assessment toolkit. However, the project is unlikely to impose significant habitat fragmentation, as the area cleared is at the southern extent of the existing habitat, in an area immediately adjacent to the Warrego Highway. The highway is known to represent a mortality source for koalas (Ipswich Koala Protection Society, 2014) and a barrier to koala movement (Bussey and Ellis, 2016). Approximately 44.6 ha of koala habitat will be retained within the Study Area and connect to more extensive networks of habitat to the north. Areas of habitat within the proposed clearing footprint had lower levels of koala utilisation than the koala habitats retained across the majority of the Study Area. Given the area to be cleared is relatively small (6.5 ha), has lower levels of utilisation, relative to other parts of the Study Area and will not cause fragmentation of koala habitats, the impact is unlikely to be considered significant. The construction of infrastructure in its’ proposed location, between an area of confirmed high value habitat and an area of known koala mortality (i.e. the Warrego Highway) may have some positive value in deterring movement of individuals onto the highway. However, the project will reduce the area of food trees available within the local area. While the project is considered unlikely to have a significant impact, it should be referred to the DEE for a formal assessment.

Table 3 Significant impact criteria - koala

Impact criteria	Potential to occur
Lead to a long-term decrease in the size of an important population of a species.	Unlikely. While the suitable koala habitat within the study area was assessed as being ‘habitat critical to the survival of the koala’, areas of habitat within the proposed clearing footprint had lower levels of koala utilisation than the koala habitats retained across the majority of the study area. The majority of the development footprint had no evidence of koala usage, with approximately 6.5 ha of suitable koala habitat

Impact criteria	Potential to occur
	<p>showing limited usage based on the relative absence of scratches and faecal pellets. Extensive suitable habitat will remain in the surrounding landscape, and mitigation measures will be implemented for the project to avoid any impacts on adjacent bushland. Therefore, loss of less suitable habitat is unlikely to result in a decrease in the population size.</p> <p>The construction of earth bunds and infrastructure in the proposed development footprint, between an area of confirmed high value habitat and an area of known koala mortality (i.e. the Warrego Highway) may have some positive value in deterring movement of individuals onto the highway.</p>
<p>Reduce the area of occupancy of an important population.</p>	<p>Unlikely.</p> <p>The loss of 6.5 ha of suitable koala habitat of low utilisation will not reduce the area of occupancy of the population. Extensive suitable habitat persists within the remainder of the study area and is prevalent within the surrounding areas. The species is considered able to remain within the study area adjacent the development. As such, the project is predicted to have negligible impact on the population's area of occupancy.</p>
<p>Fragment an existing important population into two or more populations.</p>	<p>Unlikely.</p> <p>The project will result in clearing of approximately 6.5 ha of habitat scoring 9 in the koala assessment toolkit. However, the clearance of this vegetation is considered unlikely to impose significant fragmentation of koala habitats for the following reasons:</p> <ul style="list-style-type: none"> • The area to be cleared is located at the southern extent of koala habitats present within the study area and surrounding landscape • The area to be cleared has substantially lower density of koala food trees than areas to be retained • The area to be cleared has low levels of koala utilisation compared within habitats to be retained, based on the abundance and freshness of koala scratches and faecal pellets observed • The area to be cleared is adjacent to the Warrego Highway. The highway is known to represent a mortality source for koalas (Ipswich Koala Protection Society, 2014) and a barrier to koala movement (Bussey and Ellis, 2016). • Approximately 44.6 ha of koala habitat will be retained within the study area and connect to more extensive networks of habitat to the north. <p>The construction of earth bunds and infrastructure in the proposed development footprint, between an area of confirmed high value habitat and an area of known koala mortality (i.e. the Warrego Highway) may have some positive value in deterring movement of individuals onto the highway.</p> <p>A fauna spotter will be used during clearing and fencing activities to ensure koalas are safely relocated from the impact area to adjacent suitable habitats if necessary.</p>
<p>Adversely affect habitat critical to the survival of a species.</p>	<p>Unlikely.</p> <p>The project will result in clearing of approximately 6.5 ha of suitable koala habitat scoring 9 using the koala assessment toolkit, therefore constituting habitat critical to survival of koala. However the net outcome for local koala habitat is considered unlikely to have an adverse outcome for local koala habitat. The project has been micro-sited to avoid areas of high koala habitat value and impact areas with lower value for koala. Based on the abundance and freshness of koala scratches and faecal pellets, the 6.5 ha area subject to clearing showed substantially lower levels of koala utilisation than the 44.6 ha of habitat that will be retained across the northern half of the study</p>

Impact criteria	Potential to occur
	<p>area. The area of woodland to be retained connects to extensive contiguous networks of koala habitat to the north.</p> <p>While there will be an initial loss of koala food trees as a result of the project, rehabilitation of the site will incorporate local planting of koala food trees within the northern extent of the development footprint (adjacent habitat to be retained). The net result is therefore unlikely to have a significant adverse impact on habitat critical to the survival of the species.</p> <p>The placement of infrastructure and earth bunds between an area of confirmed high value habitat and an area of known koala mortality (i.e. the Warrego Highway) is likely to prevent movement of individuals onto the highway and therefore reduce the incidence of mortality.</p>
<p>Disrupt the breeding cycle of an important population.</p>	<p>Unlikely.</p> <p>No interruption of koala breeding cycles is predicted to occur as a result of the proposed works (both construction and operation). Clearing and earthworks will be scheduled outside the lead up to koala breeding season (i.e. avoid the period between July and September) when breeding males are generally more mobile. This will minimise movement of koalas into the construction/clearing footprint and minimise disruption to normal breeding activities and movements. Measures will be in place during clearing and construction works to either allow koalas to move from the area or to be safely relocated if necessary.</p> <p>Temporary fencing during construction and fencing of power generation infrastructure during operation will prevent movement of wildlife into and beyond the development footprint (i.e. towards the Warrego Highway).</p> <p>The project will not fragment koala habitat and will therefore not pose a barrier to koala movement that could inhibit movement or dispersal of breeding individuals in the short or long-term. The project is therefore unlikely to have an impact on breeding cycles of the local koala population.</p>

Impact criteria	Potential to occur
<p>Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.</p>	<p>Unlikely.</p> <p>The project will result in a total loss of approximately 6.5 ha of low utilisation suitable koala habitat and some koala food trees. Given koala food trees are proposed to be planted as part of the on-site rehabilitation in the northern extent of the development footprint, the net loss of koala foraging habitat will be substantially reduced.</p> <p>Approximately 44.6 ha of high value koala habitat will be retained within the study area and connect to more extensive networks of habitat to the north. Areas of habitat within the proposed clearing footprint had lower levels of koala utilisation than the koala habitats retained across the majority of the study area.</p> <p>The loss of a relatively small area of lower value habitat at the southern extent of a much larger and more highly utilised area of koala habitat is unlikely to result in a decline of the species. Higher value suitable habitat will remain in the surrounding landscape, and mitigation measures will be required within the proposed development footprint to avoid any impacts on adjacent bushland.</p> <p>The construction of earth bunds and infrastructure in the proposed development footprint, between an area of confirmed high value habitat and an area of known koala mortality (i.e. the Warrego Highway) may have some positive value in deterring movement of individuals onto the highway. Temporary fencing during construction and fencing of power generation infrastructure during operation will prevent movement of wildlife into and beyond the development footprint (i.e. towards the Warrego Highway).</p>
<p>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.</p>	<p>Unlikely.</p> <p>Although proposed clearing, construction and operation activities within the proposed footprint have the potential to increase the spread of weeds, mitigation measures that will be implemented include monitoring and management of weeds.</p> <p>The site is currently fenced with barbed wire fencing that would be permeable to movement of dogs. Preventing or reducing access to dogs will reduce the potential mortality threat to local koalas and other native wildlife species. Proposed placement of earth bunds, infrastructure and fencing around infrastructure may serve to restrict invasive fauna species from entering koala habitat through the development footprint. Waste management will be controlled during construction and operation to avoid attracting dogs to the area. It is not considered likely that invasive fauna species will become established in koala habitat as a result of the proposed works.</p>
<p>Introduce disease that may cause the species to decline.</p>	<p>Unlikely.</p> <p>Proposed works are not predicted to introduce disease that may affect koalas. Koala populations in south-east Queensland carry <i>Chlamydia</i> spp. pathogens. Stress associated with loss and fragmentation of habitat, harassment by predators and overcrowding can induce an increase in the incidence of chlamydiosis symptoms among koala populations (Reed and Lunney, 1990; Phillips, 1997). However the project will not result in a fragmentation of koala habitat or substantial increase in the exposure to noise or light disturbance that may cause stress. Impacts are therefore expected to be insignificant and unlikely</p>

Impact criteria	Potential to occur
	to cause an increase in stress that would exacerbate levels of chlamydiosis or other stress-related disease in the local koala population.
Interfere substantially with the recovery of the species.	<p>Unlikely.</p> <p>The habitat assessment toolkit was used and determined that the impact area contains 'habitat critical to the survival' of the koala. The EPBC Act Referral Guidelines for the Vulnerable Koala (DotE, 2014) define impacts that are likely to substantially interfere with the recovery of the koala as one or more of the following:</p> <ul style="list-style-type: none"> • Increasing koala fatalities in habitat critical to the survival of the koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities. • Increasing koala fatalities in habitat critical to the survival of the koala due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities. • Facilitating the introduction or spread of disease or pathogens for example Chlamydia or <i>Phytophthora cinnamomi</i>, to habitat critical to the survival of the koala, that are likely to significantly reduce the reproductive output of koalas or reduce the carrying capacity of the habitat. • Creating a barrier to movement to, between or within habitat critical to the survival of the koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the koala. • Changing hydrology which degrades habitat critical to the survival of the koala to the extent that the carrying capacity of the habitat is reduced in the long-term. <p>The proposed works are not considered likely to result in any of the above and therefore not interfere substantially with the recovery fo the species.</p>

4.3 Significant impact assessment – grey-headed flying-fox

4.3.1 Assessment of habitat values under the EPBC Act

All woodland habitat within the Study Area represents suitable foraging habitat for the grey-headed flying-fox. This species forages widely throughout south-east Queensland, feeding on nectar and pollen from a range of native tree and shrub species including *Eucalyptus*, *Corymbia*, *Angophora*, *Melaleuca* and *Banksia* (Duncan *et al.*, 1999). As a consequence, habitats within the Study Area that are considered valuable for the koala are also important as foraging habitat for the grey-headed flying-fox. No roosting camps occur within or immediately adjacent to the Study Area - the nearest confirmed flying-fox roosting camp is located at Gatton, to the south of the Study Area (DEHP, 2016).

4.3.2 Assessment of impact significance under the EPBC Act

Assessment against the Matters of National Environmental Significance - Significant Impact Guidelines 1.1 (DotE, 2013) criteria indicated that a significant residual impact on grey-headed flying-fox as a result of the proposed works is not considered likely to occur. This is documented in Table 4 below.

The project will result in the clearance of approximately 6.5 ha of foraging habitat for the grey-headed flying-fox. Approximately 44.6 ha of suitable foraging habitat will be retained on the

Study Area. Given the relatively small size of the area of foraging habitat impacted and its prevalence and broad distribution in the surrounding area, this is considered unlikely to have a significant impact on the local grey-headed flying-fox population.

Table 4 Significant impact criteria – grey-headed flying-fox

Impact criteria	Potential to occur
Lead to a long-term decrease in the size of an important population of a species.	Unlikely. The grey-headed flying-fox migrates and forages over a broad geographic range and is therefore considered one nationally intermixing population. The project will not impact roosting and/or breeding habitat for the grey-headed flying-fox. Although it will initially result in the localised loss of a small area (6.5 ha) of suitable foraging habitat, rehabilitation for the project will include local on-site planting of trees that provide foraging habitat for the grey-headed flying-fox. The project is therefore unlikely to result in any substantial net loss of foraging habitat. Most of the study area (44.6 ha) will retain suitable foraging habitat for the species. Given the small, localised nature of the loss of foraging habitat, the prevalence of suitable foraging habitat within the study area and the surrounding region, and the lack of impact on breeding/roosting habitat, the project is considered unlikely to lead to a long-term decrease in the size of an important population.
Reduce the area of occupancy of an important population.	Unlikely. The loss of 6.5 ha of potential foraging habitat will not reduce the area of occupancy of the population. Suitable foraging habitat persists within most of the study area and is prevalent within the surrounding region. The species is considered likely to occur within the study area after the development. As such, the project will predicted to have negligible impact on the population's area of occupancy.
Fragment an existing important population into two or more populations.	Unlikely. The grey-headed flying-fox forages widely and has a high capacity to overcome gaps in vegetation. Given the species' capacity for movement, the grey headed flying-fox is considered one national intermixing population (Webb and Tidemann, 1995). The project will result in a localised loss of foraging habitat within a small footprint. This will not fragment the population into two or more populations.
Adversely affect habitat critical to the survival of a species.	Unlikely. Habitats critical to the survival of the grey-headed flying-fox include winter and spring-flowering food tree species (DEE, 2017b). While several winter and spring flowering food tree species occur within the study area (i.e. Eucalyptus tereticornis, E. crebra, E. fibrosa and Corymbia citriodora), winter and spring flowering food trees will be planted in the northern extent of rehabilitation areas. As a result, there is not expected to be a substantial net loss of winter and spring food trees for the grey-headed flying-fox in the long-term. The project will have no impact on roosting/breeding habitat. Given the species' regional abundance in the surrounding landscape, the project is considered unlikely to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an	Unlikely. The project will not directly impact on roosting or breeding habitat. No flying-fox roosting camps occur within or

Impact criteria	Potential to occur
important population.	immediately adjacent to the study area - the nearest mapped flying-fox roosting camp is located at Gatton, further south of the study area (DEHP, 2016). As such, the project is not expected to have an impact on the breeding cycle of the grey-headed flying-fox population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Unlikely. The project will not impact on breeding or roosting habitat for the grey-headed flying-fox. In the short-term, the project will result in a loss of approximately 6.5 ha of foraging habitat including winter/spring foraging species. Similar suitable foraging habitat is widespread and relatively abundant within the surrounding areas, particularly areas immediately north of the study area. Revegetation of the site will utilise winter and spring flowering preferred food trees of the grey-headed flying-fox and therefore reduce the net loss of foraging habitat for the species. As a result, the loss of foraging habitat is considered unlikely to have a significant impact given its restricted and localised extent and its partial replacement in replanted areas.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Unlikely. The black flying-fox is considered to be a threat to the grey-headed flying-fox, given its' potential for competition for habitat. However, the project is not expected to have an impact on the black flying-fox's prevalence within the local or regional environment.
Introduce disease that may cause the species to decline.	Unlikely. There are no known diseases that pose a significant threat to the grey-headed flying-fox (DEE, 2017b). The project is unlikely to result in the increased incidence of any species that could be a vector for disease. As such, the project is considered unlikely to introduce disease to the species.
Interfere substantially with the recovery of the species.	Unlikely. The project will result in a small-scale localised loss of foraging habitat from a region in which similar foraging habitat is widespread and abundant. In the long-term, this local loss will be offset to a large extent by nearby on-site planting of food trees for the grey-headed flying-fox. As such, the project has no capacity to interfere substantially with the recovery of the species.

4.4 Legislative implications

4.4.1 EPBC Act

No impacts will occur to listed threatened flora or TECs.

The significance impact assessment for the koala (Section 4.2 above) found that the project is unlikely to result in a significant impact on the koala, given that it will result in clearance of 6.5 ha of infrequently utilised habitat and will not result in substantial habitat fragmentation. Given the assessment fell within the 'impact uncertain' category of the EPBC referral guideline, referral is recommended.

The project will result in the clearance of approximately 6.5 ha of foraging habitat for the grey-headed flying-fox. Approximately 44.6 ha of suitable foraging habitat will be retained on the Study Area. Given the relatively small size of the area of foraging habitat impacted and its prevalence and broad distribution in the surrounding area, this is considered unlikely to have a significant impact on the local grey-headed flying-fox population.

No significant populations or habitat important to the life-cycle of migratory species were observed or considered likely to occur within the Study Area. The potential habitat present within the Study Area is not considered to be 'important habitat' for a migratory species, in that it does not support an ecologically significant proportion of a population of migratory species, is not of critical importance at a particular life-cycle stage, is not at the limit of a species' range and is not within an area where the species is known to be declining. Therefore no significant residual impact to migratory species is considered likely to occur.

A listed marine species is defined under the EPBC Act as a marine species included in s248 of the Act, which includes all species in the Class Aves (birds) that occur naturally in Commonwealth marine areas. Marine species listed under the EPBC Act (that are not otherwise listed threatened or listed migratory) are not (in themselves) controlling provisions (matters of national environmental significance) requiring a significance of impact assessment, unless the action is being undertaken in a Commonwealth marine area. As the project does not occur within a Commonwealth marine area, no further assessment of the potential for impacts to listed marine species is required. Notwithstanding, it is not considered likely that significant impacts to listed marine species or their habitat will occur as a result of the proposed project.

4.4.2 NC Act

Flora

No high-risk flora survey trigger areas are mapped across the Study Area. No flora species listed under the NC Act were identified or considered likely to occur within the Study Area. Accordingly, there are no approval requirements relevant to NC Act listed flora.

Fauna

It is likely that fauna breeding places will be located within the Study Area. There is the potential for a Species Management Program (SMP) and/or a Damage Mitigation Permit to be required where breeding places for species listed under the NC Act are identified within the project footprint. Species that this is likely to apply to include special least concern birds and echidna. Koalas are not included in SMP documentation, as they are not considered to have a habitual breeding place.

4.4.3 VM Act

A development approval exists for clearing mapped vegetation regulated under the VM Act. This approval only permits clearing of vegetation to occur within areas identified on Vegetation Clearing Plan 41-22282-L007 (dated 28 May 2010) and limited to Area A shown on the Referral Agency Response (Vegetation) Plan (reference RARP2009/009249) and in accordance with the requirements of the (then) Department of Environmental Resource Management (now DNRM) as a referral agency. This approval is dated 28 February 2014 and may be subject to timeframes for commencing works as per the *Sustainable Planning Act 2009*.

4.4.4 Biosecurity Act 2014

A number of invasive weed species that are classed as Category 3 restricted matters under the *Biosecurity Act 2014* have been recorded in the Study Area. Observed invasive weeds were generally widespread or limited to within the previously cleared areas.

Category 3 species must not be distributed, including being released into the environment, unless authorised under a regulation or permit.

5. References

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Appendices

Appendix A – Wildlife Online results



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point

Species: All

Type: All

Status: All

Records: All

Date: All

Latitude: -27.5345

Longitude: 152.2746

Distance: 2

Email: sally.potts@ghd.com

Date submitted: Thursday 27 Apr 2017 13:27:32

Date extracted: Thursday 27 Apr 2017 13:30:13

The number of records retrieved = 181

Disclaimer

As the DSITIA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufo	<i>Rhinella marina</i>	cane toad	Y			2
animals	amphibians	Hylidae	<i>Litoria caerulea</i>	common green treefrog		C		1
animals	amphibians	Hylidae	<i>Litoria rubella</i>	ruddy treefrog		C		1
animals	amphibians	Limnodynastidae	<i>Limnodynastes terraereginae</i>	scarlet sided pobblebonk		C		1
animals	amphibians	Limnodynastidae	<i>Limnodynastes tasmaniensis</i>	spotted grassfrog		C		1
animals	birds	Acanthizidae	<i>Acanthiza chrysorrhoa</i>	yellow-rumped thornbill		C		3
animals	birds	Acanthizidae	<i>Gerygone olivacea</i>	white-throated gerygone		C		6
animals	birds	Accipitridae	<i>Aquila audax</i>	wedge-tailed eagle		C		4
animals	birds	Accipitridae	<i>Milvus migrans</i>	black kite		C		7
animals	birds	Accipitridae	<i>Haliastur indus</i>	brahminy kite		C		1
animals	birds	Accipitridae	<i>Circus assimilis</i>	spotted harrier		C		1
animals	birds	Accipitridae	<i>Elanus axillaris</i>	black-shouldered kite		C		6
animals	birds	Accipitridae	<i>Circus approximans</i>	swamp harrier		C		1
animals	birds	Accipitridae	<i>Accipiter fasciatus</i>	brown goshawk		C		1
animals	birds	Accipitridae	<i>Aviceda subcristata</i>	Pacific baza		C		1
animals	birds	Accipitridae	<i>Haliastur sphenurus</i>	whistling kite		C		6
animals	birds	Accipitridae	<i>Haliaeetus leucogaster</i>	white-bellied sea-eagle		C		6
animals	birds	Acrocephalidae	<i>Acrocephalus australis</i>	Australian reed-warbler		C		3
animals	birds	Alcedinidae	<i>Ceyx azureus</i>	azure kingfisher		C		1
animals	birds	Anatidae	<i>Cygnus atratus</i>	black swan		C		9
animals	birds	Anatidae	<i>Malacorhynchus membranaceus</i>	pink-eared duck		C		1
animals	birds	Anatidae	<i>Anas superciliosa</i>	Pacific black duck		C		24
animals	birds	Anatidae	<i>Chenonetta jubata</i>	Australian wood duck		C		19
animals	birds	Anatidae	<i>Dendrocygna eytoni</i>	plumed whistling-duck		C		5
animals	birds	Anatidae	<i>Dendrocygna arcuata</i>	wandering whistling-duck		C		4
animals	birds	Anatidae	<i>Nettapus coromandelianus</i>	cotton pygmy-goose		C		2
animals	birds	Anatidae	<i>Anas gracilis</i>	grey teal		C		22
animals	birds	Anatidae	<i>Anas castanea</i>	chestnut teal		C		1
animals	birds	Anatidae	<i>Aythya australis</i>	hardhead		C		13
animals	birds	Anhingidae	<i>Anhinga novaehollandiae</i>	Australasian darter		C		9
animals	birds	Anseranatidae	<i>Anseranas semipalmata</i>	magpie goose		C		4
animals	birds	Ardeidae	<i>Ardea intermedia</i>	intermediate egret		C		7
animals	birds	Ardeidae	<i>Egretta garzetta</i>	little egret		C		3
animals	birds	Ardeidae	<i>Ardea alba modesta</i>	eastern great egret		C		11
animals	birds	Ardeidae	<i>Ixobrychus flavicollis</i>	black bittern		C		1
animals	birds	Ardeidae	<i>Nycticorax caledonicus</i>	nankeen night-heron		C		5
animals	birds	Ardeidae	<i>Bubulcus ibis</i>	cattle egret		C		19
animals	birds	Ardeidae	<i>Ardea pacifica</i>	white-necked heron		C		1
animals	birds	Ardeidae	<i>Egretta novaehollandiae</i>	white-faced heron		C		8
animals	birds	Artamidae	<i>Cracticus torquatus</i>	grey butcherbird		C		10
animals	birds	Artamidae	<i>Artamus leucorhynchus</i>	white-breasted woodswallow		C		6
animals	birds	Artamidae	<i>Cracticus nigrogularis</i>	pied butcherbird		C		9
animals	birds	Artamidae	<i>Cracticus tibicen</i>	Australian magpie		C		13
animals	birds	Artamidae	<i>Strepera graculina</i>	pied currawong		C		1
animals	birds	Burhinidae	<i>Burhinus grallarius</i>	bush stone-curlew		C		13
animals	birds	Cacatuidae	<i>Eolophus roseicapilla</i>	galah		C		17

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Cacatuidae	<i>Nymphicus hollandicus</i>	cockatiel		C		6
animals	birds	Cacatuidae	<i>Calyptorhynchus banksii</i>	red-tailed black-cockatoo		C		1
animals	birds	Cacatuidae	<i>Cacatua sanguinea</i>	little corella		C		3
animals	birds	Campephagidae	<i>Coracina papuensis</i>	white-bellied cuckoo-shrike		C		7
animals	birds	Campephagidae	<i>Coracina novaehollandiae</i>	black-faced cuckoo-shrike		C		9
animals	birds	Campephagidae	<i>Coracina tenuirostris</i>	cidcabird		C		5
animals	birds	Campephagidae	<i>Lalage leucomela</i>	varied triller		C		1
animals	birds	Campephagidae	<i>Lalage tricolor</i>	white-winged triller		C		1
animals	birds	Campephagidae	<i>Coracina maxima</i>	ground cuckoo-shrike		C		1
animals	birds	Charadriidae	<i>Vanellus miles</i>	masked lapwing		C		8
animals	birds	Charadriidae	<i>Elseyornis melanops</i>	black-fronted dotterel		C		6
animals	birds	Charadriidae	<i>Vanellus miles novaehollandiae</i>	masked lapwing (southern subspecies)		C		6
animals	birds	Charadriidae	<i>Erythrogonys cinctus</i>	red-kneed dotterel		C		2
animals	birds	Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	black-necked stork		C		3
animals	birds	Cisticolidae	<i>Cisticola exilis</i>	golden-headed cisticola		C		6
animals	birds	Climacteridae	<i>Cormobates leucophaea metastasis</i>	white-throated treecreeper (southern)		C		4
animals	birds	Columbidae	<i>Geophaps scripta scripta</i>	squatter pigeon (southern subspecies)		V	V	1
animals	birds	Columbidae	<i>Streptopelia chinensis</i>	spotted dove	Y			4
animals	birds	Columbidae	<i>Geopelia humeralis</i>	bar-shouldered dove		C		2
animals	birds	Columbidae	<i>Phaps chalcoptera</i>	common bronzewing		C		1
animals	birds	Columbidae	<i>Ocyphaps lophotes</i>	crested pigeon		C		7
animals	birds	Columbidae	<i>Columba livia</i>	rock dove	Y			4
animals	birds	Columbidae	<i>Geopelia striata</i>	peaceful dove		C		3
animals	birds	Coraciidae	<i>Eurystomus orientalis</i>	dollarbird		C		6
animals	birds	Corvidae	<i>Corvus orru</i>	Torresian crow		C		21
animals	birds	Cuculidae	<i>Eudynamys orientalis</i>	eastern koel		C		2
animals	birds	Cuculidae	<i>Centropus phasianinus</i>	pheasant coucal		C		2
animals	birds	Cuculidae	<i>Scythrops novaehollandiae</i>	channel-billed cuckoo		C		2
animals	birds	Estrildidae	<i>Neochmia modesta</i>	plum-headed finch		C		3
animals	birds	Estrildidae	<i>Lonchura castaneothorax</i>	chestnut-breasted mannikin		C		1
animals	birds	Estrildidae	<i>Taeniopygia bichenovii</i>	double-barred finch		C		2
animals	birds	Estrildidae	<i>Neochmia temporalis</i>	red-browed finch		C		1
animals	birds	Falconidae	<i>Falco berigora</i>	brown falcon		C		2
animals	birds	Falconidae	<i>Falco cenchroides</i>	nankeen kestrel		C		2
animals	birds	Falconidae	<i>Falco subniger</i>	black falcon		C		3
animals	birds	Halcyonidae	<i>Dacelo novaeguineae</i>	laughing kookaburra		C		5
animals	birds	Halcyonidae	<i>Todiramphus sanctus</i>	sacred kingfisher		C		10
animals	birds	Hirundinidae	<i>Petrochelidon nigricans</i>	tree martin		C		3
animals	birds	Hirundinidae	<i>Petrochelidon ariel</i>	fairy martin		C		6
animals	birds	Hirundinidae	<i>Hirundo neoxena</i>	welcome swallow		C		14
animals	birds	Hirundinidae	<i>Cheramoeca leucosterna</i>	white-backed swallow		C		3
animals	birds	Jacanidae	<i>Irediparra gallinacea</i>	comb-crested jacana		C		3
animals	birds	Laridae	<i>Chlidonias hybrida</i>	whiskered tern		C		1
animals	birds	Maluridae	<i>Malurus cyaneus</i>	superb fairy-wren		C		2
animals	birds	Megaluridae	<i>Megalurus timoriensis</i>	tawny grassbird		C		2
animals	birds	Meliphagidae	<i>Philemon corniculatus</i>	noisy friarbird		C		6

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Meliphagidae	<i>Manorina melanocephala</i>	noisy miner		C		19
animals	birds	Meliphagidae	<i>Myzomela sanguinolenta</i>	scarlet honeyeater		C		3
animals	birds	Meliphagidae	<i>Philemon citreogularis</i>	little friarbird		C		1
animals	birds	Meliphagidae	<i>Anthochaera carunculata</i>	red wattlebird		C		1
animals	birds	Meliphagidae	<i>Melithreptus albogularis</i>	white-throated honeyeater		C		1
animals	birds	Meliphagidae	<i>Plectorhyncha lanceolata</i>	striped honeyeater		C		7
animals	birds	Meliphagidae	<i>Melithreptus brevirostris</i>	brown-headed honeyeater		C		1
animals	birds	Meliphagidae	<i>Lichmera indistincta</i>	brown honeyeater		C		5
animals	birds	Meliphagidae	<i>Ptilotula fusca</i>	fuscous honeyeater		C		13
animals	birds	Meliphagidae	<i>Caligavis chrysops</i>	yellow-faced honeyeater		C		3
animals	birds	Meropidae	<i>Merops ornatus</i>	rainbow bee-eater		C		11
animals	birds	Monarchidae	<i>Grallina cyanoleuca</i>	magpie-lark		C		19
animals	birds	Monarchidae	<i>Myiagra rubecula</i>	leaden flycatcher		C		6
animals	birds	Nectariniidae	<i>Dicaeum hirundinaceum</i>	mistletoebird		C		2
animals	birds	Neosittidae	<i>Daphoenositta chrysoptera</i>	varied sittella		C		4
animals	birds	Oriolidae	<i>Sphecotheres vieilloti</i>	Australasian figbird		C		3
animals	birds	Oriolidae	<i>Oriolus sagittatus</i>	olive-backed oriole		C		5
animals	birds	Pachycephalidae	<i>Colluricincla harmonica</i>	grey shrike-thrush		C		4
animals	birds	Pachycephalidae	<i>Pachycephala pectoralis</i>	golden whistler		C		2
animals	birds	Pachycephalidae	<i>Pachycephala rufiventris</i>	rufous whistler		C		4
animals	birds	Pardalotidae	<i>Pardalotus punctatus</i>	spotted pardalote		C		1
animals	birds	Pardalotidae	<i>Pardalotus striatus</i>	striated pardalote		C		20
animals	birds	Passeridae	<i>Passer domesticus</i>	house sparrow	Y			2
animals	birds	Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian pelican		C		5
animals	birds	Petroicidae	<i>Petroica rosea</i>	rose robin		C		1
animals	birds	Petroicidae	<i>Microeca fascinans</i>	jacky winter		C		3
animals	birds	Phalacrocoracidae	<i>Phalacrocorax sulcirostris</i>	little black cormorant		C		14
animals	birds	Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	little pied cormorant		C		16
animals	birds	Phalacrocoracidae	<i>Phalacrocorax carbo</i>	great cormorant		C		4
animals	birds	Phasianidae	<i>Coturnix ypsilophora</i>	brown quail		C		2
animals	birds	Podargidae	<i>Podargus strigoides</i>	tawny frogmouth		C		1
animals	birds	Podicipedidae	<i>Podiceps cristatus</i>	great crested grebe		C		2
animals	birds	Podicipedidae	<i>Tachybaptus novaehollandiae</i>	Australasian grebe		C		21
animals	birds	Pomatostomidae	<i>Pomatostomus temporalis</i>	grey-crowned babbler		C		2
animals	birds	Psittacidae	<i>Trichoglossus chlorolepidotus</i>	scaly-breasted lorikeet		C		8
animals	birds	Psittacidae	<i>Trichoglossus haematodus moluccanus</i>	rainbow lorikeet		C		5
animals	birds	Psittacidae	<i>Parvipsitta pusilla</i>	little lorikeet		C		6
animals	birds	Psittacidae	<i>Platycercus adscitus</i>	pale-headed rosella		C		11
animals	birds	Psittacidae	<i>Glossopsitta concinna</i>	musk lorikeet		C		2
animals	birds	Psittacidae	<i>Psephotus haematonotus</i>	red-rumped parrot		C		7
animals	birds	Psophodidae	<i>Psophodes olivaceus</i>	eastern whipbird		C		1
animals	birds	Rallidae	<i>Gallinula tenebrosa</i>	dusky moorhen		C		19
animals	birds	Rallidae	<i>Fulica atra</i>	Eurasian coot		C		19
animals	birds	Rallidae	<i>Porphyrio melanotus</i>	purple swamphen		C		8
animals	birds	Recurvirostridae	<i>Himantopus himantopus</i>	black-winged stilt		C		10
animals	birds	Rhipiduridae	<i>Rhipidura albiscapa</i>	grey fantail		C		3

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Rhipiduridae	<i>Rhipidura leucophrys</i>	willie wagtail		C		17
animals	birds	Sturnidae	<i>Sturnus vulgaris</i>	common starling	Y			5
animals	birds	Sturnidae	<i>Acridotheres tristis</i>	common myna	Y			13
animals	birds	Threskiornithidae	<i>Platalea regia</i>	royal spoonbill		C		3
animals	birds	Threskiornithidae	<i>Threskiornis spinicollis</i>	straw-necked ibis		C		12
animals	birds	Threskiornithidae	<i>Threskiornis molucca</i>	Australian white ibis		C		15
animals	birds	Threskiornithidae	<i>Plegadis falcinellus</i>	glossy ibis		SL		2
animals	birds	Threskiornithidae	<i>Platalea flavipes</i>	yellow-billed spoonbill		C		6
animals	birds	Timaliidae	<i>Zosterops lateralis</i>	silveryeye		C		3
animals	birds	Turnicidae	<i>Turnix pyrrhothorax</i>	red-chested button-quail		C		1
animals	birds	Turnicidae	<i>Turnix maculosus</i>	red-backed button-quail		C		2
animals	birds	Tytonidae	<i>Tyto delicatula</i>	eastern barn owl		C		1
animals	insects	Nymphalidae	<i>Polyura sempronius sempronius</i>	tailed emperor				1
animals	lobe-finned fishes	Ceratodontidae	<i>Neoceratodus forsteri</i>	Australian lungfish			V	1
animals	mammals	Bovidae	<i>Bos taurus</i>	European cattle	Y			1
animals	mammals	Canidae	<i>Canis lupus dingo</i>	dingo				1
animals	mammals	Dasyuridae	<i>Phascogale tapoatafa tapoatafa</i>	brush-tailed phascogale		C		2
animals	mammals	Dasyuridae	<i>Sminthopsis murina</i>	common dunnart		C		2
animals	mammals	Leporidae	<i>Lepus europaeus</i>	European brown hare	Y			1
animals	mammals	Macropodidae	<i>Macropus parryi</i>	whiptail wallaby		C		1
animals	mammals	Macropodidae	<i>Macropus giganteus</i>	eastern grey kangaroo		C		1
animals	mammals	Macropodidae	<i>Macropus rufogriseus</i>	red-necked wallaby		C		1
animals	mammals	Petauridae	<i>Petaurus breviceps</i>	sugar glider		C		1
animals	mammals	Petauridae	<i>Petaurus norfolcensis</i>	squirrel glider		C		1/1
animals	mammals	Phalangeridae	<i>Trichosurus vulpecula</i>	common brushtail possum		C		2
animals	mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	koala		V	V	86
animals	mammals	Potoroidae	<i>Aepyprymnus rufescens</i>	rufous bettong		C		1
animals	mammals	Tachyglossidae	<i>Tachyglossus aculeatus</i>	short-beaked echidna		SL		2
animals	reptiles	Agamidae	<i>Pogona barbata</i>	bearded dragon		C		1
animals	reptiles	Agamidae	<i>Intellagama lesueurii</i>	eastern water dragon		C		3
animals	reptiles	Boidae	<i>Morelia spilota</i>	carpet python		C		2
animals	reptiles	Chelidae	<i>Chelodina longicollis</i>	eastern snake-necked turtle		C		1
animals	reptiles	Chelidae	<i>Emydura macquarii macquarii</i>	Murray turtle		C		3
animals	reptiles	Colubridae	<i>Tropidonophis mairii</i>	freshwater snake		C		1
animals	reptiles	Elapidae	<i>Cryptophis boschmai</i>	Carpentaria whip snake		C		1
animals	reptiles	Gekkonidae	<i>Gehyra dubia</i>	dubious dtella		C		1
animals	reptiles	Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's gecko		C		1
animals	reptiles	Pygopodidae	<i>Lialis burtonis</i>	Burton's legless lizard		C		1/1
animals	reptiles	Scincidae	<i>Cryptoblepharus pulcher pulcher</i>	elegant snake-eyed skink		C		1
animals	reptiles	Scincidae	<i>Ctenotus spaldingi</i>	straight-browed ctenotus		C		1
animals	uncertain	Indeterminate	<i>Indeterminate</i>	Unknown or Code Pending		C		1
plants	higher dicots	Amaranthaceae	<i>Amaranthus hybridus</i>	redshank	Y			1/1
plants	higher dicots	Euphorbiaceae	<i>Ricinus communis</i>	castor oil bush	Y			1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992*. The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ().

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*. The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.

This number is output as 999 if it equals or exceeds this value.

Appendix B – Protected Matters search results



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 27/04/17 13:27:09

[Summary](#)

[Details](#)

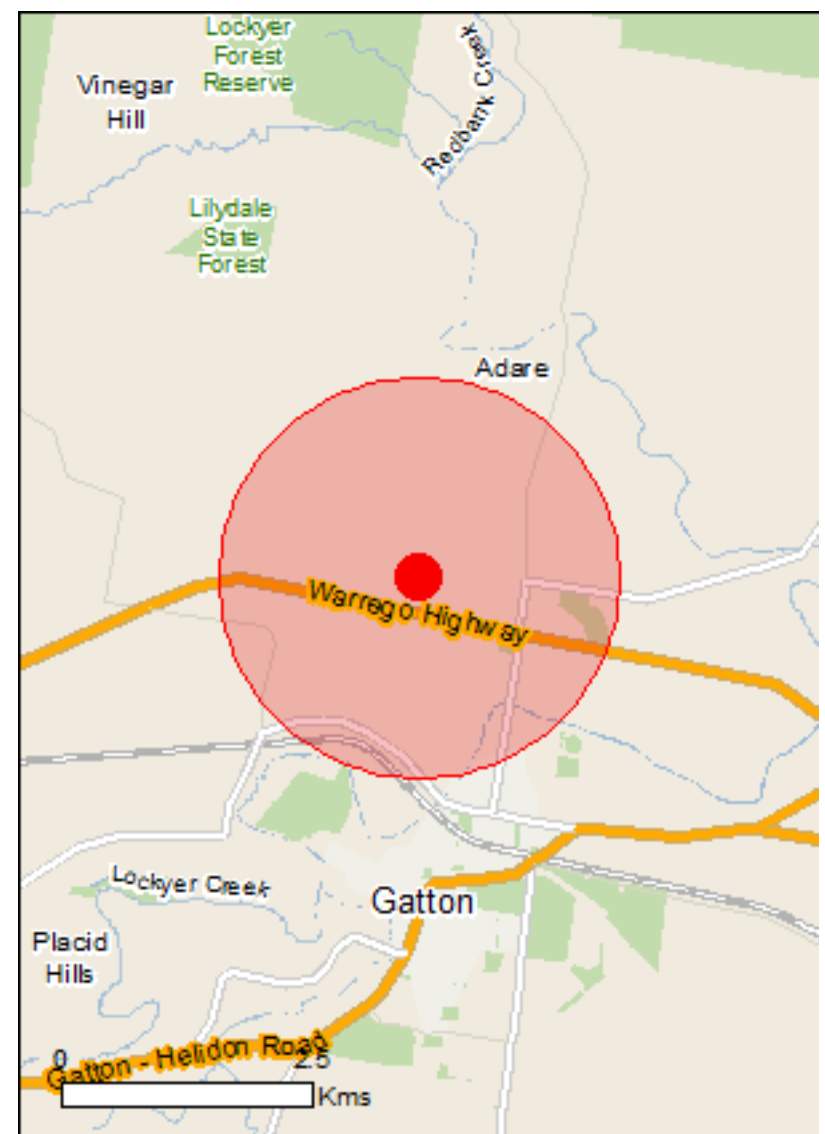
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

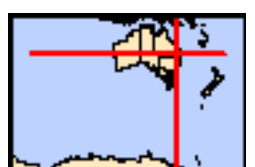
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 2.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	27
Listed Migratory Species:	16

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	23
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	27
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities

[[Resource Information](#)]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species

[[Resource Information](#)]

Name	Status	Type of Presence
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Birds

Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat known to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat likely to occur within area
Fish		
Neoceratodus forsteri Australian Lungfish, Queensland Lungfish [67620]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus hallucatus Northern Quoll, Digul [331]	Endangered	Species or species habitat may occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Phebalium distans Mt Berryman Phebalium [81869]	Critically Endangered	Species or species habitat may occur within area
Samadera bidwillii Quassia [29708]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Delma torquata Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat likely to occur within area
Furina dunmalli Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species

[\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [[Resource Information](#)]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Anseranas semipalmata		
Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis		
Cattle Egret [59542]		Breeding likely to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Cuculus saturatus		
Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor		
Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus		
Spectacled Monarch [610]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

Invasive Species

[\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
Birds		
<i>Acridotheres tristis</i> Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
<i>Anas platyrhynchos</i> Mallard [974]		Species or species habitat likely to occur within area
<i>Columba livia</i> Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
<i>Lonchura punctulata</i> Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
<i>Passer domesticus</i> House Sparrow [405]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-27.53457 152.27464

Acknowledgements

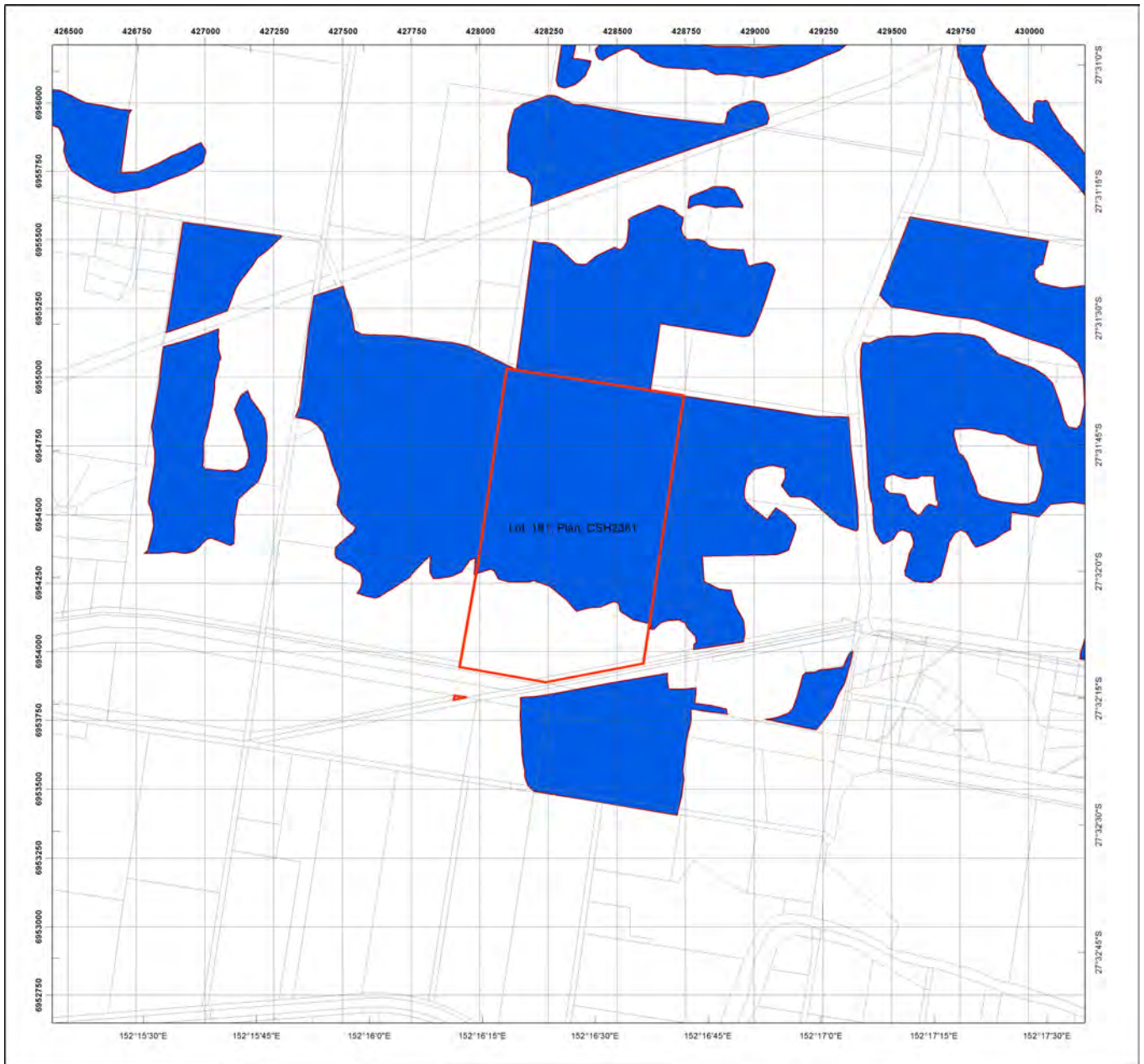
This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

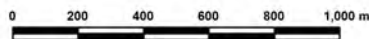
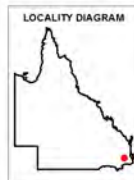
Appendix C – Regulated vegetation management map



Regulated Vegetation Management Map

Legend

- Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt on Freehold, Indigenous and Leasehold land)
- Water
- Area not categorised
- Cadastral line
- Property boundaries shown are provided as a locational aid only



This product is projected into:
 GDA 1994 MGA Zone 56

Disclaimer:

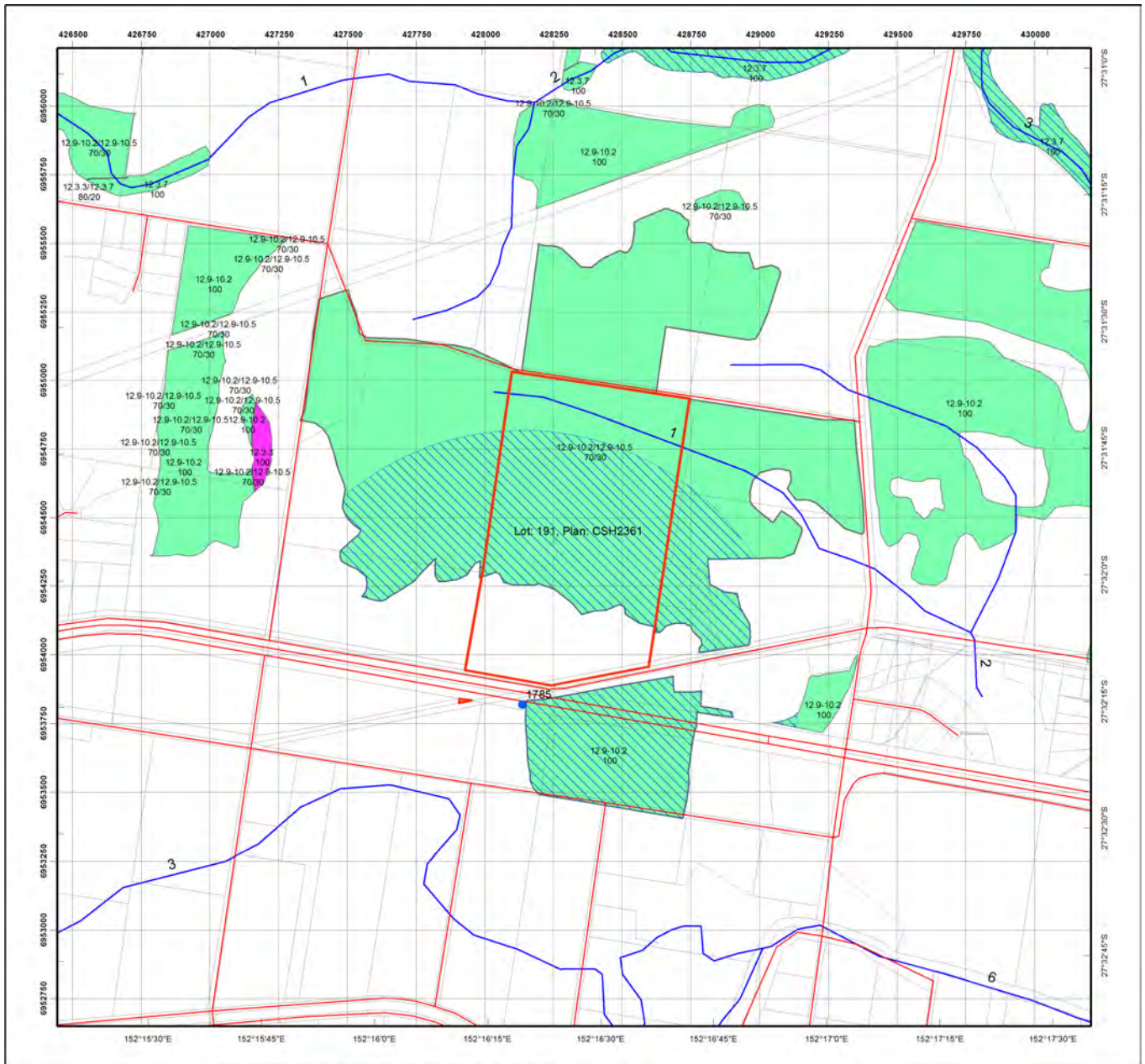
While every care is taken to ensure the accuracy of this product, the Department of Natural Resources and Mines makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.dnrm.qld.gov.au or contact the Department of Natural Resources and Mines.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at <http://www.information.qld.gov.au/>

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

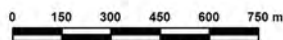




Vegetation Management Supporting Map

Legend

- Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category A or B area containing remnant vegetation
- Category A or B area under Section 20AH
These areas are edged in yellow and filled with the remnant RE Status
- Category C area containing endangered regional ecosystems
- Category C area containing of concern regional ecosystems
- Category C area that is a least concern regional ecosystem
- Category C area containing high value regrowth vegetation
- Category C area under Section 20AI
These areas are edged in purple and filled with the remnant RE Status
- Non Remnant
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourse on the vegetation management watercourse and drainage feature map
(Stream order shown as black number against stream where available)
- Roads
- National Parks, State Forest and other reserves
- Cadastral line
- Property boundaries shown are provided as a locational aid only



This product is projected into:
 GDA 1994 MGA Zone 56

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

Disclaimer:
 While every care is taken to ensure the accuracy of this product, the Department of Natural Resources and Mines makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.dnrm.qld.gov.au or contact the Department of Natural Resources and Mines.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at <http://www.information.qld.gov.au/>



Vegetation Management Act 1999 - Extract from the essential habitat database

Essential habitat is required for assessment under the:

- State Development Assessment Provisions - Module 8: Native vegetation clearing which sets out the matters of interest to the state for development assessment under the *Sustainable Planning Act 2009*; and
- Self-assessable vegetation clearing codes made under the *Vegetation Management Act 1999*

Essential habitat for one or more of the following species is found on and within 1.1 km of the identified subject lot/s or on and within 2.2 km of an identified coordinate on the accompanying essential habitat map.

This report identifies essential habitat in Category A, B and Category C areas.

The numeric labels on the essential habitat map can be cross referenced with the database below to determine which essential habitat factors might exist for a particular species.

Essential habitat is compiled from a combination of species habitat models and buffered species records.

The Department of Natural Resources and Mines website (<http://www.dnrm.qld.gov.au>) has more information on how the layer is applied under the State Development Assessment Provisions - Module 8: Native vegetation clearing and the *Vegetation Management Act 1999*.

Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated.

Essential habitat, for protected wildlife, means a category A area, a category B area or category C area shown on the regulated vegetation management map-

- 1) (a) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database; or
- 2) (b) in which the protected wildlife, at any stage of its life cycle, is located.

Essential habitat identifies endangered or vulnerable native wildlife prescribed under the *Nature Conservation Act 1994*.

Essential habitat in Category A and B (Remnant vegetation species record) areas:1100m Species Information

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
1785	<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern subsp.)	V	Dry eucalypt woodland (including poplar box, spotted gum, yellow box, acacia and callitris), with sparse short grass, often on sandy areas near to permanent water; grassy eucalypt woodlands. Nest on ground near or under grass tussock, log or low bush.	None	no soil information	Gravelly ridges, traprock and river flats.

Essential habitat in Category A and B (Remnant vegetation species record) areas:1100m Regional Ecosystems Information

Label	Regional Ecosystem (this is a mandatory essential habitat factor, unless otherwise stated)
1785	8.1.5, 8.2.1, 8.2.7, 8.2.8, 8.2.12, 8.3.2, 8.3.3, 8.3.5, 8.3.6, 8.3.13, 8.5.2, 8.5.3, 8.5.5, 8.5.6, 8.9.1, 8.11.1, 8.11.3, 8.11.4, 8.11.5, 8.11.6, 8.11.8, 8.12.6, 8.12.7, 8.12.9, 8.12.12, 8.12.14, 8.12.20, 8.12.22, 8.12.23, 8.12.25, 9.3.1, 9.3.2, 9.3.3, 9.3.4, 9.3.5, 9.3.6, 9.3.7, 9.3.8, 9.3.9, 9.3.11, 9.3.13, 9.3.14, 9.3.15, 9.3.16, 9.3.17, 9.3.18, 9.3.19, 9.3.20, 9.3.21, 9.3.22, 9.3.23, 9.5.3, 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8, 9.5.9, 9.5.10, 9.5.11, 9.5.12, 9.7.2, 9.7.3, 9.7.5, 9.7.6, 9.8.1, 9.8.2, 9.8.4, 9.8.5, 9.8.6, 9.8.9, 9.8.10, 9.8.11, 9.10.1, 9.10.3, 9.10.6, 9.10.7, 9.10.8, 9.11.1, 9.11.2, 9.11.3, 9.11.4, 9.11.5, 9.11.7, 9.11.10, 9.11.11, 9.11.12, 9.11.13, 9.11.15, 9.11.16, 9.11.17, 9.11.19, 9.11.23, 9.11.26, 9.11.28, 9.11.29, 9.11.31, 9.11.32, 9.12.1, 9.12.3, 9.12.4, 9.12.5, 9.12.6, 9.12.7, 9.12.10, 9.12.11, 9.12.12, 9.12.13, 9.12.16, 9.12.17, 9.12.18, 9.12.19, 9.12.20, 9.12.21, 9.12.22, 9.12.23, 9.12.24, 9.12.26, 9.12.28, 9.12.30, 9.12.31, 9.12.33, 9.12.35, 9.12.37, 9.12.39, 10.3.1, 10.3.2, 10.3.3, 10.3.4, 10.3.5, 10.3.6, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.19, 10.3.20, 10.3.27, 10.3.28, 10.3.30, 10.3.31, 10.4.3, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.7, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.2, 10.7.3, 10.7.5, 10.7.11, 10.7.12, 10.9.1, 10.9.2, 10.9.3, 10.9.5, 10.10.1, 10.10.3, 10.10.4, 10.10.5, 10.10.7, 11.2.1, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.7, 11.3.8, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.23, 11.3.25, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.5, 11.4.8, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.4, 11.7.6, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.2, 11.9.3, 11.9.7, 11.9.9, 11.9.14, 11.10.1, 11.10.4, 11.10.6, 11.10.7, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.15, 11.11.16, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.17, 11.12.20, 12.2.5, 12.2.6, 12.2.7, 12.2.10, 12.2.11, 12.3.3, 12.3.6, 12.3.10, 12.3.12, 12.3.14, 12.5.2, 12.5.4, 12.5.5, 12.5.7, 12.5.8, 12.5.11, 12.5.12, 12.7.1, 12.7.2, 12.8.14, 12.8.16, 12.8.17, 12.8.19, 12.9-10.7, 12.9-10.8, 12.9-10.12, 12.9-10.13, 12.11.5, 12.11.7, 12.11.8, 12.11.14, 12.11.15, 12.11.20, 12.11.21, 12.11.22, 12.12.7, 12.12.8, 12.12.9, 12.12.12, 12.12.14, 12.12.21, 12.12.22, 12.12.23, 12.12.24, 12.12.25, 12.12.27, 13.3.1, 13.3.4, 13.3.7, 13.11.1, 13.11.3, 13.11.4, 13.11.8, 13.12.2, 13.12.3, 13.12.5, 13.12.8, 13.12.9, 13.12.10

Essential habitat in Category A and B (Remnant vegetation) areas:1100m Species Information

(no results)

Essential habitat in Category A and B (Remnant vegetation) areas:1100m Regional Ecosystems Information

(no results)

Essential habitat in Category C (High value regrowth vegetation) areas:1100m Species Information

(no results)

Essential habitat in Category C (High value regrowth vegetation) areas:1100m Regional Ecosystems Information

(no results)

Appendix D – Likelihood of occurrence assessment

The likelihood of occurrence ranking was based on the following framework:

- Confirmed present: Species recorded during the field survey.
- Likely to occur: Species has been recorded in the desktop search extent or previous studies within the Study Area AND potentially suitable habitat is present within the Study Area.
- May occur: Species has not been previously recorded in the desktop search extent (although species' distribution incorporates the Study Area) AND potentially suitable habitat occurs within the Study Area.
- Unlikely to occur: Species has not been previously recorded in the desktop search extent AND/OR current known distribution does not encompass Study Area AND/OR suitable habitat is generally lacking from the Study Area.

Likelihood of occurrence – listed threatened species

Species	EPBC Act Status	NC Act Status	Source	Habitat Requirements	Likelihood Of Occurrence
Birds					
<i>Anthochaera phrygia</i> Regent honeyeater	Critically Endangered	Endangered	PMST	Regent honeyeaters mostly occur in dry Box-Ironbark eucalypt woodland and dry sclerophyll forest associations in areas of low to moderate relief (DEE, 2017).	Unlikely to occur. The desktop review did not confirm known records of the species within the search extent and habitats observed within the Study Area generally considered low value due to high levels of fragmentation.
<i>Botaurus poiciloptilus</i> Australasian bittern	Endangered	Least concern	PMST	The species favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and/or reeds (Marchant and Higgins, 1990).	May occur. The species has been historically recorded from the desktop search extent and the field survey confirmed the presence of potentially suitable habitat within the Study Area.
<i>Calidris ferruginea</i> Curlew sandpiper	Critically endangered	Endangered	PMST	This species is predominantly coastal in distribution, occurring within intertidal mudflats, estuaries, bays, inlets and lagoons (DEE, 2017)	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the Study Area.
<i>Erythrotriorchis radiatus</i> Red goshawk	Vulnerable	Endangered	PMST	The red goshawk occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia and nests in tall trees within 1 km of permanent water (DEE, 2017).	May occur. The species has not been historically recorded within the search extent. The species forages widely and potentially suitable habitat was observed within the Study Area.
<i>Geophaps scripta scripta</i> Squatter pigeon (southern)	Vulnerable	Vulnerable	Wildlife Online; PMST	The species occurs in open-forests to sparse, open-woodlands and scrub that are dominated by <i>Eucalyptus</i> , <i>Corymbia</i> and <i>Acacia</i> or <i>Callitris</i> species, remnant and regrowth within 3 km of water (DEE, 2017).	May occur: The species has been historically recorded within the search extent. However, this record is dated 1990. The species has experienced a dramatic decline from the southern parts of its range and is considered unlikely to occur within the Study

					Area. Suitable habitat was observed during the field survey in areas outside the project footprint – in areas of eucalypt woodland on rocky substrate
<i>Grantiella picta</i> Painted honeyeater	Vulnerable	Vulnerable	PMST	The species inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands, acacia-dominated woodlands, paperbarks, casuarinas, callitris, and trees on farmland or gardens (DEE, 2017).	May occur. The species has not been historically recorded within the search extent. However potentially suitable habitat was observed within the Study Area.
<i>Lathamus discolor</i> Swift parrot	Critically endangered	Endangered	PMST	The swift parrot inhabits dry sclerophyll eucalypt forests and woodlands and occasionally occurs in wet sclerophyll forests (DEE, 2017).	May occur. The species has not been historically recorded within the search extent. However potentially suitable habitat was observed within the Study Area.
<i>Numenius madagascariensis</i> Eastern curlew	Critically endangered	Vulnerable	PMST	The eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the Study Area.
<i>Poephila cincta cincta</i> Black-throated finch (southern)	Endangered	Endangered	PMST	This species occurs mainly in grassy, open woodlands and forests, typically dominated by <i>Eucalyptus</i> , <i>Corymbia</i> and <i>Melaleuca</i> , and occasionally in tussock grasslands or other habitats (for example freshwater wetlands), often along or near watercourses, or in the vicinity of water (DEE, 2017)	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the Study Area.
<i>Rostratula australis</i> Australian painted snipe	Endangered	Vulnerable	PMST	The species generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps, claypans and waterlogged grassland (DEE, 2017).	May occur. The species has not been historically recorded within the desktop search extent. Potentially suitable habitat was observed within the Study Area.

<i>Turnix melanogaster</i> Black-breasted button-quail	Vulnerable	Vulnerable	PMST	The species typically occurs in low closed forests, particularly semi-evergreen vine thicket, low microphyll vine forest, araucarian microphyll vine forest and araucarian notophyll vine forest (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the Study Area.
Mammals					
<i>Chalinolobus dwyeri</i> Large-eared pied bat	Vulnerable	Vulnerable	PMST	The species requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging (DEE, 2017).	Unlikely to occur. The desktop review did not confirm known records of the species within the search extent and no suitable habitat was observed within the Study Area
<i>Dasyurus hallucatus</i> Northern quoll	Endangered	Least concern	PMST	The species inhabits a variety of habitats, ranging from eucalypt woodlands to rainforests. Species particularly prefers areas that contain rock crevices, hollow logs and termite mounds (DEE, 2017).	Unlikely to occur: The species has not been historically recorded within the desktop search extent. No suitable habitat was observed within the Study Area.
<i>Petauroides volans</i> Greater glider	Vulnerable	Least concern	PMST	This species is largely restricted to eucalypt forests and woodlands (DEE, 2016). Modelling suggests that they require native forest patches of at least 160 km ² to maintain viable populations (Eyre, 2002).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the Study Area. Most hollow-bearing trees have been historically cleared from the Study Area.
<i>Petrogale penicillata</i> Brush-tailed rock-wallaby	Vulnerable	Vulnerable	PMST	This species prefers rocky habitats, including loose boulder-piles, rocky outcrops, steep rocky slopes, cliffs, gorges and isolated rock stacks (DEE, 2017)	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the Study Area.
<i>Phascolarctos cinereus</i> Koala	Vulnerable	Vulnerable	Wildlife Online, PMST	Within the region, koalas occur in sub-humid Eucalyptus-dominated forests and woodlands in riparian and non-riparian environments, and some <i>Acacia</i> -	Confirmed present: One individual was observed in the Conics field survey. Faecal pellets were observed from seven locations across the Study Area in the current field survey.

				dominated forests and woodlands in non-riparian environments (DEE, 2017).	
<i>Potorous tridactylus tridactylus</i> Long-nosed potoroo	Vulnerable	Vulnerable	PMST	There is limited information about the species habitat in Queensland and NSW. There is no consistent pattern to the habitat of the Long-nosed Potoroo (SE Mainland); it can be found in wet eucalypt forests to coastal heaths and scrubs. The main factors would appear to be access to some form of dense vegetation for shelter and the presence of an abundant supply of fungi for food (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the Study Area.
<i>Pseudomys novaehollandiae</i> New Holland mouse	Vulnerable	Vulnerable	PMST	The species has been found associated with open heathland, open woodland with a heathland understorey and vegetated sand dunes (DEE, 2017)	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the Study Area.
<i>Pteropus poliocephalus</i> Grey-headed flying-fox	Vulnerable	Least concern	PMST	The species roosts in rainforest patches, stands of Melaleuca, mangroves and riparian vegetation and forages widely in rainforests, open forests, closed and open woodlands, <i>Melaleuca</i> swamps and <i>Banksia</i> woodlands (DEE, 2017).	Likely to occur. The species has not been recorded within the desktop search extent. However, suitable habitat was confirmed present within the Study Area. The species is not uncommon within south-east Queensland.
<i>Tachyglossus aculeatus</i> Short-beaked echidna	-	Special least concern	Wildlife Online	Variable and widespread habitat.	Confirmed present. Evidence of echidnas was seen across woodland areas within the Study Area
Reptiles					
<i>Delma torquata</i> Collared delma	Vulnerable	Vulnerable	PMST	In eastern parts of the species range suitable habitats are commonly associated with exposed rocky outcrops on ridges or slopes in vegetation communities dominated by narrow-leaved ironbark (<i>Eucalyptus crebra</i>) (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat is present within the Study Area.

<i>Furina dunmalli</i> Dunmall's snake	Vulnerable	Vulnerable	PMST	The species is known from a broad range of habitats including <i>Corymbia citriodora</i> , <i>Eucalyptus crebra</i> and <i>E. melanophloia</i> , <i>Callitris glaucophylla</i> and bullock open forest and woodland associations on sandstone derived soils (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the Study Area.
Fish					
<i>Neoceratodus forsteri</i> Australian lungfish	Vulnerable	Least concern	Wildlife Online, PMST	This species occurs in still or slow-flowing, shallow, vegetated pools with clear or turbid water in which to spawn and feed (DEE, 2017)	Unlikely to occur. The species has been historically recorded within the desktop search extent. However, no suitable habitat occurs within the Study Area.
Plants					
<i>Dichanthium setosum</i> Bluegrass	Vulnerable	Least concern	PMST	Grass associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the Study Area.
<i>Macadamia integrifolia</i> Macadamia nut	Vulnerable	Vulnerable	PMST	Medium-sized tree to 20 m height found in remnant rainforest, preferring partially open areas such as rainforest edges (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the Study Area.
<i>Phebalium distans</i> Mt Berryman Phebalium	Critically endangered	Endangered	PMST	Only known from three locations in Queensland (near Mt Berryman (south-west of Ipswich), Kingaroy (Mt Jones Plateau and surrounds) and Mt Walla (Coalston Lakes). It is found in semi-evergreen vine thicket on red volcanic soils, or in communities adjacent to this vegetation type (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the Study Area.
<i>Samadera bidwillii</i> Quassia	Vulnerable	Vulnerable	PMST	Small shrub/tree to 6 m height often occurring in lowland rainforest or on rainforest margins, but also open forest	Unlikely to occur. The species has not been historically recorded within

				and woodland. Commonly found adjacent to temporary and permanent watercourses up to 510 m altitude. Associated with a range of eucalypt species (DEE, 2017).	the desktop search extent. No suitable habitat occurs within the Study Area.
<i>Thesium australe</i> Austral toadflax	Vulnerable	Vulnerable	PMST	Semi-parasitic herb on roots of a range of grass species, notably kangaroo grass (<i>Themeda triandra</i>). It occurs in shrubland, grassland or woodland, often on damp sites. Vegetation types include open grassy heath, grassland dominated by kangaroo grass surrounded by eucalypt woodland, and grassland dominated by barbed-wire grass (<i>Cymbopogon refractus</i>) (DEE, 2017).	May occur. The species has not been historically recorded within the search extent. However potentially suitable habitat was observed within the Study Area.

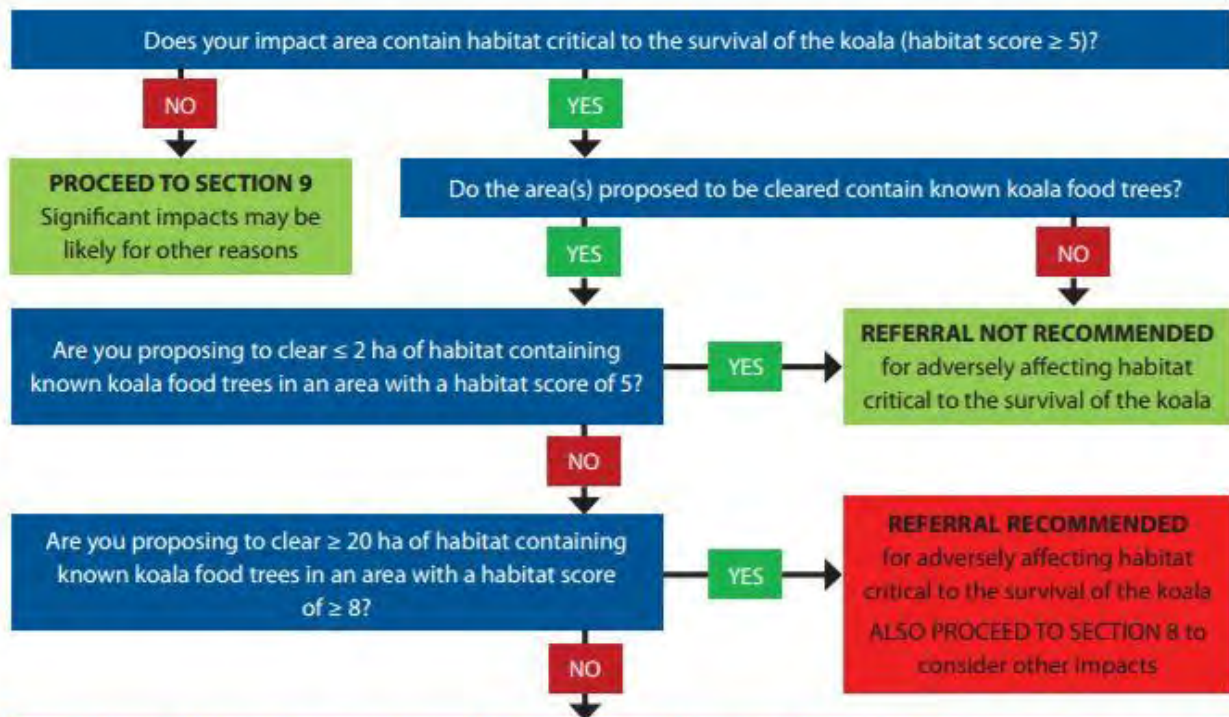
Likelihood of occurrence – listed migratory species

Species	EPBC Act status	Habitat requirements	Likelihood of occurrence
<i>Actitis hypoleucos</i> Common sandpiper	Migratory Wetlands	A small sandpiper that is not considered gregarious. Will form small flocks. Concentrated around the coastlines of Australia, but is also found around inland waters. Species typically forages in shallow water and at edges of wetlands in soft mud (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the study area.
<i>Apus pacificus</i> Fork-tailed swift	Migratory Marine	Aerial species in the Apodidae family. Species typically occurs over inland plains, but occasionally in coastal areas. Is generally associated with dry or open habitats, and urban areas, although may inhabit grasslands, sandplains and rainforests DEE, 2017).	May occur. The species has not been historically recorded within the desktop search extent. Suitable habitat occurs within the study area, as open grassland habitats are present.
<i>Calidris acuminata</i> Sharp-tailed sandpiper	Migratory Wetlands	A stout sandpiper that inhabits the muddy margins of freshwater wetlands. Forages on bare substrate or in shallow water. Inhabits coastal and inland waters throughout Australia (DEE, 2017)	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the study area.
<i>Calidris ferruginea</i> Curlew sandpiper	Migratory Wetlands, Critically endangered	This species is predominantly coastal in distribution, occurring within intertidal mudflats, estuaries, bays, inlets and lagoons (DEE, 2017)	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the study area.

<i>Calidris melanotos</i> Pectoral sandpiper	Migratory Wetlands	A small-medium sized sandpiper. The species prefers coastal and near coastal wetland habitats that have open fringing mudflats and low emergent or fringing vegetation (Higgins and Davies, 1996).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the study area.
<i>Cuculus optatus</i> Oriental cuckoo	Migratory Terrestrial	Medium-large cuckoo inhabiting canopy or shrub layer of monsoon rainforest, vine thickets, wet sclerophyll forest or open forest or woodland (Higgins et al, 2006).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. Suitable habitat is generally lacking within the study area.
<i>Gallinago hardwickii</i> Latham's snipe	Migratory Wetlands	The largest Australian snipe. Generally solitary or in loose congregations of few individuals. Habitat includes permanent and ephemeral wetlands with dense vegetation for cover (DEE, 2017).	May occur. The species has not been historically recorded within the desktop search extent. Suitable habitat occurs within the study area around the farm dams.
<i>Hirundapus caudacutus</i> White-throated needletail	Migratory Terrestrial	A large, robust, gregarious swift. Occurs throughout east and south-east Australia, particularly along the coastal regions (Higgins, 1999). They are sometimes recorded above islands well out to sea. Breeding areas restricted to Asia (DEE, 2017).	May occur. The species has not been recorded within the desktop search extent. This species is exclusively aerial with a large habitat range, therefore species may potentially move through the study area.
<i>Merops ornatus</i> Rainbow bee-eater	Migratory Terrestrial	Only species of bee-eater that occurs in Australia. Inhabits open forests and woodlands, shrublands, and open areas, generally located near permanent water. Species typically build their nest in the banks of rivers, creeks and dams (DEE, 2017).	Confirmed present: The species has been historically recorded within the desktop search extent. The species was observed in the study area in the field survey. Suitable habitat was present within the study area.
<i>Monarcha melanopsis</i> Black-faced monarch	Migratory Terrestrial	A small bird that occurs along eastern Australia. Is generally associated with rainforest habitats, although may inhabit mangroves, coastal scrub and suburban parks and gardens (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the study area.
<i>Monarcha trivergatus</i> Spectacled monarch	Migratory Terrestrial	A small bird that occurs along eastern Australia. Occurs in rainforest, densely vegetated gullies and around waterside vegetation (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the study area.
<i>Motacilla flava</i> Yellow wagtail	Migratory Terrestrial	A small, slim wagtail which occupies a wide range of habitat in non-breeding range mainly in open areas with low vegetation (Higgins et al, 2006).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the study area.
<i>Myiagra cyanoleuca</i> Satin flycatcher	Migratory Terrestrial	A small, sexually-dimorphic bird. Occurs along the east coast of Australia. Generally prefers heavily vegetated areas, but will also move through more open country when migrating (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the study area although may move through area during migration.

<i>Numenius madagascariensis</i> Eastern curlew	Migratory Wetlands, Critically endangered	The eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the study area.
<i>Pandion haliaetus</i> Osprey	Migratory Wetlands	The osprey is a medium sized raptor that primarily inhabits coastal and estuarine habitats. The species prefers littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the study area.
<i>Plegadis falcinellus</i> Glossy ibis	Migratory Wetlands	Known to be the smallest ibis in Australia. Inhabits freshwater marshes along the edges of lakes, rivers and swamps, and occasionally occur within coastal areas. (DEE, 2017).	May occur. The species has been historically recorded from the desktop search extent. Suitable habitat is generally lacking within the study area.
<i>Rhipidura rufifrons</i> Rufous fantail	Migratory Terrestrial	A small flycatcher with a distinctive rufus rump. Occurs along the coast and near coastal regions of eastern Australia. Prefers wet sclerophyll forest, and generally is associated with dense, scrubby vegetation. However, is known to move through urban parks and gardens (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the study area.
<i>Tringa nebularia</i> Common greenshank	Migratory Wetlands	A heavily built wader in the family Scolopacidae. The species occurs individually or in small to large flocks along coastal and inland wetlands. Species typically forages in shallow water and at edges of wetlands in soft mud (DEE, 2017).	Unlikely to occur. The species has not been historically recorded within the desktop search extent. No suitable habitat occurs within the study area.

Appendix E – Framework guideline for referral of koala



IMPACTS UNCERTAIN, REFERRAL DECISION DEPENDS ON THE NATURE OF YOUR ACTION

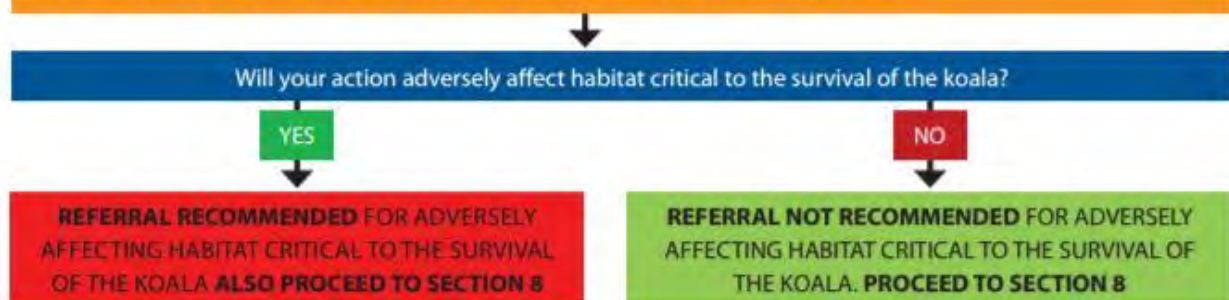
Assess the action in regards to the points below. It is these characteristics, in combination with each other, which will determine whether the action is likely to adversely affect habitat critical to the survival of the koala:

- The score calculated for the impact area (higher score = greater risk of significant impact).
- Amount of koala habitat being cleared (more habitat cleared = greater risk of significant impact).
- Method of clearing (i.e. clear-felling has greater risk of significant impact than selective felling with understorey and koala food tree retention).
- The density or abundance of koalas (relatively high density or abundance for the region means greater risk of significant impact).
- Level of fragmentation caused by the clearing (greater degree of fragmentation has greater risk of significant impact).

The factors above should be considered (where information is available) on a case by case basis. The upper and lower 'thresholds' prior in the flowchart give an indication of the level of impact that is likely to be significant. However, for actions that do not align with these thresholds, consideration of the above factors will assist in making a decision.

For example, a significant impact would be expected if 25 hectares of habitat scoring 6 or 7, or 100 hectares of score 5, was being completely cleared. In contrast, a significant impact would not be expected if 5 hectares of habitat scoring 9 or 10, or 10 hectares scoring 7 or 8, was selectively cleared.

See Attachment 2 for examples of decisions on actions where impacts were uncertain.



Appendix F – Flora species list

Family	Scientific Name	Common Name	Status [#]	Density ⁺	Location
Adiantaceae	<i>Cheilanthes sieberi</i>	rock fern	LC	V	Clearing
Amaranthaceae	<i>Gomphrena celosioides</i>	gomphrena weed	*	V	Clearing
Apiaceae	<i>Centella asiatica</i>	pennywort	LC	V	Clearing
Apocynaceae	<i>Gomphocarpus physocarpus</i>	balloon cottonbush	*	V	Clearing
Asteraceae	<i>Baccharis halimifolia</i>	groundsel bush	*R	V	Clearing
Asteraceae	<i>Cassinia laevis</i>	cough bush	LC	V	Open forest
Asteraceae	<i>Chrysocephalum apiculatum</i>	yellow buttons	LC	V-S	Widespread
Asteraceae	<i>Cirsium vulgare</i>	spear thistle	*	V	Clearing
Asteraceae	<i>Pterocaulon redolens</i>		LC	V	Clearing
Cactaceae	<i>Opuntia stricta</i>	prickly pear	*R	V	Widespread
Cactaceae	<i>Opuntia tomentosa</i>	velvety tree pear	*R	V	Open forest
Campanulaceae	<i>Lobelia purpurascens</i>	white root	LC	V	Clearing
Campanulaceae	<i>Wahlenbergia gracilis</i>	bluebell	LC	V	Widespread
Casuarinaceae	<i>Allocasuarina inophloia</i>	stringybark she-oak	LC	V	Ridgeline
Casuarinaceae	<i>Allocasuarina littoralis</i>	black she-oak	LC	V-S	Clearing
Commelinaceae	<i>Murdannia graminea</i>	slug herb	LC		Open forest
Cyperaceae	<i>Fimbristylis velata</i>	fringe rush	LC	V	Clearing
Cyperaceae	<i>Cyperus difformis</i>	dirty dora	LC	V	Clearing
Ericaceae	<i>Leucopogon juniperinus</i>	prickly heath	LC	V	Ridgeline
Fabaceae	<i>Hovea heterophylla</i>	narrow-leaved pea bush	LC	V	Ridgeline
Fabaceae	<i>Hovea planifolia</i>		LC	V	Ridgeline
Fabaceae	<i>Pultenaea petiolaris</i>	woolly bush-pea	LC	V	Ridgeline
Goodeniaceae	<i>Goodenia hederacea</i>	forest goodenia	LC	V	Open forest
Hemerocallidaceae	<i>Dianella revoluta</i>	blue flax-lily	LC	V	Widespread
Juncaceae	<i>Juncus usitatus</i>	common rush	LC	V	Dam
Malvaceae	<i>Sida cordifolia</i>	flannel sida	*	V	Clearing
Malvaceae	<i>Sida rhombifolia</i>	Paddy's lucerne	*	V	Clearing

Family	Scientific Name	Common Name	Status [#]	Density ⁺	Location
Menyanthaceae	<i>Nymphoides indica</i>	water snowflake	LC	V-D	Dam
Mimosaceae	<i>Acacia falcata</i>	sickle-leaved wattle	LC	V-S	Widespread
Mimosaceae	<i>Acacia longissima</i>		LC	V	Open forest
Mimosaceae	<i>Acacia salicina</i>	sally wattle	LC	V	Clearing
Myrtaceae	<i>Corymbia citriodora subsp. variegata</i>	spotted gum	LC	V-S	Widespread
Myrtaceae	<i>Corymbia tessellaris</i>	Moreton Bay ash	LC	V-M	Clearing
Myrtaceae	<i>Corymbia trachyphloia subsp. trachyphloia</i>	white bloodwood	LC	V-S	Ridgeline
Myrtaceae	<i>Eucalyptus crebra</i>	narrow-leaved ironbark	LC	V-S	Open forest
Myrtaceae	<i>Eucalyptus fibrosa subsp. fibrosa</i>	broad-leaved ironbark	LC	V-S	Open forest
Myrtaceae	<i>Eucalyptus tereticornis</i>	blue gum	LC	V	Clearing/Open forest
Ochnaceae	<i>Ochna serrulata</i>	ochna	*	V	Open forest
Phyllanthaceae	<i>Phyllanthus virgatus</i>	spurge	LC	V	Open forest
Picrodendraceae	<i>Petalostigma pubescens</i>	bitter bark	LC	V-S	Open forest/Ridgeline
Pittosporaceae	<i>Bursaria spinosa var. spinosa</i>	sweet bursaria	LC	V	Clearing
Poaceae	<i>Aristida calycina</i>	dark wiregrass	LC		Widespread
Poaceae	<i>Bothriochloa bladhii</i>	forest bluegrass	LC	S-M	Clearing
Poaceae	<i>Bothriochloa decipiens</i>	pitted bluegrass	LC		Widespread
Poaceae	<i>Chloris gayana</i>	Rhodes grass	*	V	Clearing
Poaceae	<i>Cymbopogon refractus</i>	barbed wire grass	LC		Widespread
Poaceae	<i>Dactyloctenium radulans</i>	button grass	LC	V	Clearing
Poaceae	<i>Dichanthium sericeum</i>	Queensland bluegrass	LC	V	Widespread
Poaceae	<i>Eragrostis brownii</i>	Brown's lovegrass	LC	V	Widespread
Poaceae	<i>Eremochloa bimaculata</i>	poverty grass	LC	V	Open forest
Poaceae	<i>Heteropogon contortus</i>	spear grass	LC	S	Widespread
Poaceae	<i>Megathyrsus maximus var. maximus</i>	guinea grass	*	V-S	Clearing
Poaceae	<i>Melinis repens</i>	red natal grass	*	S	Widespread
Poaceae	<i>Sporobolus creber</i>	slender rat's tail grass	LC	V	Clearing

Family	Scientific Name	Common Name	Status [#]	Density ⁺	Location
Poaceae	<i>Sporobolus pyramidalis</i>	rat's tail grass	*R	V	Clearing
Poaceae	<i>Themeda triandra</i>	kangaroo grass	LC	V	Widespread
Philydraceae	<i>Philydrum lanuginosum</i>	frogsmouth	LC	V	Upper dams
Rhamnaceae	<i>Alphitonia excelsa</i>	soap ash	LC	V-S	Widespread
Sapindaceae	<i>Dodonaea triquetra</i>	large-leaf hop bush	LC	V	Open forest
Solanaceae	<i>Solanum ellipticum</i>	potato bush	LC	V	Clearing
Thymelaeaceae	<i>Pimelea linifolia</i>	rice flower	LC	V	Ridgeline
Verbenaceae	<i>Lantana camara</i>	lantana	*R	V-S	Widespread
Verbenaceae	<i>Lantana montevidensis</i>	creeping lantana	*R	V	Ridgeline
Verbenaceae	<i>Verbena bonariensis</i>	purple verbena	*	V	Clearing
Xanthorrhoeaceae	<i>Xanthorrhoea johnsonii</i>	grass tree	LC	V	Ridgeline

Status: LC = Least concern under the Queensland NC Act, * = Introduced, R = Restricted invasive species under the Biosecurity Act 2014

+ Density: V = very sparse, S = sparse, M = mid-dense, D = dense

Appendix G – Fauna species list

Scientific name	Common name	EPBC Act^	NC Act#
Amphibians			
<i>Rhinella marina</i>	Cane toad		I
<i>Limnodynastes peronii</i>	Striped marsh frog		LC
<i>Litoria fallax</i>	Eastern sedge frog		LC
Reptiles			
<i>Varanus varius</i>	Lace monitor		LC
<i>Carlia pectoralis</i>	Open-litter rainbow-skink		LC
<i>Carlia vivax</i>	Lively rainbow skink		LC
<i>Oedura rhombifer</i>	Zigzag velvet gecko		LC
<i>Lampropholis delicata</i>	Grass skink		LC
<i>Cryptoblepharus pulcher</i>	Elegant snake-eyed skink		LC
Mammals			
<i>Macropus giganteus</i>	Eastern grey kangaroo		LC
<i>Macropus rufogriseus</i>	Red-necked wallaby		LC
<i>Tachyglossus aculeatus</i>	Short-beaked echidna		SLC
<i>Lepus capensis</i>	Brown hare		I
<i>Isoodon macrourus</i>	Northern brown bandicoot		LC
<i>Phascolarctos cinereus</i>	Koala	V	V
<i>Canis lupus</i>	Dingo, domestic dog		I
Birds			
<i>Colluricincla harmonica</i>	Grey Shrike-thrush		LC
<i>Eopsaltria australis</i>	Eastern yellow robin		LC
<i>Hirundo neoxena</i>	Welcome swallow		LC
<i>Threskiornis molucca</i>	Australian white ibis		LC
<i>Gerygone albogularis</i>	White-throated Gerygone		LC
<i>Anas superciliosa</i>	Pacific black duck		LC
<i>Coracina novaehollandiae</i>	Black-faced cuckoo-shrike		LC

Scientific name	Common name	EPBC Act^	NC Act#
<i>Microcarbo melanoleucos</i>	Little pied cormorant		LC
<i>Cacatua sanguinea</i>	Little corella		LC
<i>Taeniopygia bichenovii</i>	Double-barred finch		LC
<i>Geopelia striata</i>	Peaceful dove		LC
<i>Ocyphaps lophotes</i>	Crested pigeon		LC
<i>Geopelia humeralis</i>	Bar-shouldered dove		LC
<i>Microeca fascinans</i>	Jacky winter		LC
<i>Acanthiza pusilla</i>	Brown thornbill		LC
<i>Smicromis brevirostris</i>	Weebill		LC
<i>Vanellus miles</i>	Masked lapwing		LC
<i>Merops ornatus</i>	Rainbow bee-eater	Ma, Mi	SLC
<i>Ardea ibis</i>	Cattle egret	Ma	LC
<i>Egretta novaehollandiae</i>	White-faced heron		LC
<i>Nycticorax caledonicus</i>	Nankeen night-heron		LC
<i>Milvus migrans</i>	Black kite		LC
<i>Dicaeum hirundinaceum</i>	Mistletoebird		LC
<i>Zosterops lateralis</i>	Silvereye	Ma	LC
<i>Cormobates leucophaea</i>	White-throated treecreeper		LC
<i>Lichenostomus chrysops</i>	Yellow-faced honeyeater		LC
<i>Melithreptus albogularis</i>	White-throated honeyeater		LC
<i>Lichmera indistincta</i>	Brown honeyeater		LC
<i>Platycercus adscitus</i>	Pale-headed rosella		LC
<i>Myiagra rubecula</i>	Leaden flycatcher		LC
<i>Cacatua sanguinea</i>	Little corella		LC
<i>Eolophus roseicapillus</i>	Galah		LC
<i>Cacatua galerita</i>	Sulphur-crested cockatoo		LC
<i>Glossopsitta pusilla</i>	Little lorikeet		LC
<i>Trichoglossus chlorolepidotus</i>	Scaly-breasted lorikeet		LC
<i>Trichoglossus haematodus</i>	Rainbow lorikeet		LC
<i>Porphyrio porphyrio</i>	Purple swamphen		LC

Scientific name	Common name	EPBC Act [^]	NC Act [#]
<i>Gallinula tenebrosa</i>	Dusky moorhen		LC
<i>Dacelo novaeguineae</i>	Laughing kookaburra		LC
<i>Anas gracilis</i>	Grey teal		LC
<i>Chenonetta jubata</i>	Australian wood duck		LC
<i>Tachybaptus novaehollandiae</i>	Australasian grebe		LC
<i>Rhipidura albiscapa</i>	Grey fantail		LC
<i>Rhipidura leucophrys</i>	Willie wagtail		LC
<i>Cracticus tibicen</i>	Australian magpie		LC
<i>Grallina cyanoleuca</i>	Magpie-lark		LC
<i>Dicrurus bracteatus</i>	Spangled drongo	Ma	LC
<i>Cracticus torquatus</i>	Grey butcherbird		LC
<i>Strepera graculina</i>	Pied currawong		LC
<i>Cracticus nigrogularis</i>	Pied butcherbird		LC
<i>Corvus orru</i>	Torresian crow		LC
<i>Philemon citreogularis</i>	Little friarbird		LC
<i>Philemon corniculatus</i>	Noisy friarbird		LC
<i>Manorina melanocephala</i>	Noisy miner		I

[^] EPBC Act Status: V = vulnerable, Mi = migratory, Ma = marine

[#] NC Act Status: V = vulnerable, SLC = special least concern, LC = least concern, I = Introduced

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67471/<https://projects.ghd.com/oc/Advisory/westlinkdevelopment/Delivery/Documents/9110341-REP-A-Flora and Fauna Assessment Report.docx>

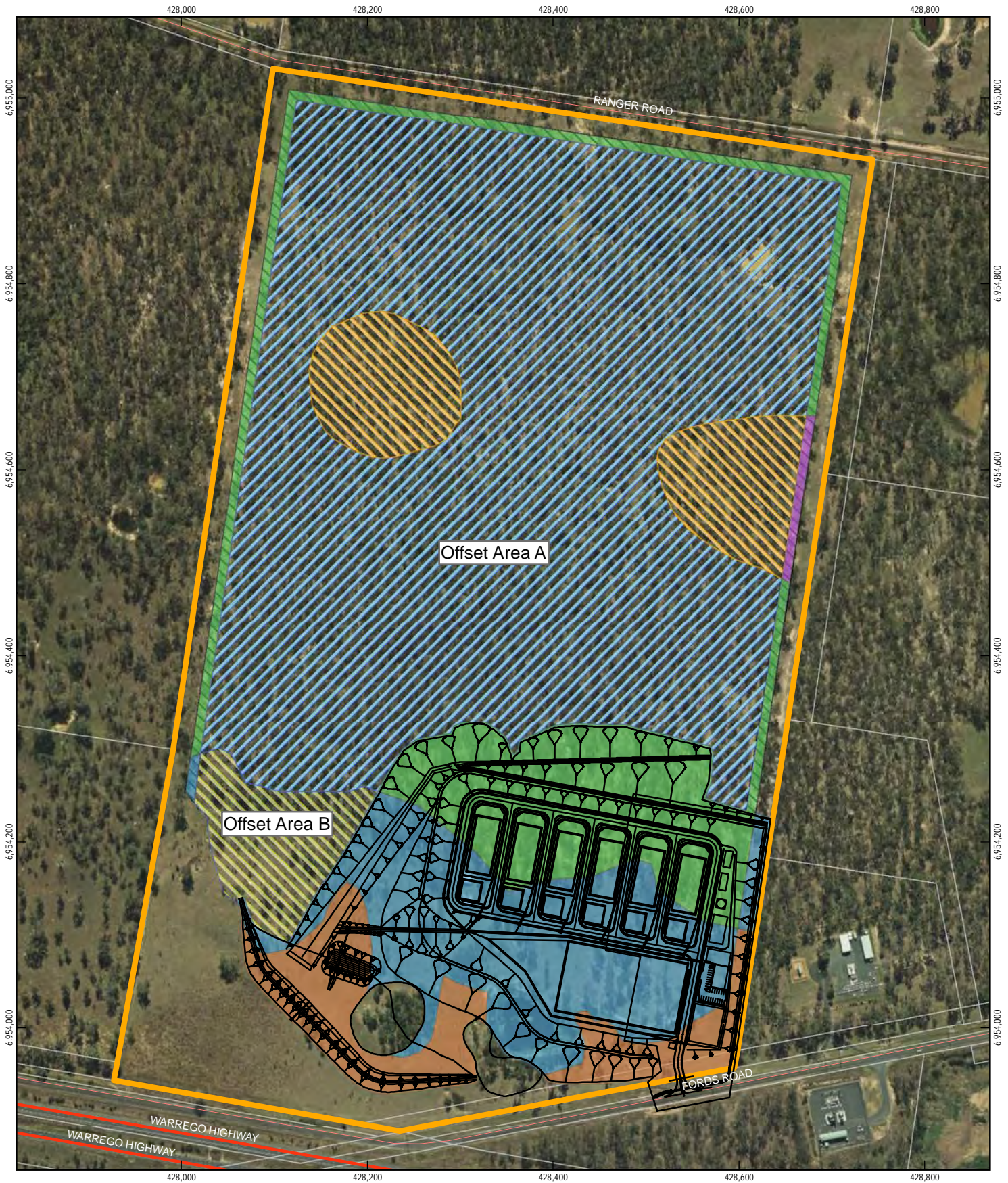
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Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	S Hodgkison/ S Potts	M Ward		A Dash		14/07/17

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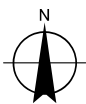
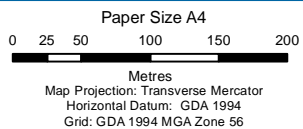
APPENDIX 8: OFFSET AREA AND ASSESSMENT UNITS



LEGEND

- | | | | | | |
|-------------------|------------------------|------------|--------------------------|---------------------------|-------------------------|
| Highway | Impact Area 1 (7.24Ha) | 3 (3.51Ha) | Offset Area A 4 (7.46Ha) | Offset Area B 5 (35.47Ha) | Fire break 10m clearing |
| Street/Local Road | 2 (0.17Ha) | 4 (7.46Ha) | 5 (35.47Ha) | 7 (2.13 Ha) | Subject Site (70.15 Ha) |
| Design | | 6 (3.98Ha) | | | |
| Cadastre | | | | | |

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Quinbrook Infrastructure Partners Pty Ltd	Job Number	91-10341
Lockyer Energy Project	Revision	4
	Date	27 Nov 2017

Offset area and assessment units **Figure 5**

**APPENDIX 9: LANDSCAPE & REVEGETATION PLAN, LITORIA
CONSULTING**

Landscape & Revegetation Plan

Ranger Road, Adare QLD 4343

Lot 191 on CSH2361



LRP01: Cover Page

Legend

- Site (surveyed)
- Lot boundary
- Easement

Rehabilitation Objectives:
1. Provide a strategy for the rehabilitation and maintenance of the nominated area to achieve remnant status.
2. Revegetate and rehabilitate the nominated areas to using locally endemic species.
3. Treat and eradicate weed species.
4. Minimise the spread of weeds to and from adjacent land.
5. Ensure rehabilitated areas are appropriately maintained.
7. Protect and enhance wildlife movement opportunities including flood free terrestrial fauna movement.
8. Maintain on site vegetation, including rehabilitation, to manage the threat of bushfire exposure and or severity.

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Plan Contents:

Drawing No.	Title
LRP01	Cover Page
LRP02	Overall Layout Plan
LRP03	Landscape & Revegetation Plan - Stage 1
LRP04	Landscape & Revegetation Plan - Stage 2
LRP05	Sections
LRP06	Planting Details
LRP07a - LRP07b	Revegetation Procedures
RP08	Weed Control Procedures

Plan References:

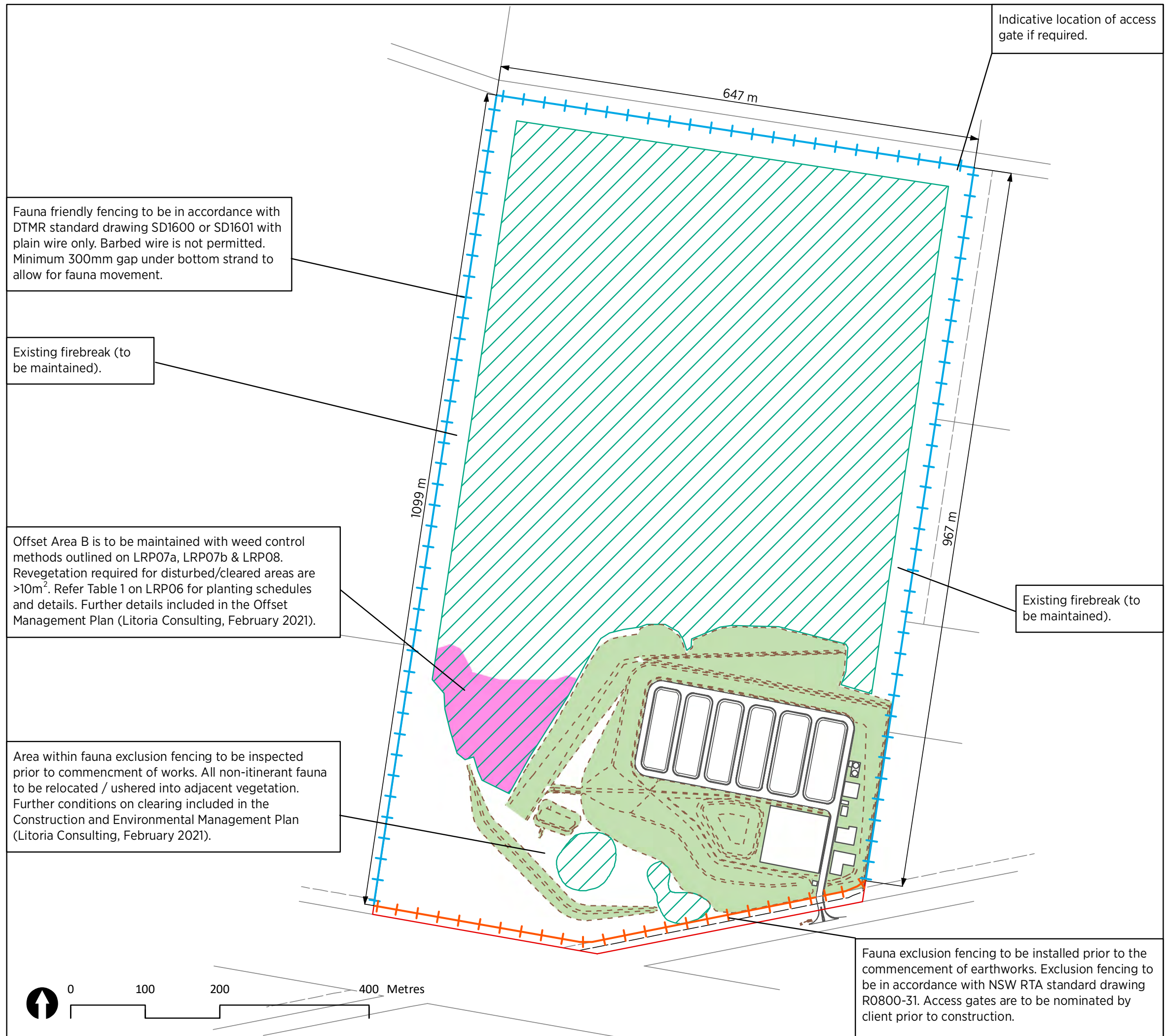
NATSPEC Specification - 0253 Landscape - Planting
NATSPEC Specification - 0251 Landscape - Soils / 0252 Landscape - Soil Preparation
NATSPEC Specification - 0255 Landscape - Plant Procurement
NATSPEC Specification - 0256 Landscape - Establishment
NATSPEC Specification - 0259 Landscape - Maintenance
Appendix C of the South East Queensland Ecological Restoration Framework
Best Practice Erosion & Sediment Control (IECA Australasia, November 2008)
CORVEG Regional Ecosystem Technical Descriptions
BSD-9051 Planting General Notes
BSD-9053 Planting - Typical Tree, Shrub and Tubestock
Development Permit No. 2606 of 2010 (In the Planning and Environment Court, 28/02/2014) - Condition 10.

Litoria Consulting Pty Ltd (ABN 75 100 511 689) certifies that this plan has been prepared by a qualified environmental consultant and AQF Level 5 arborist in accordance with local, State and Commonwealth environmental regulations.

Dan Clowes MEIANZ MESA
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LRP02: Overall Layout Plan

- Legend**
- Site (surveyed)
 - Adjacent cadastre (surveyed)
 - Lot boundary
 - Easement
 - Proposed works
 - Buildings / plant area
 - Earthworks
 - Easement (new)
 - Retained vegetation
 - Landscaping and revegetation treatments
 - Proposed treatments (Refer LRP03 & LRP04 for details)
 - Offset area B
 - Fauna exclusion fence
 - Fauna friendly fence

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LRP03: Landscape & Revegetation Plan - Stage 1

Legend

- Site (surveyed)
- Adjacent cadastre (surveyed)
- Lot boundary
- Easement
- Proposed works (Stage 1)
- Buildings / plant area
- Top of batter
- Bottom of batter
- Easement (new)
- Stormwater
- Existing features
- Scour protection
- Retained trees
- Landscaping and revegetation treatments (Stage 1)
- Screening amenity bund (2.55ha)
- Drainage slopes (1.23ha)
- Exposed rock face (slopes >1:2)
- Channel base (0.30ha)
- Garden and entry statement (0.07ha)
- Maintained grass (includes pathways between buildings) (1.18ha)
- Bioretention basin (Refer civil engineers drawings)
- Evaporation pond (Refer civil engineers drawings)
- Offset area B
- Temporary diversion (1.07ha)
- Disturbed reseed (where required)

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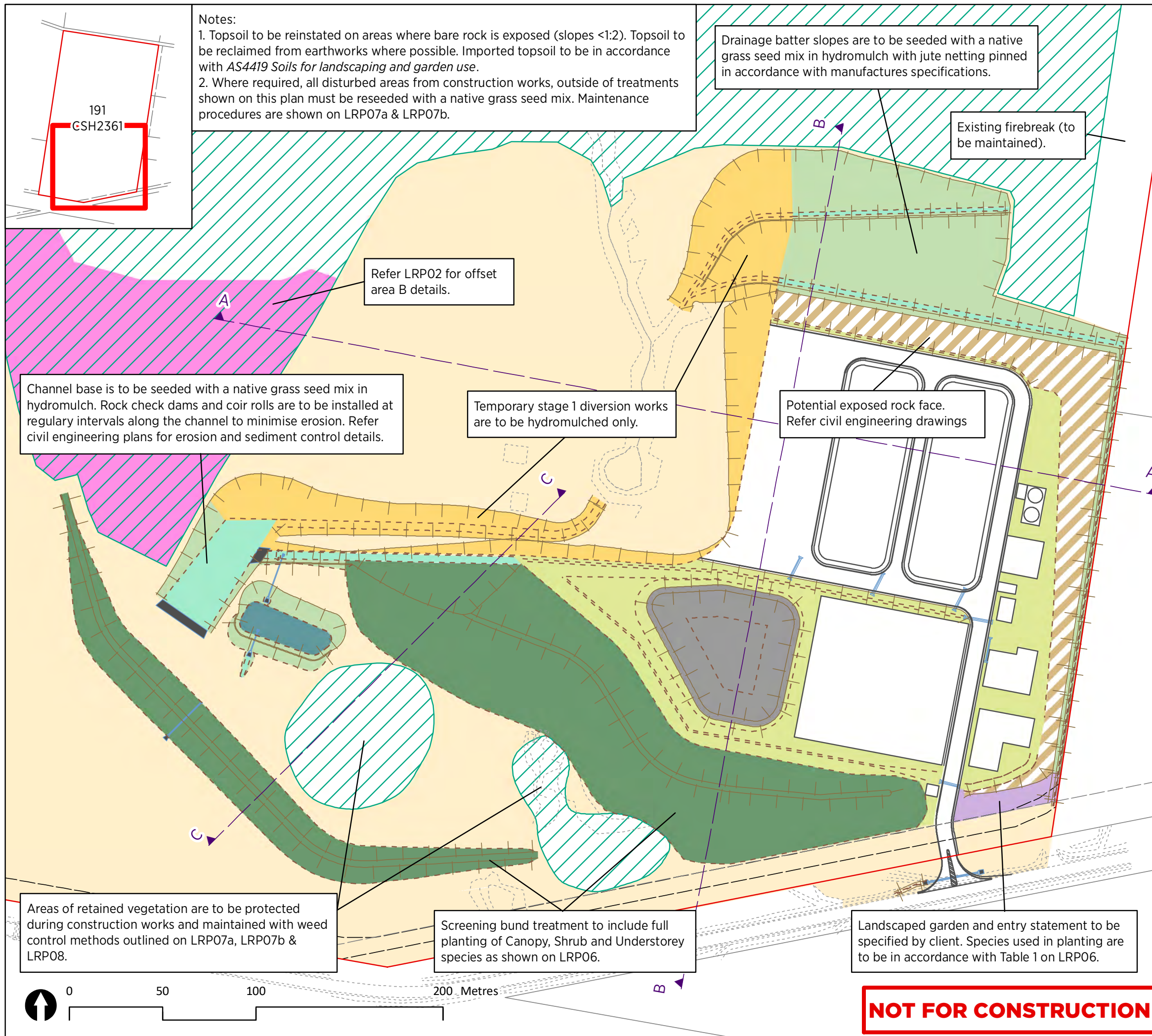
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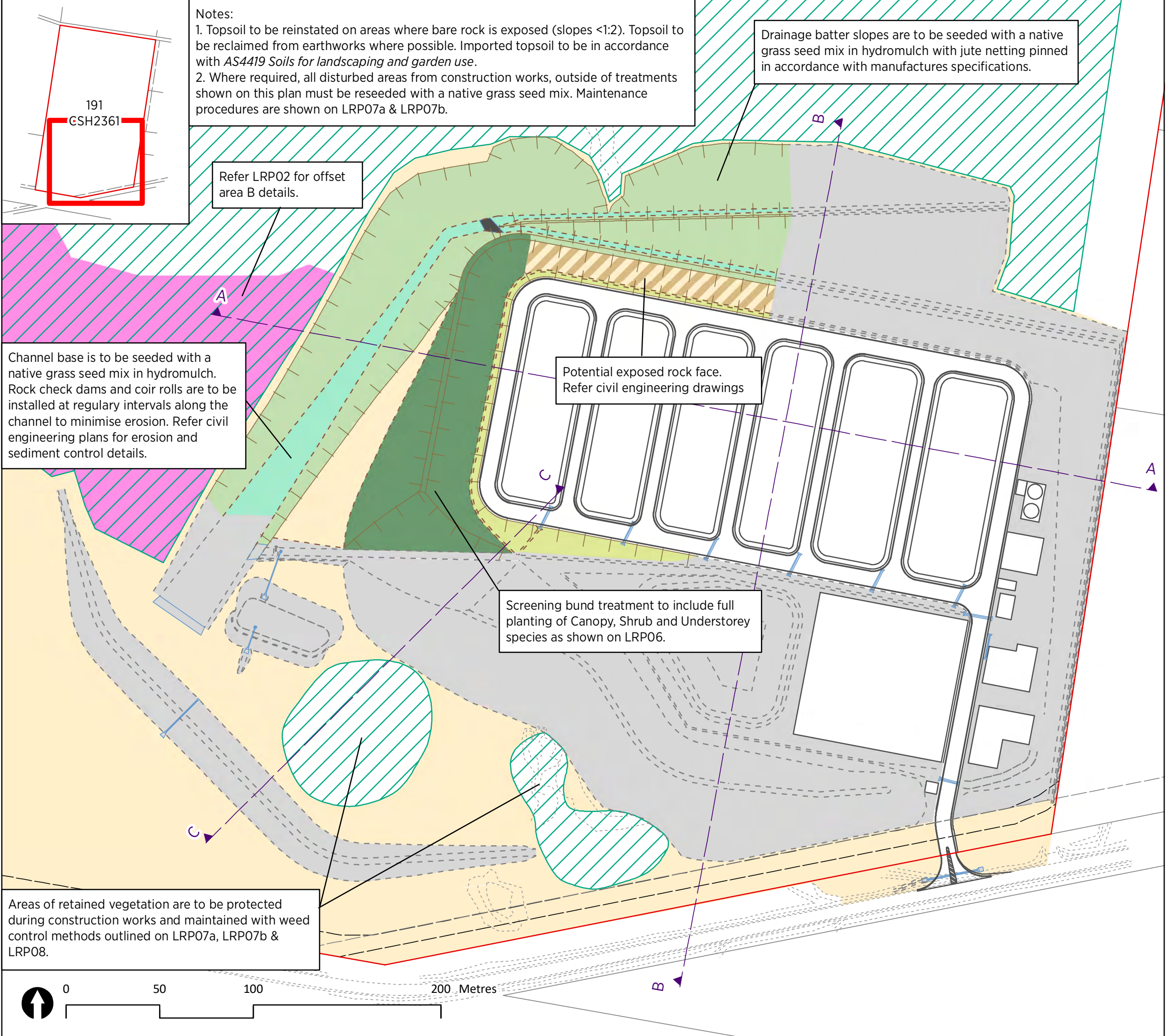


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LRP04: Landscape & Revegetation Plan - Stage 2

- Legend**
- Site (surveyed)
 - Adjacent cadastre (surveyed)
 - Lot boundary
 - Easement
 - Proposed works (Stage 2)
 - Buildings / plant area
 - Top of batter
 - Bottom of batter
 - Completed earthworks
 - Easement (new)
 - Stormwater
 - Existing features
 - Scour protection
 - Retained trees
 - Landscape and revegetation treatments (Stage 2)**
 - Screening amenity bund (0.77ha)
 - Drainage slope (1.65ha)
 - Drainage slope / rock face (where required slopes >1:2)
 - Channel base (0.31ha)
 - Maintained grass (0.21ha)
 - Offset area B
 - Disturbed reseed (where required)
 - Works completed as part of stage 1



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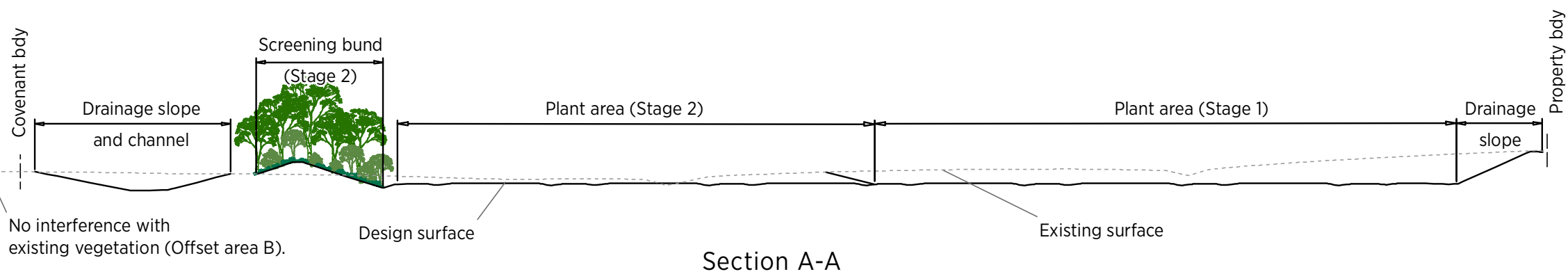
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LRP05: Sections

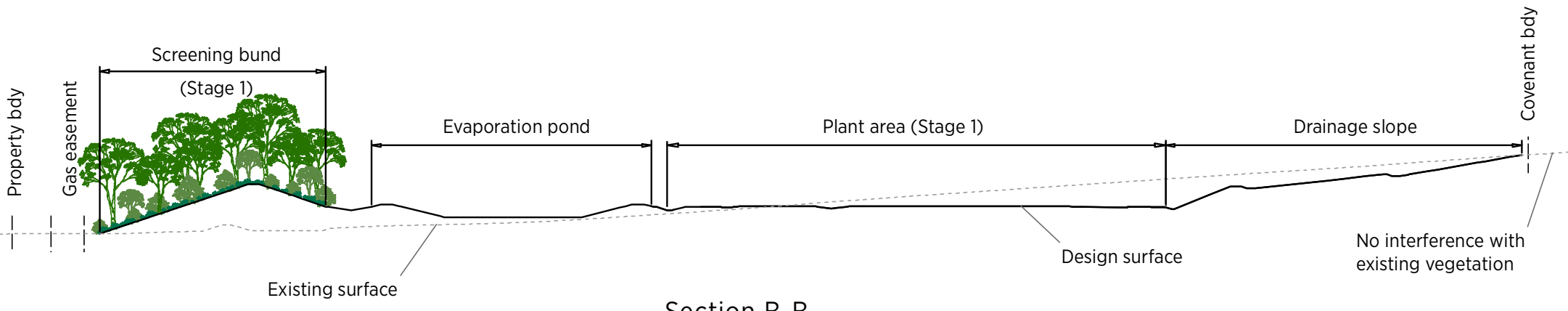
Legend

- Existing surface
- Design surface

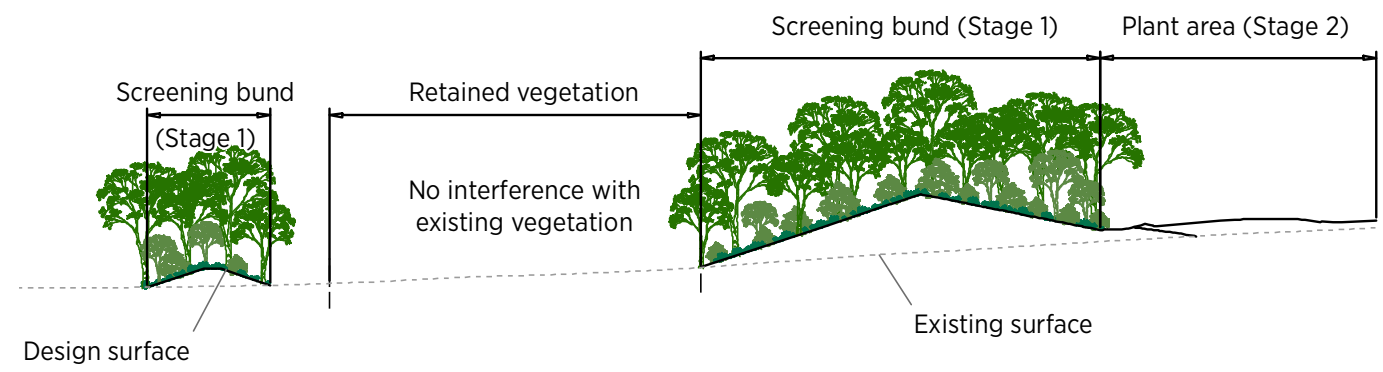
Notes:
 1. Refer to drawings LRP03 and LRP04 for relevant details of the sections shown on this plan.
 2. Vegetation shown on this plan is indicative only. It is shown to demonstrate the potential vegetation structure at full maturity.
 3. Existing vegetation and plant treatments not shown for clarity.



Section A-A



Section B-B



Section C-C

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Table 1: Screening Amenity bund treatment

Botanical Name	Common Name	Planted Size	Planted density
Canopy			
<i>Angophora leiocarpa</i>	Smooth-barked Apple	75mm	1/9m ²
<i>Corymbia citriodora</i> subsp. <i>variegata</i>	Spotted Gum	75mm	
<i>Corymbia intermedia</i>	Pink Bloodwood	75mm	
<i>Eucalyptus creba</i>	Narrow-leaved Ironbark	75mm	
<i>Eucalyptus tessellaris</i>	Moreton Bay Ash	75mm	
<i>Eucalyptus tereticornis</i>	Queensland Blue Gum	75mm	
Mid-storey			
<i>Acacia disparrima</i> subsp. <i>disparrima</i>	Hickory Wattle	75mm	1/3m ²
<i>Acacia leiocalyx</i>	Early Black Wattle	75mm	
<i>Allocasuarina luehmannii</i>	Bull Oak	75mm	
<i>Allocasuarina torulosa</i>	Forest Oak	75mm	
<i>Alphitonia excelsa</i>	Soap Tree	75mm	
<i>Brachychiton populneus</i>	Kurrajong	75mm	
<i>Hovea acutifolia</i>	Purple Pea Bush	75mm	
<i>Jacksonia scoparia</i>	Dogwood	75mm	
<i>Pittosporum angustifolium</i>	Weeping Pittosporum	75mm	
Groundcovers			
<i>Aristida vagans</i>	Threeawn Speargrass	75mm	2/1m ²
<i>Cymbopogon refractus</i>	Barbed Wire Grass	75mm	
<i>Dianella revoluta</i>	Blue Flax-lily	75mm	
<i>Entolasia stricta</i>	Wiry Panic	75mm	
<i>Eremochloa bimaculata</i>	Poverty Grass	75mm	
<i>Eremophola debilis</i>	Winter Apple	75mm	
<i>Imperata cylindrica</i>	Blady Grass	75mm	
<i>Hardenbergia violacea</i>	Native Sarsaparilla	75mm	
<i>Lomandra longifolia</i>	Mat Rush	75mm	
<i>Themeda triandra</i>	Kangaroo Grass	75mm	

Table 2: Native grass seed mix

Botanical Name	Common Name	Application
Groundcovers		
<i>Aristida vagans</i>	Threeawn Speargrass	To be included in hydromulch mix
<i>Cymbopogon refractus</i>	Barbed Wire Grass	
<i>Entolasia stricta</i>	Wiry Panic	
<i>Eremochloa bimaculata</i>	Poverty Grass	
<i>Imperata cylindrica</i>	Blady Grass	
<i>Lomandra longifolia</i>	Mat Rush	
<i>Themeda triandra</i>	Kangaroo Grass	

LRP06: Planting details

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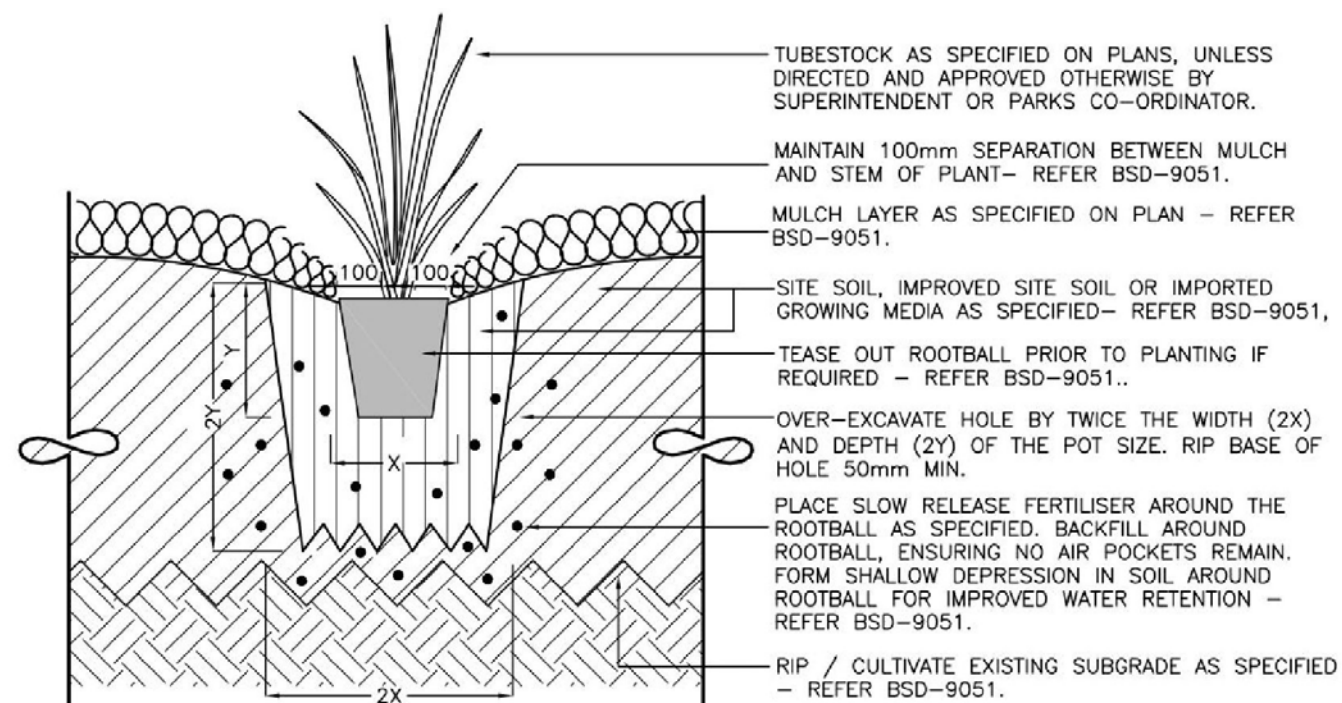
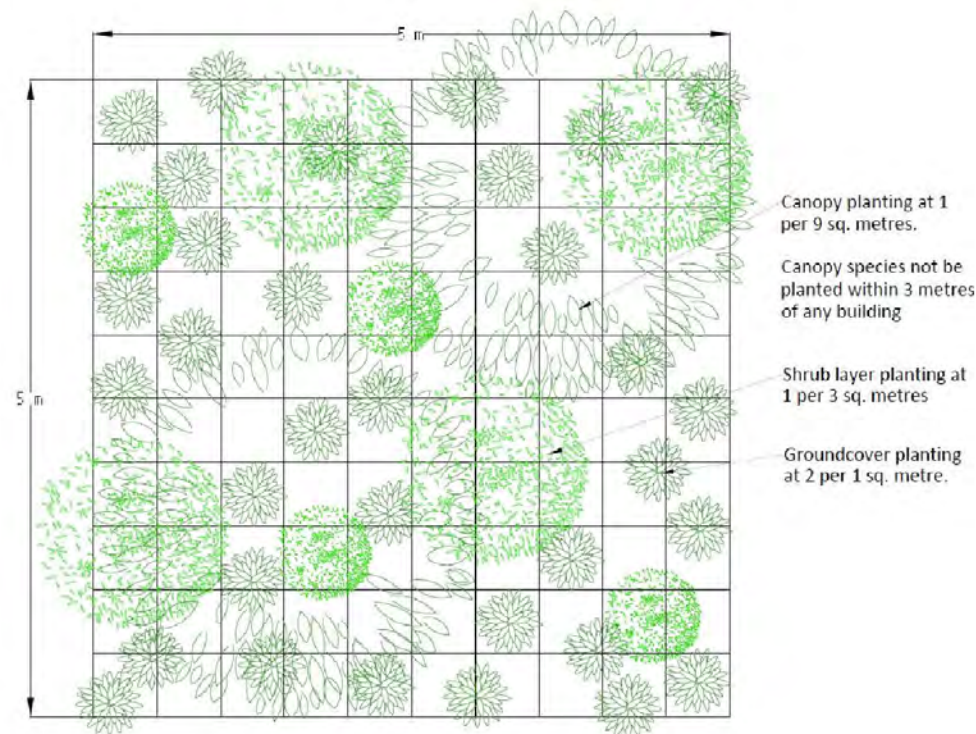
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Tubestock Planting Detail (BSD-9053)

Sample Planting Layout (to be achieved by off-maintenance).



Table 3: Revegetation Procedures

Activity	Management Response	Responsible Party
Appointment of contractor	1 Appointment of contractor with demonstrated experience in bushland rehabilitation. Relevant qualifications include a certificate in Conservation Land Management - natural Area Restoration or a degree in a related field such as ecology or vegetation management. Contractors must hold applicable licences such as: - Commercial operator's licence (ground application of herbicides) issued under the <i>Agricultural Chemicals Distribution Control Act 1966</i> ; - Senior First Aid certificate; - White Card i.e. General Safety Induction (Construction Industry); and, - Relevant Ecoaccess permits issued by the relevant State department.	Project Manager
Review Rehabilitation Plan	1 Rehabilitation Plan must be reviewed by contractor prior to commencement of site work. 2 All relevant personnel sign a register noting that they have reviewed and will comply with the requirements of the Rehabilitation Plan.	Project Manager, Contractor
Rehabilitation staging	1 Staging to be in accordance with LRPO3 & LRPO4 of this plan. 2 All stages of rehabilitation works are to be completed prior to establishment period. 24 month maintenance period to include all stages of rehabilitation. 3 Prior to commencement of any stage, spotter/catcher is to inspect stage area. Observed fauna is to be relocated outside of the stage boundary into already completed rehabilitation areas or adjacent vegetation. 4 Any amphibians encountered during inspections, works or monitoring are to be handled in accordance with the <i>Interim hygiene protocol for handling amphibians</i> (DEHP).	Contractor
Site preparation	1 Bare topsoil in rehabilitation areas will be appropriately prepared prior to planting. 2 Bare soil in rehabilitation areas affected by earthworks is to be tined to a minimum depth of 300mm prior to planting and covered with 200mm reclaimed topsoil. 3 Import topsoil similar to naturally occurring topsoil, suitable for the establishment and on-going viability of the selected vegetation, free of weed propagules and contaminants, and which achieves the requirements of <i>AS 4419 Soils for landscaping and garden use</i> . 4 Avoid differential subsidence and excess compaction and produce a finished topsoil surface which has the following characteristics: a Finished to design levels. b Smooth and free from stones or lumps of soil. c Graded to drain freely, without ponding, to catchment points. d Graded evenly into adjoining ground surfaces. e Ready for planting. 5 In areas of exposed soil, install mulch which is free of deleterious and extraneous matter such as soil, weeds and sticks. 6 Mulch is to be from native trees removed from site where possible. Otherwise native organic mulch is to be imported in accordance with <i>AS 4454-2012 Composts, soil conditioners and mulches</i> .	Contractor
Erosion and sediment	1 Temporary erosion and sediment control fencing to be installed in accordance with Best Practice Erosion and Sediment Control (IECA Australia, November 2008).	Contractor
Adaptive management, monitoring and compliance	1 Project Ecologist to conduct regular inspections to ensure compliance with procedures outlined in this plan. 2 Project Ecologist to issue notice of compliance to contractor for non-conforming works and any remedial works to ensure compliance.	Project Ecologist
Plant procurement	1 Plant species and sizes to be supplied in accordance with Table 1. 2 Plants will be supplied in weed-free containers of the required size. Open rooted stock is not to be supplied. All plants are to be healthy and vigorous. Root bound, diseased and poor stock will not be accepted. 3 Supply plants with foliage size, texture and colour at time of delivery consistent with the size, texture and colour shown in healthy specimens of the nominated species. 4 Supply plants with extension growth consistent with that exhibited in vigorous specimens of the species nominated. 5 Supply plants free from damage and from restricted habit due to growth in nursery rows. 6 Supply plants free from stress resulting from inadequate watering, excessive shade or excessive sunlight experienced at any time during their development. 7 Supply plants that have been grown and hardened off to suit the conditions that could reasonably be anticipated to exist on site at the time of delivery. 8 Supply plants with foliage free from attack by pests or disease. 9 No single species shall constitute more than 30% of the total individuals planted. 10 All plant material is to be sourced from local provenance stock. 11 Plant substitution is not permitted and alternative species must be confirmed with Litoria Consulting and/or Council prior to planting.	Contractor

Activity	Management Response	Responsible Party
Planting	1 Do not plant in unsuitable weather conditions such as extreme heat, cold, wind or rain. In other than sandy soils, suspend excavation when the soil is wet, or during frost periods.	Contractor
	2 Planting of designated areas in accordance with the planting schedule, densities and planting detail described in this Rehabilitation Plan.	Contractor
	3 Planting layout of designated areas requires a random planting layout, in accordance with the <i>Sample Planting Layout, Tubestock Planting Detail</i> shown in this Rehabilitation Plan.	
	4 Generally planting holes for trees are to be a minimum of 1.5 times the diameter of the rootball and twice the depth of the rootball.	Contractor
	5 Planting pit is to have roughened sides and decompacted base.	Contractor
	6 Install water retention crystals to manufacturer's specifications (approximately 5 grams per plant).	Contractor
	7 Remove the plant from the container with minimum disturbance to the root ball, ensure that the root ball is moist and place it in its final position, in the centre of the hole and plumb, and with the top soil level of the plant root ball level with the finished surface of the surrounding soil.	Contractor
	8 Backfill with topsoil mixture. Lightly tamp and water to eliminate air pockets. Ensure that topsoil is not placed over the top of the root ball, so that the plant stem remains the same height above ground as it was in the container.	Contractor
Weed control	1 Prior to the commencement of weed removal / control, contractor to inspect site to confirm weed species and/or extents for control.	Contractor
	2 Weed species / extents are flagged on-site (as required).	Contractor
	3 Weed control, subject to site monitoring, undertaken every 3 months following planting and carried out in accordance with requirements listed in this Rehabilitation Plan.	Contractor
	4 During the establishment and 12 month maintenance period all rehabilitation treatments shall be maintained in a weed free condition.	Contractor
	5 Weed control is carried out in accordance with best practice methods according to the requirements of individual species and/or environmental conditions as specified in Table 4 and Table 5.	Contractor
	6 Weed control will be undertaken in a manner which does not promote erosion or instability of soil, especially in waterways or high velocity flow zones.	Contractor
	7 Avoid application of herbicides on windy days or if rain is likely to follow within 12 hours.	Contractor
	8 Apply herbicides: a To the manufacturer's instructions and material data and safety sheets. b When the weather is humid with moderate temperatures and maximum sunlight. c When the ground has adequate soil moisture. d Where in close proximity to waterways, undertake weed control in accordance with the following guidelines: 1. Do not spray herbicides over waterbody. 2. Direct spray away from waterbody where possible. 3. Spray only to the extent of covering foliage with droplets. 4. Spray when weather is calm. 5. Use a flat fan nozzle and low pump pressure to reduce likelihood of spray drift. 6. Do not spray when rain is forecast within 6 hours.	Contractor
	9 Undertake any 'make good' works arising from meetings with either Council or Litoria Consulting, resulting in no declared plant pests or environmental weeds (i.e. 0%).	Contractor
Establishment	1 Ensure the general appearance and presentation of the landscape and the quality of plant material at date of practical completion is maintained for the full planting establishment period.	Contractor
	2 Replace failed, dead and/or damaged plants at maximum 3 week intervals as necessary throughout the full plant establishment period.	Contractor
Watering	1 Thoroughly water the plants before planting, immediately after planting, and as required to maintain growth rates free of stress.	Contractor
	2 Subject to prevailing weather conditions, watering to occur: a Daily for first week (5 waterings) b 3/week for weeks 2-4 (9 waterings) c 2/week for weeks 5-8 (8 waterings)	Contractor
	3 Manually water all planting areas, soaking to a depth of 300 mm. Avoid frequent dampening of the surface. Allow the surface of the soil to partially dry out between waterings.	Contractor
	4 Water at times of day to minimise water evaporation loss. Do not water during the hottest period of Summer days.	Contractor

LRP07a: Revegetation procedures

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Table 3: Revegetation Procedures (cont)

Activity	Management Response	Responsible Party
Maintenance	1 Maintain appropriate planting densities and replace dead / dying / diseased stock every 3 months.	Contractor
	2 Provide replacement plants as follows:	Contractor
	a Of the same species and size listed in Table 1 & Table 2.	Contractor
	b Of uniformly high quality stock equal to the best commercially available.	Contractor
	c Representative of optimum growth for the species as restricted by the container size.	Contractor
	d With a balanced root system in relation to the size of the plant and conducive to successful transpiration. Inspect the root conditions of plants by knocking plants from their containers.	Contractor
	e Without signs of having been stressed at any stage during their development due to inadequate watering, excessive shade/sunlight, suffered physical damage or have restricted habit due to growth in nursery rows.	Contractor
	f Healthy, well grown, hardened off specimens of good shape and free from pests and disease.	Contractor
	g Well rooted and without any indication of having been restricted (pot bound) or damaged at any time.	Contractor
	h Been grown in their final containers for not less than twelve (12) weeks.	Contractor
	3 Water to a depth of 300 mm. Avoid frequent dampening of the surface. Allow the surface of the soil to partially dry out between waterings. Water at times of day to minimise water evaporation loss. Do not water during the hottest period of Summer days.	Contractor
	4 Provide progress report to Council at minimum 12 months after acceptance on-maintenance.	Contractor

Table 4: Maintenance and Monitoring Procedures

Task	Objective	Action	Timing	Maintenance frequency	Responsible Party
Weed control in rehabilitation areas	No declared plant pests within restoration areas (Council/State) (i.e. 0%).	Supplementary weed removal in accordance with this Landscape & Rehabilitation Plan.	Prior to completion of maintenance period	Every 3 months during maintenance period	Current owners / proprietors of the land
	No environmental weeds within restoration areas (i.e. 0%).	Supplementary weed removal in accordance with this Landscape & Rehabilitation Plan.	Prior to completion of maintenance period	Every 3 months during maintenance period	Current owners / proprietors of the land
Establishment and survival of all plants	90% survivorship of plants.	Replacement or supplementary planting in accordance with this Landscape & Rehabilitation Plan.	Prior to completion of maintenance period	Every 3 months during maintenance period	Current owners / proprietors of the land
Maintain appropriate planting densities	Planting densities are in accordance with this Landscape & Rehabilitation Plan.	Replacement or supplementary planting in accordance with this Landscape & Rehabilitation Plan.	Prior to completion of maintenance period	Every 3 months during maintenance period	Current owners / proprietors of the land
Rubbish removal	No rubbish within restoration areas	Remove rubbish and dispose off-site.	Prior to on-maintenance inspection.	-	Contractor / current owners / proprietors of the land

Table 5: Performance Outcomes

Period	Weed content	Planting densities	Structure, growth & health	Diversity
On-maintenance inspection	<20%	-80% (±5%) of target density	Species from canopy, shrub and understorey present.	Planted species in accordance with LRP06, with no species to constitute more than 30% of planted individuals.
Off-maintenance inspection	<10%	-90% (±5%) of target density	Species from canopy, shrub and understorey present, exhibiting healthy plant growth typical for 24 month for each species.	Planted species in accordance with LRP06, with no species to constitute more than 30% of planted individuals.

LRP07b: Revegetation procedures

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Table 6: Weed Control Procedures

Method	Details
Complete removal	This technique is used for plants which regrow from bulbs, tubers or other plant parts, such as runners. Remove all plant parts, including roots by hand pulling. Plant parts should be removed from the site and disposed of via landfill or composting.
Stem scraping	This method is suitable for treating small shrubs and vines with thin and relatively soft bark tissue, which are actively growing and not stressed. Stem scraping or scrape and paint is perfect for treating vine species, especially Madeira Vine. The aim of this technique is to remove a small portion of the bark. This will allow the herbicide to penetrate into the plant's sapwood travelling to the tubers and effectively destroying the plant. Using the knife, scrape away 100 millimetres to expose the sap wood. Immediately (within 15 seconds) apply the herbicide to the exposed stem. Failure to apply the herbicide immediately will result in the plant sealing itself off and not all the herbicide to effectively penetrate into it.
Cut stump	This method is a quick and effective way of treating small shrubs, large trees, woody plants and vines without aerial tubers. This method allows accurate placement of the herbicide with minimal hazard to the environment and the operator. The intention of this method is to apply the herbicide to the actively growing plant sapwood. The herbicide will move through the plant into its roots and effectively kill it. Using the saw, machete, cane knife or secateurs, cut the plant at least 150mm above the ground. Immediately (within 15 seconds) apply the herbicide to the base of the stump. Failure to apply the herbicide immediately will result in the plant sealing itself off and not allow the herbicide to effectively penetrate into it.
Overall wet spray	This technique is suitable for treating grasses, herbs and shrubs up to 6 metres tall and involves spraying individual and small clumps of weeds with diluted herbicide. Avoid spraying on rainy or windy days and make sure the plants are actively growing. Ideal conditions for spraying are immediately after rain and once all the dew has evaporated. In terms of application technique: 1. Spray close to the target plants to avoid spray drift onto other valuable (i.e. native) plants. 2. Spray to cover all leaves and stems to the point of visible wetness. 3. Use short sweeping strokes. 4. Start from the far corner of the infestation working away from sprayed areas. 5. Be systematic to avoid spraying the same area twice.

Table 7: Weeds & Recommended Control

Scientific Name	Common Name	Control Method
<i>Bidens pilosa</i>	Cobbler's Pegs	Complete removal
<i>Cirsium vulgare</i>	Spear Thistle	Overall wet spray
<i>Conyza bonariensis</i>	Flaxleaf Fleabane	Overall wet spray
<i>Gomphocarpus physocarpus</i>	Balloon Cotton Bush	Overall wet spray
<i>Gomphrena celosioides</i>	Gomphrena Weed	Overall wet spray
<i>Lantana camara</i>	Lantana	Cut stump, stem scraping
<i>Lantana montevidensis</i>	Creeping Lantana	Cut stump, stem scraping
<i>Melinis repens</i>	Red Natal Grass	Overall wet spray
<i>Optunia stricta</i>	Prickly Pear	Complete removal
<i>Paspalum dilatatum</i>	Paspalum	Overall wet spray, slashing and mowing
<i>Verbena bonariensis</i>	Purpletop	Overall wet spray

LRP08: Weed control procedures

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**APPENDIX 10: WESTLINK POWER PROJECT LANDSCAPE
MANAGEMENT AND REVEGETATION PLAN**

Attachment C

Landscape Management and Revegetation Plan



CLIENTS | PEOPLE | PERFORMANCE

Westlink Pty Ltd

Report for Westlink Power
Station Development

Landscape Management and
Revegetation Plan

February 2010



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1. Introduction

1.1 Scope of Works

The Landscape Management and Revegetation Plan (LMRP) has been produced to manage and reinstate vegetation throughout the operation, construction and maintenance phases of specified areas of Westlink Power Project (WPP) site. Refer to Landscape Detail Design Planting Layout 1, Dwg 41-22282-L001, L002, L003 and L004, Rev A, located in Appendix A of this document. A Detailed Landscape Specification document has also been prepared which sets out the procedures to be followed for implementation of the soft landscape components of the project. Please Refer to Appendix D of the Visual Impact and Landscape Assessment Addendum Report for details. Additionally, a Detailed Ecological Assessment, dated 21st April 2009, has been prepared by Conics and relevant information on existing vegetation, fauna, weed species has been referred to in this LMRP.

1.2 Aims and Objectives of Revegetation

The LMRP aims to provide a clear, concise and practical framework for the management and revegetation of the areas outlined in 41-22282-L001 to L004 Planting Layout Plan for the WPP located in Appendix A of this document. The objectives of the LMRP are described in Table 1 below.

Table 1 Aims and Objectives of Rehabilitation Works

Components	Objective	Management Response
<i>Project Management</i>	To formulate and implement vegetation management actions; To clearly identify, methods and reporting lines; To inform all relevant players of their responsibilities; To promote and maintain stable vegetation cover.	Project management will incorporate LMRP as an integral part of the construction and operational phase. Nominate the person with responsibility for overseeing development works (e.g. the site supervisor or works supervisor) to be responsible for implementing vegetation management actions on site, and for point-of-contact for local Council or other agencies. Advise all contractors as to their role in vegetation management. Supply an action plan outlining timeframes for the implementation of each phase, and monitoring and reporting activities.



***Catchment
Management and
Action***

To protect catchments during construction and operational phases of development.

Implement catchment protection measures prior to construction works commencing.

Ensure that short (construction phase) impacts on water quality are minimized.

Ensure that hydrology quality of runoff is restored in the long-term.



Components	Objective	Management Responses
<p>Clearing and Disposal of Vegetation</p>	<p>To minimise the adverse impacts of vegetation clearance;</p> <p>To maximise recycling or reuse of cleared vegetation;</p> <p>To minimise the impacts of habitat loss due to the removal of vegetation or hollow bearing trees;</p> <p>To minimise impacts to native flora and fauna;</p> <p>To minimise soil erosion and sedimentation;</p> <p>To minimise the introduction and/or spread of weeds;</p> <p>To promptly identify and control weeds and to eliminate noxious weed species;</p> <p>To maintain existing floristic characteristics of the region throughout the proposed developed landscape;</p> <p>To minimise the negative impacts of pest plant and animal species within and adjoining the power station footprint, during construction of the project;</p> <p>To ensure the most appropriate measures are implemented to mitigate potential negative impacts of infestation by pest plant & animal species, caused before, prior to, during construction and throughout the maintenance period of the project;</p> <p>To ensure no negative impacts in water quality resulting from pathogens, bacteria, and nutrients; and</p> <p>To define the roles, responsibilities and the tasks to be performed, in regard to the control and monitoring of weed infestations.</p>	<p>Clearly identify areas of vegetation to be cleared or retained, and areas containing hollow bearing trees. Relocate wildlife including possums, sugar gliders, and native beehives prior to the removal of habitat trees.</p> <p>Ensure appropriate permits have been obtained prior to these actions.</p> <p>Use clearing methods that will not damage adjacent protected vegetation and will minimise soil profile disturbance.</p> <p>Recycle cleared vegetation for reuse on or off site such as mulch.</p> <p>Trees with identified hollows should have the hollow section preserved and this section should be suitably mounted on nearby or adjacent suitable trees, subject to Council approval.</p> <p>Establish an inventory of both native and exotic species on the site.</p> <p>Identify any species listed under the <i>Nature Conservation Act 1992 (Qld)</i>, and the <i>Environmental Protection and Biodiversity Conservation Act 2000 (Commonwealth)</i> which are to be protected under this legislation.</p> <p>Implement vegetation protection measures prior to construction works commencing. These commonly include designating vehicle access ways and work areas, signage, barrier fences, and tree guards, to minimize compaction of the remaining vegetation's root zone.</p> <p>Protect the root zones of individual trees or clumps of trees from compaction, filling, stockpiling or excavation, by excluding such activities to a location outside the vegetation canopy drip-line.</p>



Revegetation and Maintenance

To restore and enhance disturbed areas in the post construction phase;

To maximise survival opportunities for areas of retained vegetation and newly rehabilitated areas;

To protect vegetation and catchments during construction and operational phases of development;

To restore and enhance disturbed areas in the post construction phase;

To maximise survival opportunities for areas of retained vegetation and newly rehabilitated areas;

To improve the ecological values by providing a naturally vegetated weed-free area with habitat complexity, food resources and linkages to other areas; and

To prevent existing and new weeds from restabilising within the rehabilitated areas.

Determine the revegetation techniques suitable for the site taking into account the topography, soils, and ecological processes (i.e. natural regeneration, direct seeding, and soil seed-bank translocation techniques). Provide planting densities and techniques as required.

Provide recommended native species lists for revegetation, as well as priority weed species recommended for control. Ensure recommended native plant species will not aggressively compete or displace existing native species.

Specify a maintenance program in the LMRP to ensure the long-term health and vigour of retained vegetation and the healthy growth of new plantings and/or direct seeded areas.

Give details on mulching, watering and fertiliser regimes, regular inspection schedules for damage or disease, replacement planting criteria and weed eradication measures in this program.

Implement a monitoring program to measure the effectiveness of adopted measures. Provide for monitoring of any adjacent waterways for sedimentation and erosion with an action plan to remediate as necessary. Weed management and control methods should be applied in dry weather conditions only throughout the year.

Chemical control of weeds should have a minimum of 4 – 24 hrs of non-contact exposure to heavy rain.

All exposed soil surfaces are to be rehabilitated within 24 hrs of construction or landscaping completion and where necessary have temporary or permanent sediment control devices in place prior or during construction phase.



2. Existing Vegetation to be Retained

A field assessment was conducted to establish existing conditions on site in the vicinity of the proposed power station and screen/buffer mound areas. Trees at the southern bank of the existing dam and to the south west of the dam will be retained where possible. A variety of eucalypt species have been identified, refer to Landscape Detail Design Planting Layout 1, Dwg 41-22282-L001, L002, L003 and L004, Rev A, prepared by GHD and the Detailed Ecological Assessment, Lot 191 CSH2361, Ford's Road Gatton, dated 21st April 2009, prepared by Conics. Existing vegetation will provide an amount of instant screening of the proposed power station stacks. This has been documented on Landscape Detail Design Planting Layout 1, Dwg 41-22282-L001, L002, L003 and L004, Rev A, prepared by GHD

Mistletoe Infestation

There was a visible infestation of mistletoe (*Amyema miquelii*) on the forest red gums (*Eucalyptus tereticornis*) present on site around the largest dam. Mistletoe is a native epiphytic parasitic shrub that, if occurring in high enough densities may kill its host tree. Mistletoe also provides a potential food source for birds, particularly mistletoebird (*Dicaeum hirundinaceum*) and provides roosting opportunities for other species. Although mistletoe was present in quite a few trees located around the dam, it does not appear to be having a detrimental effect on the host trees. Retained trees should be routinely inspected by a suitably qualified arborist to make an assessment and perform any treatment required.



3. Roles and Responsibility for Revegetation Works

All personnel are responsible for the environmental performance of their activities and for complying with their General Environmental Duty as outlined in the *Environmental Protection Act 1994* (EP Act).

Section 36 (1) on the EP Act states that “a person must not carry out any activity that causes, or is likely to cause, environmental harm, unless the person takes all reasonable and practicable measures to minimise that harm”. The following roles and responsibilities relates to their obligations under the EP Act.

General Manager

The General Manager (GM) is responsible for the overall management of the project. This includes Environmental, Health and Safety management.

Project Manager

The Project Manager (PM), (Revegetation Contractor) is responsible for all project works and implementation of the work on location. This person reports to the GM.

The PM is also responsible for developing and maintaining a Compliance Register for the project. This includes managing compliance audits (environmental and safety) to ensure compliance.

Project Supervisor/s

The Supervisor is responsible for directing work in the field in compliance with the specifications documented in the specification for the Site Landscape and Revegetation Works. The Project Supervisors have the authority to ‘stop the work’ if, in their opinion, the work has the potential to harm people or damage the environment. This includes the incorporation of LMRP mitigation measures into work procedures, Job Hazard Analysis and Toolbox Meetings. The supervisor/s report to the PM.

The supervisor/s are also responsible for the implementation, monitoring and reporting in compliance with the LMRP. This includes the continuous improvement of environmental performance of people and equipment. The Project Supervisor is responsible for implementing all deliverables of the weed management plan outlined in the LMRP. This includes identification and control of all weeds species on site with a priority focus on declared weeds species using appropriate control techniques. The site supervisor is also required to prepare regular reports and records of all work activities. This person is responsible to the Project Manager.

Revegetation Contractor - Project Manager Role

- ▶ Supply of skilled and qualified Project Overseer to manage the project;
- ▶ Provision of providing site assessment of projects being undertaken;
- ▶ Overseeing staff/employees conducting labour intensive project and on site supervision/onsite training in general hand tools and small engine equipment;
- ▶ Setting daily tasks and meeting goals or work objectives;



- ▶ Community liaison;
- ▶ On site /council representation;
- ▶ Preparing or daily work reports/feedback to project coordinator;
- ▶ Project Design, planning and budgeting; and
- ▶ Meetings/presentations;
- ▶ Recruitment of employees/training;
- ▶ Provision of vehicle;
- ▶ All work cover/insurance wages and administration costs incurred by Revegetation Contractor; and
- ▶ Travelling expenses covered by Revegetation Contractor.

Revegetation Contractor - Project Supervisor Role

- ▶ Supply of skilled and qualified site supervisor to oversee project;
- ▶ Provision of providing site assessment of projects being undertaken;
- ▶ Overseeing staff/contractors intensive labour project;
- ▶ On site supervision/onsite training in general hand tools and small engine equipment;
- ▶ Setting daily tasks and meeting goals or work objectives;
- ▶ Community liaison / on site /council representation;
- ▶ Preparing or daily work reports/feedback to project coordinator; and
- ▶ Provision of vehicle and all work cover/insurance wages, travelling expenses and administration costs incurred by Rehabilitation contractor.

Weed Contractor

The Weed Contractor is responsible for implementing all deliverables in the weed management plan outlined in the LMRP. This includes identification and control of all weeds species on site with a priority focus on declared weed species using appropriate control techniques. The weed contractor is also required to prepare regular reports and records of all work activities. This person is responsible to the Environmental Site Manager.

Landscape Contractor

The landscape contractor is responsible for the implementation of all deliverables outlined in this LMRP. This includes identification and control of all weeds species on site, with a priority focus on declared weed species, using appropriate control techniques. The landscape contractor is also required to prepare regular reports and records of all work activities. This person is responsible to Environmental Site Manager.

Important: Roles of the weed and landscape contractor need to be determined as there is potential for one or the other to overlap in terms of their roles and responsibilities for project deliverables. For example, the weed contractor can maintain revegetation areas, which would relieve the landscape contractor of their maintenance duties. Preferably an organisation that can achieve and deliver all outcomes can alleviate this issue. Otherwise, clear and concise site specific work plans for the project



will have to be produced for the contractors to delineate work activities.



4. Management of Risks for Flora and Fauna Revegetation Works

The revegetation works will be developed to effectively implement the following:

- ▶ Effective management of vegetation within the work area;
- ▶ Control and prevent re-establishment of weeds in the proposed restoration, revegetation areas and natural areas of the site;
- ▶ Maintain, enhance and promote the rejuvenation of native species on the site and surrounding areas; and
- ▶ Establish a monitoring program to effectively manage adverse weed infestation and its impact on the environmental values of the area.

Table 2 below outlines all management requirements for the operational and maintenance phase of the project and the responsibility for managing fauna, flora, monitoring and reporting requirements.

Table 2 Flora and Fauna Management – Operational & Maintenance of Rehabilitation Works

Flora and Fauna Management Operational & Maintenance Phase	
Objective	To minimise known and potential fauna and flora impacts in areas of high environmental sensitivity
Issues and Impacts	Minimisation of tree clearing (weed treatment) particularly in high value riparian habitat areas; Disturbance of ground cover vegetation; Destruction of fauna habitat Rehabilitation.



<p>Control Measures</p>	<p>Vegetation Treatment</p> <p>In the event vegetation is required to be cleared a spotter/catcher is to inspect for and appropriately remove any fauna immediately prior to works.</p> <p>A Vegetation Management Indicator Code should be adopted to mark all individual trees on site. This is to be marked on trees (degradable paint or tie) to inform all operators on site the status of the trees. The following codes should be used:</p> <ul style="list-style-type: none"> ▶ Red tape to indicate removal; ▶ Yellow and black tape to indicate significant tree; and ▶ Blue tape to indicate vegetation to be pruned. <p>The extent or partial vegetation treatment within the site is to be clearly marked in each restoration zone (Monitoring Photographic Data Points are to be pegged and GPS for delineation).</p> <p>Tree protection devices or protection zones are to be used to minimise disturbance to existing vegetation on site that is to remain. These can vary from timber deflection braces attached to trees themselves in confined working spaces to wire strand star picket fences to protection tree root areas or groups of trees.</p> <p>In the event individual trees are to be removed from site they are to have mature seed collected (if in season) for direct seeding of disturbed areas and be mulched on site.</p> <p>Mechanical vegetation (hand) removal methods shall be favored over the use of herbicides where possible.</p>
<p>Control Measures</p>	<p>Where required by the landowner or relevant statutory authority, strips of vegetation or individual trees should remain to allow passage for animals between revegetation planting plots.</p> <p>Dead/injured wildlife during works or found on site shall be reported to the GM.</p> <p>Logs occurring in the proposed revegetation zones should be examined and their importance in terms of habitat value determined and assessed. Where they provide significant habitat values, logs should be left in their place of origin or relocated near or reinstated once weed removal treatment is completed.</p> <p>Rehabilitation</p> <p>Avoid the need for revegetation as much as possible by limiting vegetation clearing and/or site disturbance. Revegetation should only be considered where natural regeneration appears to have failed despite a period of suitable weather for colonisation and growth of vegetation.</p> <p>The site will be monitored during the works to ensure that the conservation and aesthetic value of the site are maintained. Areas proposed for rehabilitation will be supplemented with replacement plantings if any losses occur in the first 24-month period.</p>
<p>Monitoring</p>	<p>Maintenance personnel to monitor site during works and monthly through monthly maintenance inspections.</p>



Reporting	<p>Monthly monitoring operational works sheet are to be recorded and submitted to the general manager.</p> <p>Regular random on-site surveillance of tree and vegetation operational works to be conducted and onsite weed management surveillance report to recorded and submitted to site officer.</p> <p>Monthly progress rejuvenation monitoring records to be maintained on file by site officer.</p> <p>Monthly rejuvenation operational works sheet are to be recorded and submitted to site officer.</p> <p>Regular random on site surveillance of rejuvenation operational works to be conducted and onsite surveillance recorded and submitted to site officer.</p> <p>Annual rejuvenation management review including monitoring results of planting plots to be undertaken and submitted in an annual report.</p>
Corrective Action	<p>Areas undergoing rehabilitation shall be maintained as required.</p> <p>If soil erosion is still occurring in rejuvenation areas:</p> <ul style="list-style-type: none"> ▶ review rejuvenation techniques conducted by project manager; ▶ assess the potential for disturbance to occur; and ▶ implement erosion and sediment control actions. <p>If there is poor re-growth or regeneration of native plants occurring in rejuvenation, conservation and operational works zones:</p> <ul style="list-style-type: none"> ▶ review rejuvenation and direct seeding management techniques conducted by project manager; ▶ assess the appropriate use and amounts of herbicides are being used in rejuvenation areas; ▶ assess the potential for weeds to occur in rejuvenation areas; and ▶ assess other potential sources or causes of weeds or limited re-growth of native plants to occur .i.e. plant pests and disease monitoring.
Responsibility	Revegetation Contractor



5. Management of Risks for Weed Management

Poor weed control accounts for most tree-planting failures, due to competition for light, moisture and nutrients. Weeds can reduce a planted species' early growth rates by up to 70% compared to weed free sites, and can decrease survival from an expected 90% of trees planted to as little as 10% survival rate. It is therefore vital that weed control is undertaken prior to planting.

The area around the footprint of the stacks and bunds has been diminished in the past due to historic landuses such as farming. Initial site investigations found tree species around the proposed power station site are largely made up of immature trees. The vegetation on site is presently providing habitat to native fauna species. For a list of fauna species recorded on Lot 191 CSH2361, refer to Detailed Ecological Assessment report, Appendix 4 of the original REF, Fauna Species Recorded on Lot 191 CSH2361 dated 21st April by Conics. Weed control activities and revegetation of the site should be staged such that suitable habitat for fauna species is maintained throughout the revegetation process and are afforded a degree of protection for as long as practicable.

Native plant species should be used in all landscaping or revegetation to provide habitat for native fauna.

Weed management requirements for operational works and maintenance for the re-vegetation works has been identified and listed in Table 2 below.

Table 2 Weed Management – Operation and Maintenance Rehabilitation Works

Weed Management and Maintenance	
Objective	To ensure that no existing weeds are spread or introduced during Project and ongoing maintenance.
Issues and Impacts	Ground disturbance, transfer and spreading of weeds.



Operational and Maintenance	
Control Measures	<p>All weed technicians on site must be an accredited AC/DC Licensed operator.</p> <p>A pre-project weed audit and chemical treatment is to be undertaken before commencing works.</p> <p>All declared weeds (P1 -Priority 1 weeds) within the site are to be treated first before (P2 – Priority 2 weeds) before any revegetation works are to commence and are to continue throughout the duration of the 12 months maintenance project.</p> <p>All weed species located on site are to be identified and recorded. When applying weed management methods all due diligence will be used to maintain and preserve surrounding or existing native vegetation or communities.</p> <p>Woody weed species should have there stem cut close to ground level (50 mm) and be sprayed or swabbed with an approved herbicide e.g Roundup bioactive 20 ml/1 litre or concentrate, to prevent regrowth of unwanted weed species. The application of herbicidal dye should be used with the constituent herbicide to monitor the application kill rates of weed species.</p> <p>All broadleaf weeds in open space pasture areas are to be sprayed with Amicide 625 at a rate of 3 litres/400 litres of water.</p> <p>It is intended that any regrowth of weed seeds that may occur on site will be successfully controlled in the proposed maintenance program. Weekly, biweekly and monthly weed management practices will be applied to suppress and prevent re-growth of weeds species in all areas of the work site.</p> <p>Regularly monitoring and declared weed surveillance is to be conducted on a monthly basis of all areas. All weed removal techniques and chemicals used on site will be recorded and filed and made readily available to all relevant government agencies on request.</p> <p>Conduct follow up weed inspection during the growing season one year after hand over and arrange for the chemical eradication of any perceived weed occurrence. This will be outside existing contract conditions and will incur additional fees and services charges if required.</p>
Monitoring	<p>Weeds are to be visually monitored during routine monthly site inspections and maintenance visits.</p> <p>Technicians are to provide reports after maintenance patrols outlining the presence of weed infestations.</p> <p>Daily weed operational works sheet are to be recorded and submitted during operational works to Project Manager daily.</p> <p>Monthly site surveillance and maintenance report is to be submitted to the GM.</p>



Corrective Action	<p>Destroy localised infestations of weeds and conduct follow-up inspection to ensure that weed control has been effective.</p> <p>Train maintenance staff in weed identification and control measures.</p> <p>If weed infestations are still occurring in rejuvenation, conservation and operational works zones:</p> <ul style="list-style-type: none">▶ review weed removal and weed management techniques conducted by technicians;▶ assess the appropriate use and amounts of herbicides are being used;▶ assess the potential for weeds to occur;▶ assess other potential sources or causes of weeds to occur. <p>Weeds to be sprayed by project manager using herbicides (approved low toxicity herbicides). Manual removal must be used adjacent to watercourses. Plant pathogens to be notified to DERM and QPI as appropriate and treated with approved chemicals in consultation with relevant statutory authority.</p>
Reporting	Weeds and other pests shall be included in monthly maintenance reports.



6. Revegetation Techniques

- ▶ All species to be sourced from local seed provenance where possible;
- ▶ All schedule species to be provided in standard native tube plant sizes;
- ▶ All planting stock shall be true to schedule nomenclature, well formed and hardened off to suit their final location, disease free nursery stock. The root system should be firmly established without large roots extruded from the container tube; and
- ▶ Tube stock shall not be root bound.

Appropriate species that are to be reinstated in the re-vegetation program are to be species already existing on site. Canopy trees, small trees and shrubs, sedges and rushes should be planted where possible. A list of re-vegetation species to be considered when regenerating disturbed areas is provided in Table 4. All tube stock is to be inspected prior to planting out with any unacceptable or diseased stock is to be returned by the contractor.

6.1 Revegetation Techniques

Depending on site conditions and availability of resources, it is recommended that a combination of revegetation techniques be used to restore functioning vegetation throughout the site.

Plant Propagation

Plant propagation shall be handled by an appropriate wholesale nursery facility with experience in the propagation of native plants from provenance seed. Plants purchased on 'spec' should also be of provenance material only.

Hand Installation

For hand installation the planting hole will be a minimum of 25% larger than the planting container and its edges will be suitably 'roughed' prior to plant installation. The hole shall be excavated using a 'hamilton planter' or petrol auger, if ground conditions allow, or 'potti putki' if planting occurs in rip lines. The planting hole will then be backfilled with soil and firmly tamped down by hand and foot.

Hand Broadcasting / Natural Recruitment

To supplement the establishment of tube stock native trees, shrubs and lower storey species in restoration zones, it is suggested that during on-going maintenance if any existing native species on site is producing seed these adjacent species should be encouraged to self seed into the surrounding area or the seed should be collected and broad casted across the site. This will add further diversity to the site, particularly ground covers.

Direct seeding is a very 'cost effective' method of revegetation for species that are suitable for this kind of application. This includes local provenance seed such as wattles collected prior to construction. Wattles and other legumes fix nitrogen in the soil while growing and can therefore greatly improve soil condition. Many of these plants also flower heavily and are therefore very attractive to birds and insects. The addition of these pollinators into the revegetation work adds diversity and brings opportunities for natural regeneration.



6.2 Timing of Revegetation

In general, autumn and early winter are the best seasons for planting as summer temperatures can be too high for young plants to establish and impede survival rates. Planting in all seasons can be effective as long as a suitable watering regime is implemented.

6.3 Topsoil/ Mulching requirements

Imported top soil in accordance with AS4419 is recommended for the site as per landscape drawing package 41-22282-L001- RA, ; 41-22282-L002- RA, 41-22282-L003- RA, 41-22282-L004- RA, 41-22282-L005- RA, and Soft Landscape Specification reference 400159, mulched material should be applied particularly to degraded open areas to aid in soil stabilising, weed control, moisture retention and nutrient sources. Mulch depth is to be inspected prior to planting out can commence and should be consistently 100 mm across the site.

6.4 Fertiliser Requirements

Planting areas should be fertilised with Terracottem with approximately 5-10 grams per native tube stock. Terracottem should be placed directly in the hole as composition allows for minerals to transverse downward to the bottom of the hole to encourage root growth away from the planting hole. All sections should be mulched. Fertiliser is to be inspected during application and rates monitored.

6.5 Tree Guards

All plants installed manually will be suitably guarded with a protective sleeve 750 mm high with bamboo stakes.

6.6 Watering Requirements

To assist in the establishment of the rehabilitated areas, tube stock should receive a minimum of 5 litres of water per tree 3 times per week for 2 weeks during the initial planting period. Watering should occur once a week for the 12 week maintenance period. Ongoing watering should occur once a month at the same individual tree rate thereafter. Any tube stock replaced should be continually watered until it is established.

6.7 On-going Weed Management

An active weed control program should be maintained throughout all of the rehabilitated sections. The definition of a “weed” for the purposes of management is based on that of ‘environmental weed,’ namely a species that by virtue of fecundity and growth habit has the potential to establish large infestations without disturbances that dominate and eventually exclude the native vegetation.

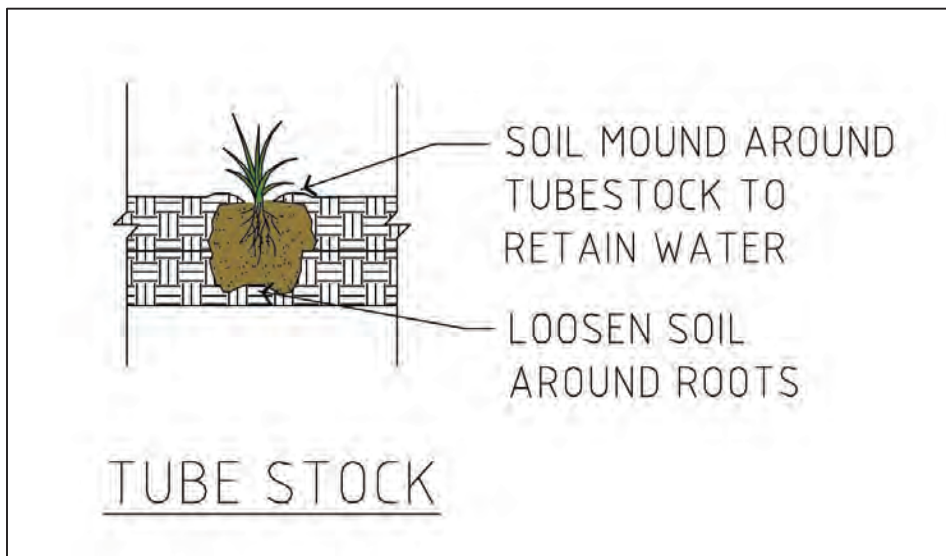
- ▶ Control programs to be carried out by personnel qualified in the recognition of target weeds and potential weed species; and
- ▶ Where possible maintain weed control within one metre of each plant to reduce competition to new revegetation for approximately 24 months.

7. Planting Techniques

The following techniques should be employed for revegetation of the site:

- ▶ Figure 1 and Figure 2 illustrate the recommended planting out techniques of nursery tube stock and mature plants that should be utilised.
- ▶ Where possible planting of tube stock should commence immediately after weed management activities, preferably the two activities should be concurrent within a management section.
- ▶ Plants should be obtained from local nurseries that specialise in endemic or provincial species.
- ▶ If plants are not available seed can be collected from appropriate species of trees, shrubs and groundcover from local provenances such as other reaches of the site. These can then be established as tube stock for planting.
- ▶ Drainage lines that follow the natural contours of the site should be included within the rehabilitation works.

Figure 1 Planting diagram for tube stock



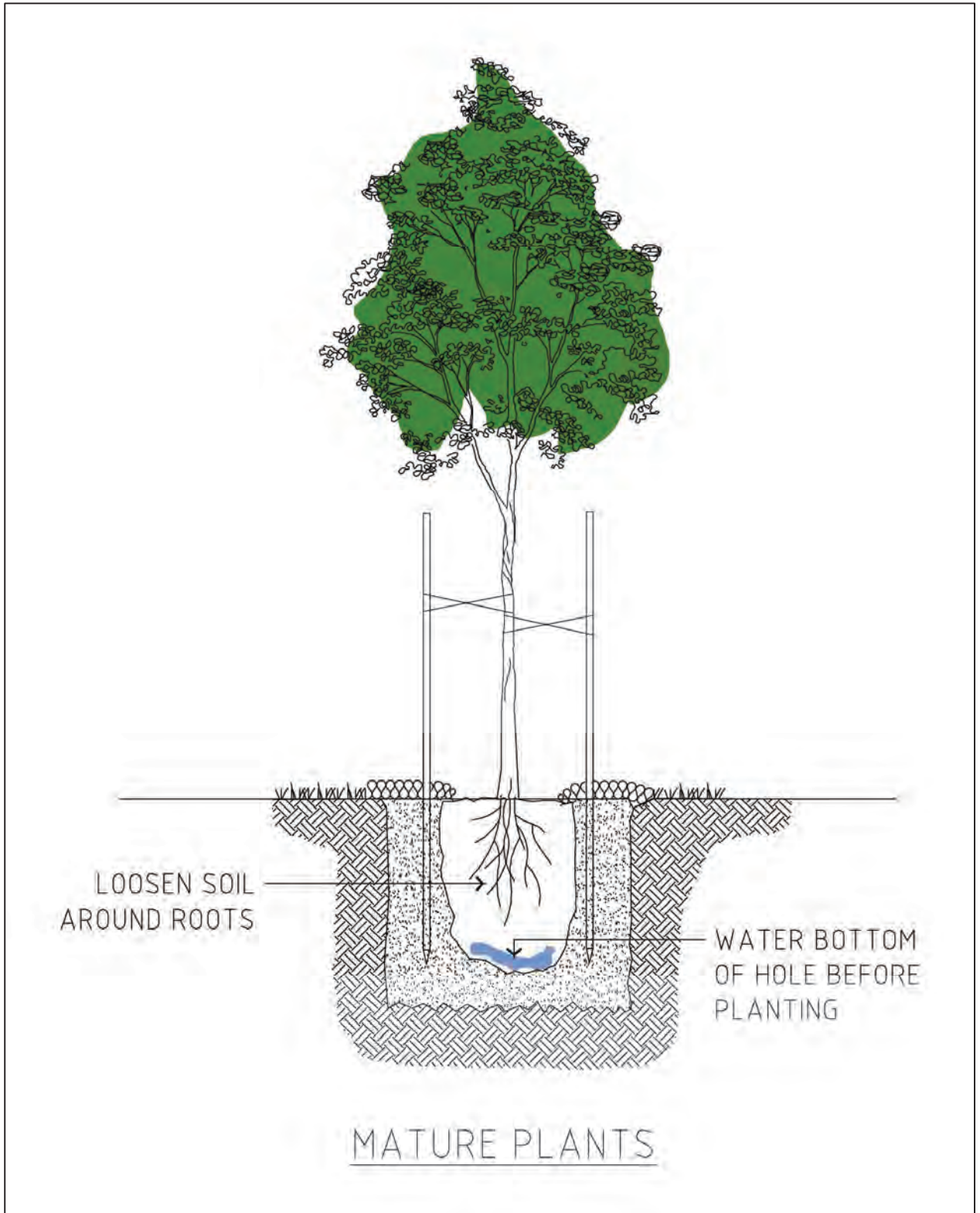


Figure 2 Planting diagrams for trees

7.1 Revegetation Areas

A cross-sectional view of a typical screen/buffer mound where the groups of trees are to be positioned within the site is provided in Figure 3. The planting structure includes a canopy layer; the local native species selected are estimated to reach a height of 25-30 m at maturity. The mid-story and understory will assist in screening the power station from various viewpoints. Plant species used in the revegetation areas will provide habitats for local fauna and avifauna species.

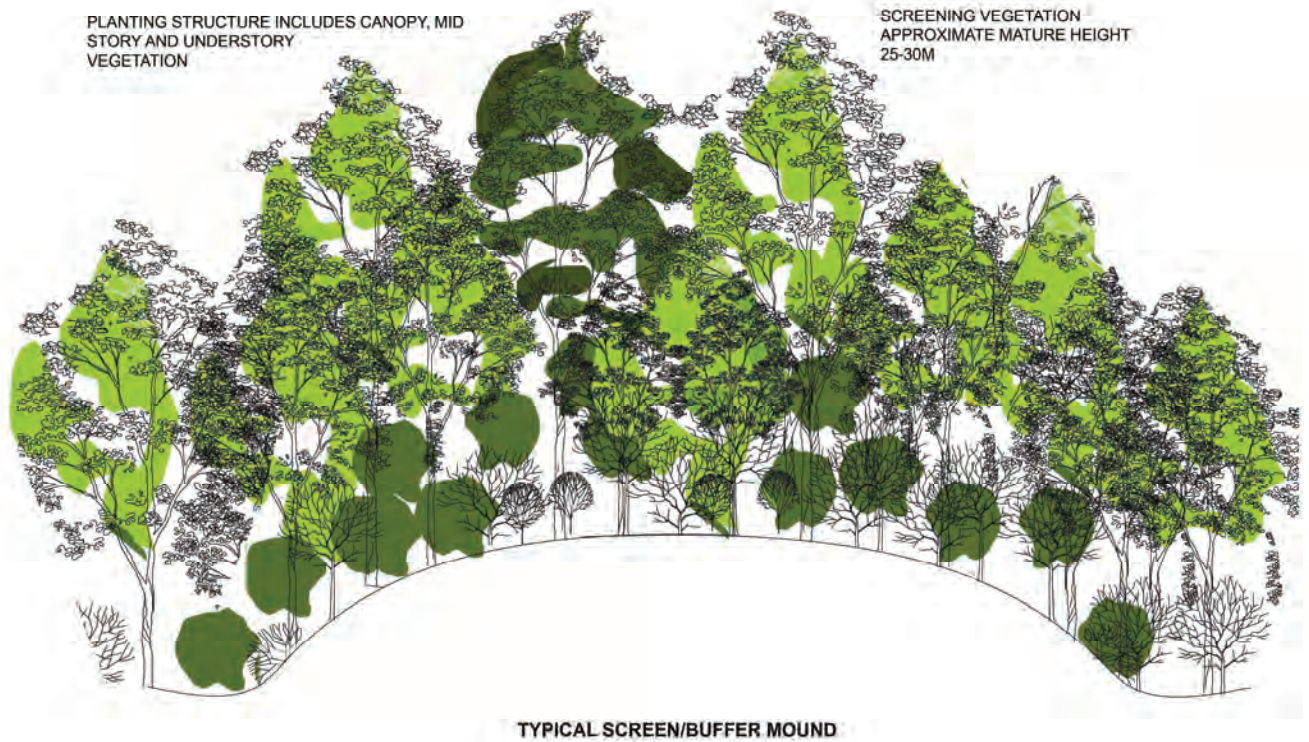


Figure 3 Cross sectional view of Typical Screen/Buffer Mound



7.2 Planting Densities

Planting densities for each tree size is provided in Table 3. A diversity of species in each habitat category should be planted out in accordance with the densities below.

Table 3 Planting Densities

Tree Form	Density
Large tree	1 tree every 10 m
Medium tree	1 tree every 7-8 m
Small tree	1 tree every 3-5m
Shrub	1 shrub every 2-3 m
Ground cover	Clumps every 1-2 m

7.3 Species list for rehabilitation

A list of species is to be used during the rehabilitation are those plants identified from onsite investigations of natural vegetation. Refer to 41-22282-L001 to L004 Landscape Planting Layout for placement of selected species.

Table 4 Species list for Revegetation Areas

Species	Type	Areas
<i>ALLOCASUARINA inophloia</i>	Tree	In both dam locations
<i>CORYMBIA maculata</i>	Tree	In both dam locations
<i>CORYMBIA tessellaris</i>	Tree	In both dam locations
<i>EUCALYPTUS tereticornis</i>	Tree	In both dam locations
<i>LOPHOSTEMON suaveolens</i>	Tree	In both dam locations
<i>ACACIA juncifolia</i>	Shrub	In both dam locations
<i>DODONAEA viscosa</i>	Shrub	In both dam locations
<i>HOVEA acutifolia</i>	Shrub	In both dam locations
<i>JACKSONIA scoparia</i>	Shrub	In both dam locations



<i>PULTENAEA villosa</i>	Shrub	In both dam locations
<i>CYMOPOGON refractus</i>	Grass/Groundcover/ Native Grass Mix 1	In both dam locations
<i>DIANELLA revoluta</i>	Grass/Groundcover/ Native Grass Mix 1	In both dam locations
<i>HARDENBERGIA violacea</i>	Grass/Groundcover/ Native Grass Mix 1	In both dam locations

Species	Type	Areas
<i>LOMANDRA longifolia</i>	Grass/Groundcover/ Native Grass Mix 1	In both dam locations
<i>THEMEDA australis</i>	Grass/Groundcover/ Native Grass Mix 1	In both dam locations
<i>DIANELLA caerulea</i>	Grass/Groundcover/ Native Grass Mix 2	In both dam locations
<i>SOLEPIS nodosa</i>	Grass/Groundcover/ Native Grass Mix 2	In both dam locations
<i>LOMANDRA longifolia</i>	Grass/Groundcover/ Native Grass Mix 2	In both dam locations
<i>THEMEDA australis</i>	Grass/Groundcover/ Native Grass Mix 2	In both dam locations
<i>HARDENBERGIA violacea</i>	Hydromulch Mix with Macmat Jute Matting	In both dam locations
<i>LOMANDRA longifolia</i>	Hydromulch Mix with Macmat Jute Matting	In both dam locations
<i>MYOPORUM ellipticum</i>	Hydromulch Mix with Macmat Jute Matting	In both dam locations
<i>CYNODON dactylon</i>	Hydromulch Grass Mix	In both dam locations



8. Maintenance Program for Revegetation Works

8.1 Revegetation Maintenance Actions

Table 5 Revegetation Maintenance Actions

	Time	Maintenance Action
Presence of Weeds	Fortnightly (12 weeks) Monthly (12 weeks) Quarterly (18 months)	Remove weed regrowth to ensure dominance of regenerating native plants. A weed exclusion zone of at least 2 m should be maintained around each revegetated area. Replenish mulch / weed matting where necessary. Problematic weeds listed in table 10 will be a specific focus for ongoing management.
Health of Plants	Fortnightly (12 weeks) Monthly (12 weeks) Quarterly (18 months)	Replace dead or dying plants. Sick plants may be an indication of stress or poor soil conditions. This may be a result of low nutrient levels or lack of water, it is imperative that a stringent watering regime is maintained.
Signs of Regeneration	Fortnightly (12 weeks) Monthly (12 weeks) Biennially (24 months)	Natural regeneration and new growth in previously weed infested areas is a good sign of recovery and indicates a healthy ecosystem.
Signs of Disturbance	Fortnightly (12 weeks) Monthly (12 weeks) Biennially (24 months)	If a disturbance (e.g. foraging by wildlife or insects, erosion, nutrient influx etc) is affecting >10% of a revegetation area it is considered a major threat and should be mitigated.
Habitat Values	12 months (annually for 2 years)	The site should be developing food sources, (e.g. nectar and seed) and habitat (e.g. leaf litter, nesting sites) for native fauna. Logs, rocks and nest boxes can be utilised to enhance fauna habitat.
Diversity & Structures	12 months (annually for 2 years)	The site should begin to represent a natural system. It should display a diversity of native species and a natural structure incorporating canopy, mid-layer and groundcover.



Density	24 months	A stem density of no greater than one (1) m centre between any two (2) plants to be achieved by end of maintenance period.
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8.2 Proposed Maintenance Schedule

Table 6 Proposed Maintenance Schedule

MAINTENANCE SCHEDULE	
Responsibility	PM (Rehabilitation Contractor)
Maintenance Actions and Methodologies	<p>Initial Establishment</p> <p>Initial 12-week establishment period applies to all vegetation works. During this period weekly maintenance is to occur that involves the following:</p> <ul style="list-style-type: none"> ▶ watering; ▶ ongoing weeding; ▶ fertilising; and ▶ replacement of dead or damaged stock. <p>Ongoing Maintenance</p> <p>After this period, it is recommended that the site be maintained on a monthly basis over a 24 month period to ensure that the revegetation has been successful. The following is to occur:</p> <ul style="list-style-type: none"> ▶ Conduct weed spraying, tree watering, tree replacement of losses as necessary to maintain >90% survival rate. ▶ All proposed natural/conservation or landscape areas that are disturbed, will be revegetated at module planting rates. ▶ All revegetation species will be disease free and supplied from an accredited nursery supplier. <p>Long-term Maintenance</p> <p>Annual report is required to determine the success of rehabilitation against the floristic and structural criteria provided above and contain recommendations by the PM to the GM in regard to issues affecting the ongoing success of the restoration works, and the possible need for additional activities that may be required outside the normal maintenance program.</p>
Management Intervals	<p>Weekly for first 12 weeks;</p> <p>Monthly for after 24 months; and</p> <p>Review with Biannual report.</p>



<p>Monitoring Program</p>	<p>The monitoring should address the following issues:</p> <ul style="list-style-type: none">▶ Plant growth, percentage cover and survival rates;▶ Plant losses through herbivores, disease, vandalism, storm damage or other factors;▶ Weed re-growth and control measures;▶ Plant replacement;▶ Guard repair and weeding inside guards; and▶ Maintenance watering regime. <p>It is also essential to keep an accurate photo-record of the progress of the restoration works by setting up an appropriate number of representative fixed photo-points across the site. Photos should be taken by digital camera and recorded in the project file by date and discrete photo-point number. Photo-point locations should be clearly marked on site and mapped by a surveyor or by GPS.</p> <p>The site should be monitored on a monthly basis over 24 months</p>
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<p>Corrective Actions</p>	<p>If soil erosion is still occurring in planting zones the following is to occur:</p> <ul style="list-style-type: none">▶ review rehabilitation techniques conducted by project manager;▶ review erosion and sediment control;▶ assess the potential for disturbance to occur;▶ assess other potential sources or causes of disturbance to occur; and▶ maintain planting regimes to a minimum of >90% survival rate. <p>If weed infestations are still occurring in planting zones the following is to occur:</p> <ul style="list-style-type: none">▶ review weed removal and weed management techniques conducted by project manager;▶ assess the appropriate use and amounts of herbicides are being used;▶ assess the potential for weeds to occur; and▶ assess other potential sources or causes of weeds to occur. <p>If there is poor re-growth or regeneration of native plants occurring in rejuvenation areas zones, the following is to occur:</p> <ul style="list-style-type: none">▶ review re-vegetation and direct seeding management techniques conducted by project manager;▶ assess the appropriate use and amounts of herbicides are being used in rejuvenation areas;▶ assess the potential for weeds to occur in rehabilitated areas; and▶ assess other potential sources or causes of weeds or limited re-growth of native plants to occur.i.e. plant pests and disease monitoring.
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Reporting	<p>Report prepared after each maintenance and monitoring visit documenting the following:</p> <ul style="list-style-type: none"> ▶ plant growth rate; ▶ plant survival rate in each monitoring zone; ▶ photos from monitoring zones; ▶ areas of weed establishment including species; and ▶ weed spraying, tree watering or tree replacement of losses completed. <p>Annual report is required to determine success of rehabilitation against the floristic and structural criteria provided above and is to outline recommendations by the PM to the GM in regard to issues affecting the ongoing success of the restoration works, and the possible need for additional activities that may be required outside the normal maintenance program.</p>
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8.3 Photographic Monitoring Data Points

To aid in evaluating the success of the weed management and rehabilitation a number of photo points will be established along the restoration management area. Posts (timber) will be used to delineate the extent of the planting plot and each post will have a GPS coordinated for each post. Photographs will be taken at a post indicating a southern and northern aspect view of each planting plots. On a monthly basis, the same GPS posts will be used as a reference point to take photographs of the revegetation plots to monitor site establishment, tree growth and weed suppression. Periodic inspections are to be conducted every month for 24 months. Photographs are to be taken and included in the annual report to provide an indication of the survival and growth of vegetation and establishment of weeds over the maintenance period.

8.4 Preparation and submission follow up Monitoring Report

The objectives of the follow up report will be through site analysis and correlation of preliminary work activity reports will be to provide a maintenance report outlining:

- ▶ a comprehensive description of the existing environment after restoration works and mapping;
- ▶ establish plant identification of species located on site and a vegetation management plan;
- ▶ photographic record of site before and after of designated areas for revegetation/planting techniques to be applied;
- ▶ assessment of the potential impacts of weeds within the site and appropriate weed management practices to be implemented;
- ▶ review of vegetation management plan monitoring and maintenance program;
- ▶ review of description of project deliverables to meet guidelines;
- ▶ review of preparation of project schedule;
- ▶ description of safety measures used;



- ▶ review of methodologies; and
- ▶ conclusion and recommendation on long term maintenance of the revegetation works.

The Landscape Management and Revegetation Plan produced should establish a maintenance benchmark for the site. The revegetation areas would be required to be watered and weed free to maintain a planting threshold of 90% over a 24-month period. Any plant losses over this period of time should be replaced to maintain required planting regimes and to meet the 24-month maintenance conditions criteria outlined in Table 7 below.

Table 7 Site specific floristic and structural criteria – 24 month maintenance period

Criterion	24 Months	Comments
Plant survival (%)	90%	Provided follow-up maintenance is provided (i.e. watering, weeding and replacement planting). If maintenance is not provided then survival rate will be lower which is not acceptable. Failures must be replaced during maintenance and prior to handover. Failed hydro seeding areas are to be reapplied.
Diversity of species (% original planting ratio)	80%	A diversity of native species for each plant type (edge, pioneer, shrub, tree) should be present and one or two species should not dominate (i.e. wattle species). 80% must be achieved in the first 12 months.
Plant growth (cm)	> 1.00m growth	Average Height of tree to be >1 m.
Mean cover (%) excluding weeds	80%	Include trees, shrubs and ground covers must achieve 80% Hydro seeded areas must achieve 90%
Mean weed foliage cover (%)	<5%	Must be no greater than 5% in the first 12 months.
Presence of invading environmental weeds (%)	5%	In first 12 months 5% with evidence of dieback/ poisoning.
Evidence of self-generating	Evident	
Fauna habitat developing	Evident	

8.5 Mulching & Erosion Matting

All exposed soil surfaces are to be blanket mulched to a minimum depth of 100 mm mulched with a natural mix blend of organic matter (forest mulch) to aid in the retention of moisture and the reduction of weeds for the initial planting. In the event that mulch quantities are insufficient on site, mulch maybe



required to be imported to site. All organic products delivered to site are required to be supplied by a quality supplier and be QPI certified red imported fire ant free.

In areas where embankment gradients are steep or the area shows signs of potential erosion, control devices such as coil logs or a bio degradable matting (Jute Matting Grade 3) should be used to line exposed areas batters/slopes.

Native seed can be hand sown under the matting if available or it can be planted into with tube stock. The matting should be positioned parallel to the embankment gradient and be partially submerged into the soil at its highest and lowest point (both ends) and pinned at 1.5 m spacing over the matting coverage. Where matting is required to join another piece the matting should be slightly rolled so the joining mats are overlaid and then pinned through the centre at 1 m spacings. This will prevent slippage from water runoff and mats being dislodged from strong winds.

Once matting is in place, planting into the Jute matting is to be at 1 plant per 1 m², the matting is to cut using Jute matting scissors. The cut is to be made as an upside v pattern with the cut portion turned into and under the mat. This allows access to plant into the soil and acts as a device to catch and hold water to the new plant.

Re-vegetated areas are to be designated as lawn free maintenance zones. The combination of natural re-growth and leaf litter from plants will eventually allow the natural vegetation to maintain itself.

8.5.1 Stockpiling Areas for Mulch

It is recommended to establish any mulch stock piles at a distance of 40 m from a major watercourse and preferably on flat land. The stock pile is to have a sediment fence installed around its entire perimeter. It is best practice to ensure that any exposed surfaces should be covered within a 48 hour period after being cleared. Where blanket mulch meets embankments with steep slopes. Sediment fencing should be installed along the top of the embankment at 1.5 m from the edge of the slope to prevent mulch being potentially washed down embankments during heavy rainfall periods.

If embankments are mulched, sediment fences should be installed to run parallel along the embankment slope at top and toe of batter to prevent mulch slipping in heavy rainfall periods until plantings have stabilised the slope.



9. Erosion and Sediment Control

Erosion and sediment requirements have been identified and listed in Table 8 below:

Table 8 Erosion and Sediment Control Plan

Erosion and Sediment Control	
Objective	To rehabilitate the site using all reasonable and practicable measures to minimise erosion and sedimentation.
Issues and Impacts	Locating structures, existing erosion problems, extensions/upgrade of access tracks Traffic movement on access tracks, vegetation clearing
Planning and design	
Control Measures	<p>Locate structures in areas of low erosion potential, where possible.</p> <p>Where any widening of existing tracks or structures are to be located in areas of high erosion risk, design erosion control measures in accordance with <i>Institute of Engineers Australia Queensland Division (1996) Soil Erosion and Sediment Control – Guidelines for Queensland Construction Sites</i>. Utilise existing access tracks where possible.</p> <p>Design/schedule ameliorative measures for existing erosion areas including:</p> <ul style="list-style-type: none"> ▶ Installation of whoa boys on access tracks if required; ▶ Backfill, resurface and install contour banks for existing rill and gully erosion, to provide erosion resistance and reduce overland flow velocity. ▶ Planning and design are to consider erosion and sediment control impacts and include into budgets
Monitoring	Not applicable to this stage of project
Reporting	Not applicable to this stage of project
Corrective Action	Review design of erosion and sediment control measures
Responsibility	Westlink



Construction	
Control Measures	<p>Access Tracks</p> <p>Limit construction of new access tracks by utilising existing tracks where possible.</p> <p>Limit construction of new access tracks where existing surface remains suitable for construction traffic and longer term 4WD maintenance vehicles.</p> <p>All access tracks to be located by GPS and shown on site route plans to avoid misunderstandings prior to detailed construction commencing.</p>
Control Measures	<p>No clearing of riparian vegetation or in any areas vulnerable to erosion unless at structure sites.</p> <p>Access tracks through easily erodable ground shall have endemic grass (or with a mixture of sterile annuals) seeds hand spread across the majority of the track on a regular basis to facilitate native grass germination and soil retention, even though the track may remain under irregular traffic use.</p> <p>Where access tracks become heavily disturbed, restrict movement by cordoning off with survey tape. Install additional drainage control measures (such as table drains, rock check dams and whoa boys) if required.</p> <p>Access tracks not required: to be cordoned off, re-profiled and rehabilitated, as such areas become available. Erosion controls shall remain in place and maintained until such time as a stable landform (>70% groundcover) has been achieved.</p>



<p>Control Measures</p>	<p>Any new access tracks or extensions to existing access tracks shall be constructed to control drainage and minimise erosion. Erosion and sediment control shall be undertaken in accordance with <i>Institute of Engineers Australia Queensland Division (1996) Soil Erosion and Sediment Control – Guidelines for Queensland Construction Sites</i>, a copy of which is with each Construction Manager and Project Environmental Officer.</p> <p>Where new or extended access tracks are required across creeks and gullies, earthworks should be minimised as far as practicable to minimise soil disturbance. Crossings should be constructed at right angles to the stream flow, if possible. Approaches to creeks may need stone lining to provide stable access and access clearings should be minimised to retain riparian vegetation. Whoa-boys should be constructed immediately upslope to prevent up-gradient runoff from causing rill erosion. The surface of the crossing should be finished at the original creek bed level. Streambeds may require stone lining for protection.</p> <p>New or extended access tracks shall be constructed at grades of less than 20%, as far as possible. Where previously constructed tracks traverse directly up steep ridge lines that are causing significant erosion, alternative flatter alignments should be investigated and the existing track rehabilitated.</p> <p>Erosion protection of access track lead off drains from whoa boys, dams or other drains shall be extended until a non-scourable 2% grade or less is achieved.</p> <p>Rehabilitate temporary access roads by deep ripping, replacing displaced topsoil and revegetating with endemic vegetation.</p> <p>Traffic Movement</p> <p>In the event of saturated soil conditions, works may be postponed until further notice to prevent disturbance and damage to access roads.</p>
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<p>Control Measures</p>	<p>Structure footings and infrastructure within site.</p> <p>Disturbances associated with constructing structure footings require strategies to minimise the release of sediment to waters. These strategies shall include but not be limited to the construction of diversion banks/drains, where necessary, along the elevated perimeter of the works to prevent uncontaminated stormwater from contacting areas of disturbance and installation of temporary sediment fences below areas of earthworks.</p> <p>Erosion and sediment control measures at disturbed areas and on the approach corridors shall be implemented as per (Institute of Engineers Australia Queensland Division (1996) Soil Erosion and Sediment Control – Guidelines for Queensland Construction Sites).</p>
<p>Control Measures</p>	<p>Cleared vegetation should be windrowed on the low side of the clearing.</p> <p>Broad-scale clearing shall be undertaken with blades at least 100mm above ground level to minimise topsoil disturbance, unless earthworks are required.</p> <p>Deep rip and revegetate disturbed areas once construction has been completed and lay down areas or access tracks no longer required.</p>
<p>Monitoring</p>	<p>Regular inspections of all stormwater drains and erosion control measures for discharges of suspended solids to waters daily in response to significant rainfall events (>50 mm in 24 hours). The Contractors Site Foreperson or delegate shall immediately undertake any necessary maintenance works to prevent or minimise the release of contaminated runoff to any waterways. Such actions are to be audited by the Project Environmental Officer for compliance.</p>
<p>Reporting</p>	<p>Erosion and sediment control shall be included in monthly reports prepared by the Project Environmental Officer. The reports are to recommend appropriate controls to minimise erosion on site.</p>



Corrective Action	<p>The Construction Manager and the Project Environmental Officer are to be notified in the event of non-compliance.</p> <p>Corrective actions in the event of non-compliance include inspection of maintenance and erosion control measures and identification of sediment control deficiencies. Sediment fences and additional whoa boys (or rock check dams on drainage lines) may be installed to prevent transport of sediment to any waterway.</p> <p>Undertake revegetation works in areas of likely erosion.</p> <p>Some tracks may have to be temporarily closed to repair erosion damage and to prevent further sediment transport off site.</p>
Responsibility	Construction Manager and Project Environmental Officer
Operation and Maintenance	
Control Measures	<p>Access roads and structure sites will be regularly monitored (minimum annually) for evidence of erosion and sedimentation of gullies and creeks.</p> <p>Grading of tracks should be limited to those sections where erosion damage has occurred. Where ground cover exists and no erosion is occurring, access should be maintained by slashing with grading limited to clean-up of drainage control structures to allow dry weather 4WD vehicle drive access.</p> <p>The success of rehabilitation should determine the need for additional erosion control works.</p>
Monitoring	Regular monitoring for erosion along the corridor during routine inspections.
Reporting	Corridor Maintenance to include erosion in reporting requirements.
Corrective Action	Where erosion has occurred, stabilise the area and implement appropriate controls (drainage, bunds, sediment devices etc) to prevent erosion from occurring again.
Responsibility	Environmental Officer and Maintenance Contractor



10. Weed Control and Management

Identification of Weeds on Site

During the field visit to the area proposed for the power station and buffer mound, one declared weed, listed under the *Land Protection (Pest and Stock Route Management) Act 2002* (LPA), was identified.

This was:

- ▶ *Optunia stricta* (prickly pear) – Class 2 Declared Plant.

For general site information on declared weeds, refer to section 3.4.1 of the Detailed Ecological Assessment, Lot 191 CHS2361, Ford's Road, Gatton, dated 21st April 2009 prepared by Conics.

Environmental Weeds

Table 10 contains species that are considered environmental weeds in South East Queensland. These species were identified during the site visit on 14/12/09 and located in the southeast corner of the site, in open grassland areas.

Table 9

Species Name	Common Name
<i>Cirsium vulgare</i>	spear thistle
<i>Gomphocarpus physocarpus</i>	Balloon cotton bush

Environmental weeds identified generally on the site by ecologist are listed in Table 10. Refer to section 3.4.1 Environmental Weeds of the Detailed Ecological Assessment, Lot 191 CHS2361, Ford's Road, Gatton, dated 21st April 2009 prepared by Conics.

Table 10

Species Name	Common Name
<i>Paspalum dilatatum</i>	paspalumgrass
<i>Plantago lanceolata</i>	lamb's tongue
<i>Conyza bonariensis</i>	flaxleaf fleabane
<i>Melinis repens</i>	red natal grass
<i>Gomphrena celosioides</i>	gomphrena weed
<i>Bidens pilosa</i>	cobbler's pegs
<i>Lantana montevidensis</i>	creeping lantana (Class 3 weed)
<i>Verbena bonariensis</i>	purple topped verbana



10.1 Control Methods and Species List

Weed Removal Methods

The following methods are the most common and user-friendly methods of applying appropriate weed management techniques to contain weeds on the property. The following types of weed management techniques are recommended to eradicate different types of weed species, and promote the regeneration of native species in the area.

Although weeds will be removed via machinery as part of the engineering works for the construction of the access track, certain responsibilities in maintaining this zone are required. Weeds reproduce in great numbers by effective methods of vegetative propagation or by setting great numbers of seeds. Seeds and other propagules are spread around by localised environmental elements and machinery. Most soils contain large numbers of dormant weed seeds that readily germinate when exposed to light and moisture. Bare and disturbed soil will be readily colonised by weeds and regular maintenance will be required.

The following methods are to be applied in managing weeds on site:

- ▶ direct contact spray; and
- ▶ cut stump method.

Direct Contact Spray

This method involves direct spraying of herbicide to the leaf surface of classified weed species. This method is particularly user friendly and time efficient if it is implemented on targeting weed species, which are of a herbaceous/succulent or young nature. The plant usually dies on site and will not require removal using this method. This will minimise the impact on the environment.

This method is excellent for targeting more invasive low growth species such as grasses and herbaceous weeds species, which may occur. Invasive weeds of this kind have a short rapid growth cycle producing regular flowers and seeds, and short reproduction cycles.

Timely direct spraying of these weeds can effectively minimise the reoccurrence of these weeds, disturbing the lifecycle by preventing the plant from producing seed.

Cut stump method

The cut stump method is applied to semi-hardwood species. This involves mechanically cutting the plants stem and then directly applying the herbicide to the cut stem. It is recommended that a dye be added to the herbicide to assist in the application as a visual aid to monitor the use and success of the herbicide. For optimum results herbicide should be applied to the stem immediately to prevent plant cells from sealing and preventing herbicide from entering the plant. Mechanical treatment of woody weeds, such as lantana by reducing plant to 50 mm above ground is the most appropriate method. The cut stump method involves applying undiluted Glyphosate directly to the cut stem.

Type of herbicide

When applying weed control methods near waterways that require the use of chemical herbicides it is a



requirement to use herbicide of a low residual composition. This will minimise the build up of herbicide levels in the surface soil and ecosystem. Roundup biactive is the preferred use herbicide as it has a low residual nature and is also effective in the control of weed species. The type of herbicide is preferred when in close proximity of waterways. Coloured dye should be added to chemical control of weeds to provide visual identification of herbicide application and the monitoring of success rates. In areas of intense weed infestation, particularly near creeks), removal of vegetation encourages erosion and further opportunistic weed species. Revegetation of these areas is a priority.

Timing

The weed management techniques are to be applied in the early morning and/or late afternoon. If the herbicide is mixed with water and used in the direct contact spray, the herbicide may evaporate before it is absorbed into the plant tissue. It is a legal requirement that any department or contractor must be an approved licensed herbicide operator (AC/DC Applicators License) when using herbicide on state, commercial or public lands. It is a requirement to record and file a materials/herbicide spray checklist nominating Time/Date/weather conditions/ litres used (application rates) on every application and be made available to any government official if requested. Chemical control of weeds should have a minimum of 4 – 24 hrs of non-contact exposure to heavy rain.

All exposed soil surfaces are to be rehabilitated within 24 hrs of construction or landscaping completion and where necessary have temporary or permanent sediment control devices in place prior or during construction phase

Declared Plant Surveillance

When monitoring declared weeds it is a requirement to undertake monthly and annual site surveillance inspections to monitor weed and re-vegetation areas. This allows consultation between landowners and council to maintain awareness and education in relation to weed management on the site for the potential re-growth and occurrence of new invasive weeds. This surveillance is required to be undertaken by a suitably qualified person. Under the *Queensland Land Protection (Pest and Stock Route Management) Act 2002*, it is a required that the property owner, manage any declared plants on the property.

Table 11 Guide for weed species list and recommended control methods

Species Name	Common Name	Form	Control methods
<i>Lantana camara</i> Class 3	Lantana	Shrub	Refer to P1 General Control Methods
<i>Opuntia stricta</i> Class 2 Declared Pest P1	Prickly Pear	Cactus	Refer to P1 General Control Methods 1



<i>Lantana montevidensis</i> Class 3 Declared Pest P1	Creeping Lantana	Shrub	Refer to P1 General Control Methods
<i>Bidens pilosa</i> P2	Cobbler's Pegs	Annual Herb	P2 Control Method
<i>Melinis repens</i> P2	Red Natal Grass	Perennial grass	P1 Control Method 1
<i>Verbena bonariensis</i>	Purpletop	Perennial herb	P2 Control Method



11. Potential Impacts and Mitigation Measures for Revegetation Works

To ensure the most appropriate measures are implemented to mitigate potential negative impacts from the infestation by pest plants, the management of native vegetation and the stabilisation of a riparian zone, prior to, during construction and throughout the maintenance period of the project needs to be implemented. Site-specific mitigation measures have been developed and are to be applied on site as additional requirements to the standard guidelines of the LMRP.

Potential impacts from the proposed rehabilitation works on the surrounding vegetation communities include but not limited to the following:

- ▶ Vegetation loss and habitat fragmentation
- ▶ Gully erosion and sediment run-off; and
- ▶ Weed invasion.

These impacts are discussed in more detail below.

11.1 Vegetation loss and habitat fragmentation Mitigation Measures

- ▶ Vegetation to be retained is to clearly visible by barricade fencing or clearly marked or flagged;
- ▶ All appropriate permits and approvals to be gained;
- ▶ Prior to clearing vegetation or weeds on site, clearing zones need to be identified to all operational and construction personnel;
- ▶ Temporary fencing incorporating safety measures and sediment control devices should be installed to delineate limit of clearing permitted under the development application;
- ▶ Utilise existing tracks, disturbed areas and cleared lands for access only;
- ▶ Rehabilitate cleared area with appropriate local native species;
- ▶ Retain habitat features such as large fallen logs for reinstatement following construction and during rehabilitation;
- ▶ Vegetation required to be cleared should be mulched on site. The mulch should be used to assist in stabilising soil batters/disturbed areas or stockpiled to reinstate future proposed re vegetation areas after completion of works;
- ▶ Vegetation removed on embankments should be cut no less than 50 mm above ground level to maintain soil/riparian surface stability where possible. This will assist to maintain and improve the potential regeneration of the site from re-growth when construction is completed;
- ▶ Logs occurring in the proposed rehabilitation area should be examined and their importance in terms of habitat value determined and assessed. Where they provide significant habitat values, logs should be left in their place of origin or relocated near or reinstated once works are completed.
- ▶ A list of species is to be used during the revegetation are those plants identified from on site investigations of natural vegetation Table 4. Species have been grouped into the different categories



based location of planting.

- ▶ Planting densities for each tree size is provided (refer to Table 3). A diversity of species in each habitat category should be planted out in accordance with the densities in Table 3. Re-vegetation is required to mitigate against potential adverse impacts on vegetated and or exposed lands of the operation works.

Gully Erosion and Sediment Run-off

The embankments also show evidence of spoil and landfill waste used to stabilise the embankments. Further clearing and disturbance to the soil structure and vegetation cover through this area would increase any erosion already present on the gully slopes through exposed soil surfaces, increased water run-off and disturbance to the banks.

Mitigation Measures

- ▶ Site is to be assessed prior to works to determine locations of stockpiles, diversion banks and requirements for other sediment retention devices. Appropriate devices to be installed to prevent turbid water from leaving site and entering surrounding surface waters. Water should be ponded until sediment has settled or water has receded.
- ▶ Sediment Control Devices to be used:
 - coil logs on formed swales, dry creek beds and slopes;
 - sediment fencing on boundaries and open surface run off areas;
 - silt curtains in water bodies; and
 - jute matting (grade 3) on all exposed slopes/batters greater than 1: 2.
- ▶ Revegetation should occur as by applying a direct seed mix of native ground covers, sedges and grasses or tubestock species to achieve a ground cover density of 1 plant 1 m ration. Utilise existing tracks, disturbed and cleared areas for pipeline easement;
- ▶ Install sediment fencing to protect surrounding creek lines, gullies and reduce run-off;
- ▶ Backfilling and rehabilitation of the alignment within 24 - 48 hrs is to occur immediately after pipe-laying is complete;
- ▶ Exposed soil surfaces are to be jute matted (grade 3) on slopes/batters and rehabilitated at 1 native plant per m² or direct seeded under matting or exposed surfaces at 7 kg per hectare; and;
- ▶ By reducing the need to clear vegetation, it will reduce the area required to regenerate.

11.2 Weed Invasion and Edge Effect

Increased disturbance within the site in time would allow weed species to penetrate further into this area if not managed accordingly. In time this may affect the integrity, biodiversity and habitat value of the native vegetation. Also, weeds may not provide good protection against erosion. Often the removal of one weed species allows another weed species type to takeover. The following mitigation measures are suggested.

Mitigation Measures

In addition to implementing the rehabilitation and revegetation in accordance with the overall VMRP the



following site-specific requirements are to be implemented:

- ▶ All weeds throughout the site are to be sprayed and managed a minimum 1-month prior to any clearing or earthworks can commence;
- ▶ Direct contact spraying and cut stump method are the preferred weed control methods to be used throughout the proposed rehabilitation site;
- ▶ Herbaceous weeds are to be direct contact sprayed and woody weeds are to be cut 50 mm above to ground level and have stumps sprayed or swabbed with an approved herbicide - e.g. Roundup Biactive 20 ml/1 litre with wetting agent, to prevent re-growth of unwanted weed species. The application of an herbicidal application dye should be used and applied with the constituent herbicide to monitor the application kill rates of weed species.
- ▶ Clean equipment prior to exiting and arriving on site. A leaf blower is sufficient to prevent the introduction of new weeds on site.
- ▶ Roundup bioactive is the preferred herbicide (applied with dye to monitor application) to be used on site;
- ▶ Landscape/weed contractor is to be a licensed and accredited commercial operator with approval from QPI;
- ▶ Initial 12-week establishment period applies to all vegetation works. During this period weekly weed maintenance is to occur that involves ongoing weeding and spot spraying; and
- ▶ Regular monthly ongoing maintenance of the rehabilitation works is to occur for a period of 24 months for weed suppression and re-vegetation areas.



12. Conclusions

As a result of the proposed landscape management and revegetation works the following has been determined:

- ▶ Selective removal of weeds will occur as a result of the project;
- ▶ All environmental weeds throughout the site are to be sprayed and managed in accordance of the LMRP;
- ▶ Trees, shrubs and ground covers must be planted in accordance with the planting specification as outlined in the 41-22282-L001-L004, Landscape Planting Layout and associated Landscape Specification;
- ▶ Mean ground cover of weeds must be no greater than 5% in re-vegetation planting plots in the first 24 months;
- ▶ Regular monitoring and reporting is required for clearing, rehabilitation, weed management and re-vegetation of all areas;
- ▶ Regular ongoing maintenance of re-vegetation establishment, weed suppression areas, re-vegetation of areas is required to maintain and enhance the visual and dominant landscape in the region;
- ▶ Replacement of dead plants is required during the maintenance period.
- ▶ Successful survival of all re-vegetated species planted to a minimum of 90% survival rate after 24-month period;
- ▶ A follow-up quarterly maintenance program after the initial 12 months is highly recommended;
- ▶ The PM is responsible for implementing and achieving the deliverables outlined in Section 11 of this LMP (Weed Control and Management);
- ▶ PM is to be a licensed and accredited commercial operator with approval of from QPI;
- ▶ All declared weeds (P1 zone) are required to be controlled as a priority over all other weed species;
- ▶ Direct contact spraying and cut stump method are the preferred weed control method techniques to be used throughout the site;
- ▶ Initial 12-week establishment period applies to all vegetation works. During this period; weekly weed maintenance is to occur that involves ongoing weeding and spot spraying;
- ▶ Ongoing maintenance is to continue monthly for the 24 months;
- ▶ Roundup bioactive is the preferred herbicide to be used on site;
- ▶ PM and the EO are to visually monitor for the presence of weeds during routine patrols PM personnel are to provide reports after maintenance patrols outlining the presence of weed infestations.
- ▶ Monthly operational works sheet are to be recorded and submitted to GM monthly.
- ▶ An accurate photo-record of the progress of the weed control works and re-vegetation is required by setting up an appropriate number of representative fixed photo-points in the area. Photos should be taken by digital camera and recorded with a GPS coordinate. Photo-point locations should be clearly



marked on site and mapped by a surveyor or by GPS.

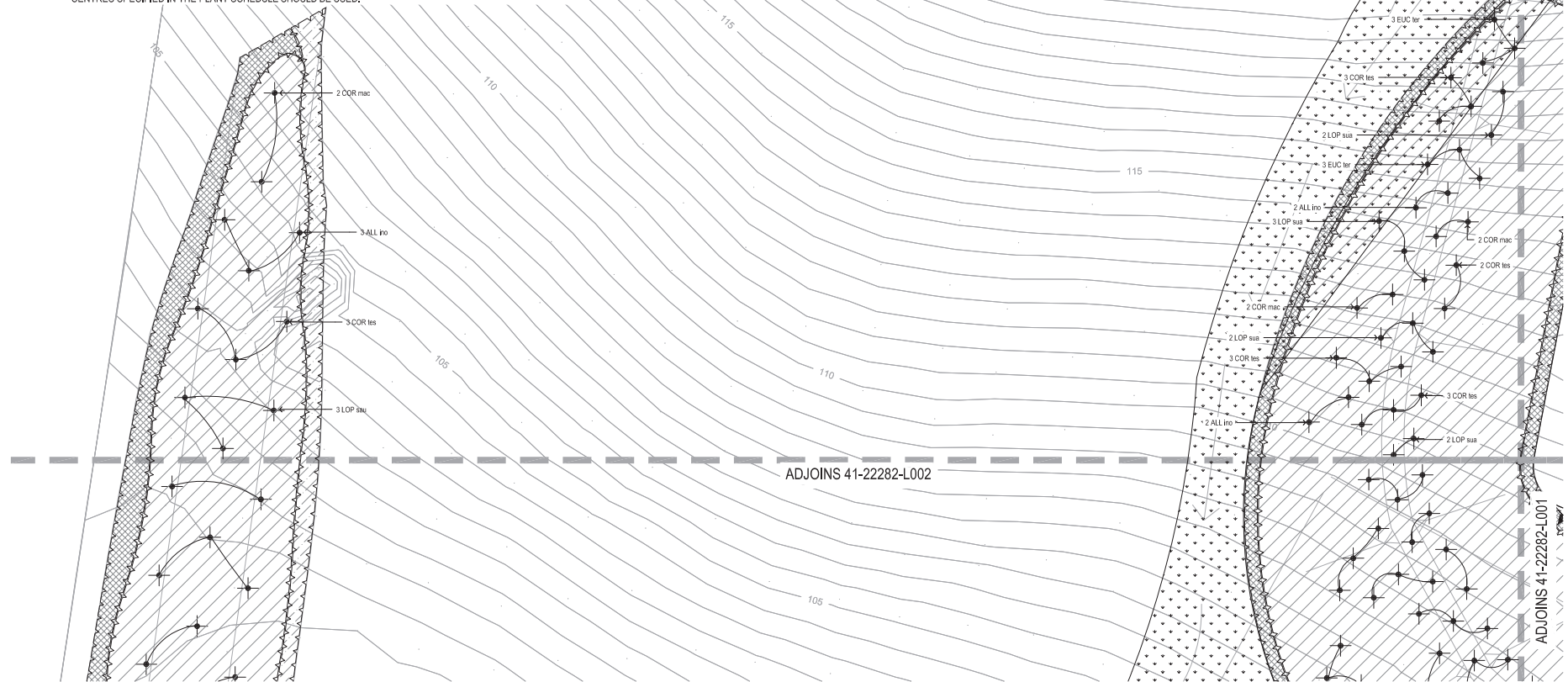
- ▶ An annual report should be prepared documenting the monthly activities and reporting over the 24 months.
- ▶ The report completed by the PM to the GM should contain recommendations in regard to issues affecting the ongoing success of the LMRP works, and the possible need for additional activities that may be required outside the normal maintenance program.



Appendix A
Detailed Landscape Plan

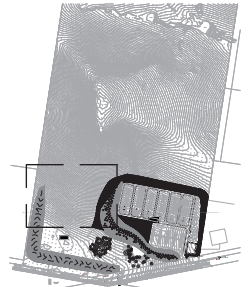
MASTER PLANT SCHEDULE										REV A
QUANTITY	CODE	BOTANICAL NAME	COMMON NAME	CENTRES (mm)	POT SIZE	HEIGHT (MATURITY)	SUPPLY HEIGHT	STAKING		
TREES										
42	ALL ino	ALLOCASUARINA inophloia	Stringybark She Oak	10000	25L	10m	1200mm	Y		
52	COR mac	CORYMBIA maculata	Spotted Gum	10000	25L	25-30m	1200mm	Y		
46	COR tes	CORYMBIA tessellata	Moreton Bay Ash	10000	25L	35m	1200mm	Y		
37	EUC ter	EUCALYPTUS tereticornis	Forest Red Gum	10000	25L	30m	1200mm	Y		
48	LOP sau	LOPHOSTEMON suaveolens	Swamp Box	10000	25L	10-25m	1200mm	Y		
SHRUB MIX										
13950	ACA jun	ACACIA junctifolia	Rush Leaf Wattle		TUBE	1-2.5m	NA	N		
13950	DOD vis	DODONAEA viscosa	Sticky Hop Bush		MIXTURE OF SPECIES AT 2000mm CENTRES	TUBE	5-8m	NA	N	
13950	HOV vis	HOVEA acutifolia	Printed Leaf Hovea		TUBE	2-4m	NA	N		
13950	JAC sco	JACKSONIA scoparia	Dogwood		TUBE	4m	NA	N		
13950	PUL vil	PULTENAEA villosa	Hairy Bush Pea		TUBE	2m	NA	N		
GROUNDCOVERS/NATIVE GRASS MIX 1										
2255	CYM ref	CYMBOPOGON refractus	Barbed Wire Grass		TUBE	NA	NA	N		
2255	DIA rev	DIANELLA revoluta	Blasberry Lily		MIXTURE OF SPECIES AT 750mm CENTRES	TUBE	NA	NA	N	
2255	HAR vo	HARDENBERGIA violacea	Native Sarapanilla		TUBE	NA	NA	N		
2255	LOM lon	LOMANDRA longifolia	Mat Rush		TUBE	NA	NA	N		
2255	THE aus	THEMEDA australis	Kangaroo Grass		TUBE	NA	NA	N		
GROUNDCOVERS/NATIVE GRASS MIX 2										
1060	DIA cas	DIANELLA caerulea	Blue Flax Lily		MIXTURE OF SPECIES AT 150mm CENTRES	TUBE	NA	NA	N	
1060	ISO nod	ISOLEPIS nodosa	Knobby Club Rush		TUBE	NA	NA	N		
1060	LOM lon	LOMANDRA longifolia	Mat Rush		TUBE	NA	NA	N		
1060	THE aus	THEMEDA australis	Kangaroo Grass		TUBE	NA	NA	N		
HYDROMULCH MIX WITH MACMAT JUTE MATTING										
NA	1/3	HARDENBERGIA violacea	Native Sarapanilla	NA	NA	NA	NA	N		
NA	1/3	LOMANDRA longifolia	Mat Rush	NA	NA	NA	NA	N		
NA	1/3	MYOPORUM ellipticum	Scoblia	NA	NA	NA	NA	N		
HYDROMULCH GRASS MIX										
		CYNODON dactylon		NA	NA	NA	NA	N		

- NOTES:
- WHERE DISCREPANCIES OCCUR BETWEEN PLANT QUANTITIES SHOWN ON DRAWING AND PLANT SCHEDULE, A QUANTITY DERIVED FROM PLANT CENTRES SPECIFIED IN THE PLANT SCHEDULE SHOULD BE USED.
 - WHERE SITE CONDITIONS DIFFER FROM AREAS SHOWN ON DRAWINGS, A QUANTITY DERIVED FROM PLANT CENTRES SPECIFIED IN THE PLANT SCHEDULE SHOULD BE USED.



- LEGEND**
- EXISTING TREE TO BE RETAINED (INDICATIVE LOCATION ONLY)
 - ✦ PROPOSED TREE
 - ✕ PROPOSED SHRUB MIX
 - ▨ PROPOSED GROUNDCOVER/NATIVE GRASS MIX 1
 - ▩ PROPOSED GROUNDCOVER/NATIVE GRASS MIX 2
 - ▧ PROPOSED HYDROMULCH MIX WITH MACMAT JUTE MATTING (REFER TO SPECIFICATION)
 - ▦ PROPOSED HYDROMULCH GRASS MIX (TO BE APPLIED TO ALL DISTURBED AREAS. REFER SPECIFICATION)

- NOTES:
- REFER TO LMRP FOR WEED REMOVAL INFORMATION, RIPARIAN ORDERS AND WILDLIFE CORRIDORS, STOCKPILE LOCATIONS AND DISPOSAL SITES, EROSION CONTROL AND LOCATION OF MACHINE ACCESS WAYS



KEY PLAN
NTS

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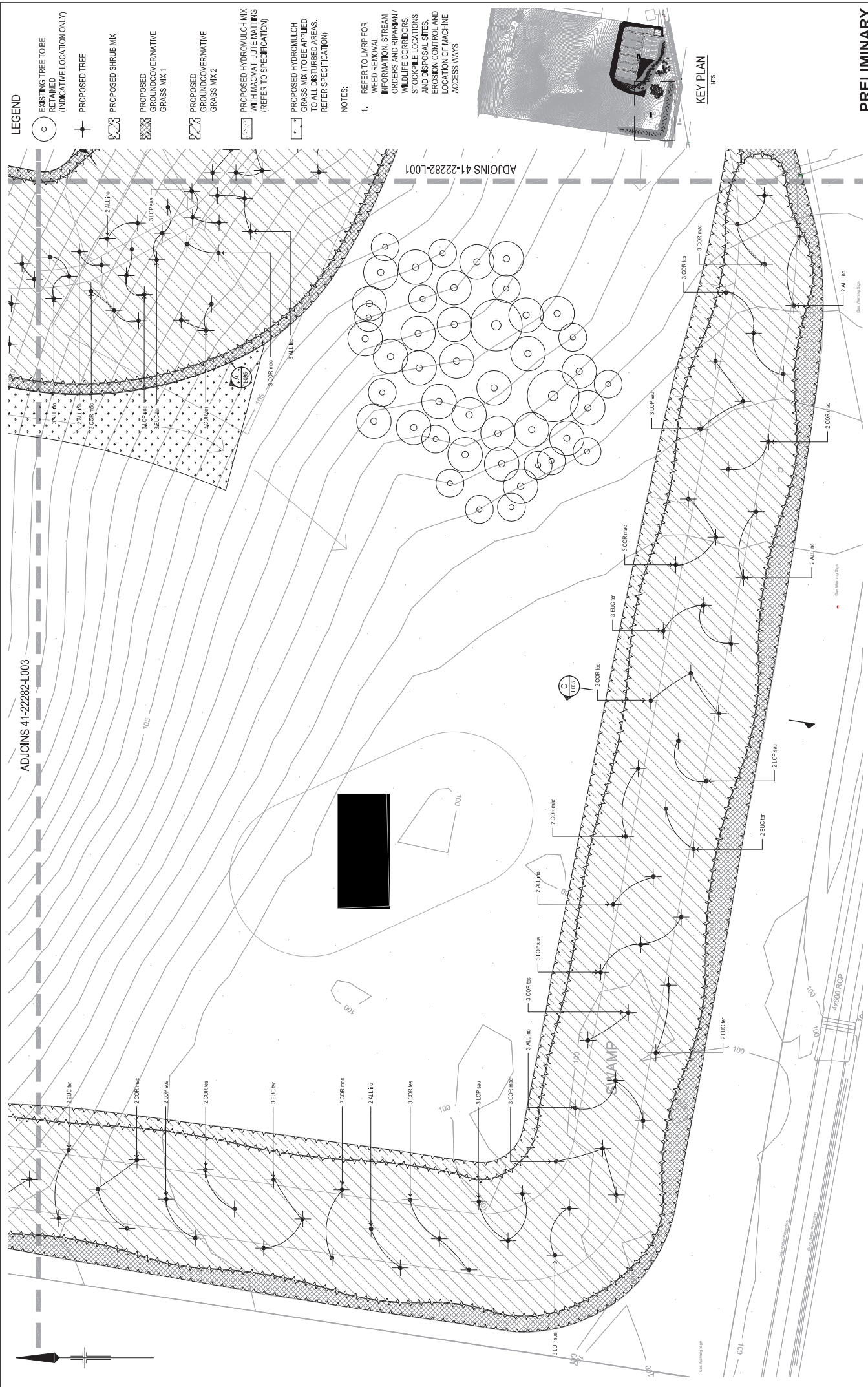
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WESTLINK POWERSTATION
LANDSCAPE DETAILED DESIGN
LANDSCAPE PLANTING LAYOUT 3

Title
LANDSCAPE PLANTING LAYOUT 3

Drawing No: **41-22282-L003**

Rev: **A**



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 - PROPOSED SHRUB MIX
 - PROPOSED GROUND COVERATIVE GRASS MIX 1
 - PROPOSED GROUND COVERATIVE GRASS MIX 2
 - PROPOSED HYDROMULCH MIX WITH IMMEDIATE JUTE MATTING (REFER TO SPECIFICATION)
 - PROPOSED HYDROMULCH GRASS MIX (TO BE APPLIED TO ALL DISTURBED AREAS. REFER TO SPECIFICATION)
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WESTLINK PTY LTD.
WESTLINK POWERSTATION
LANDSCAPE DETAILED DESIGN
LANDSCAPE PLANNING LAYOUT 2

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 Project: WESTLINK POWERSTATION
 Title: LANDSCAPE PLANNING LAYOUT 2
 Drawing No: 41-22282-L002

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 Checked: C.HUMPHREYS
 Design: C.HUMPHREYS
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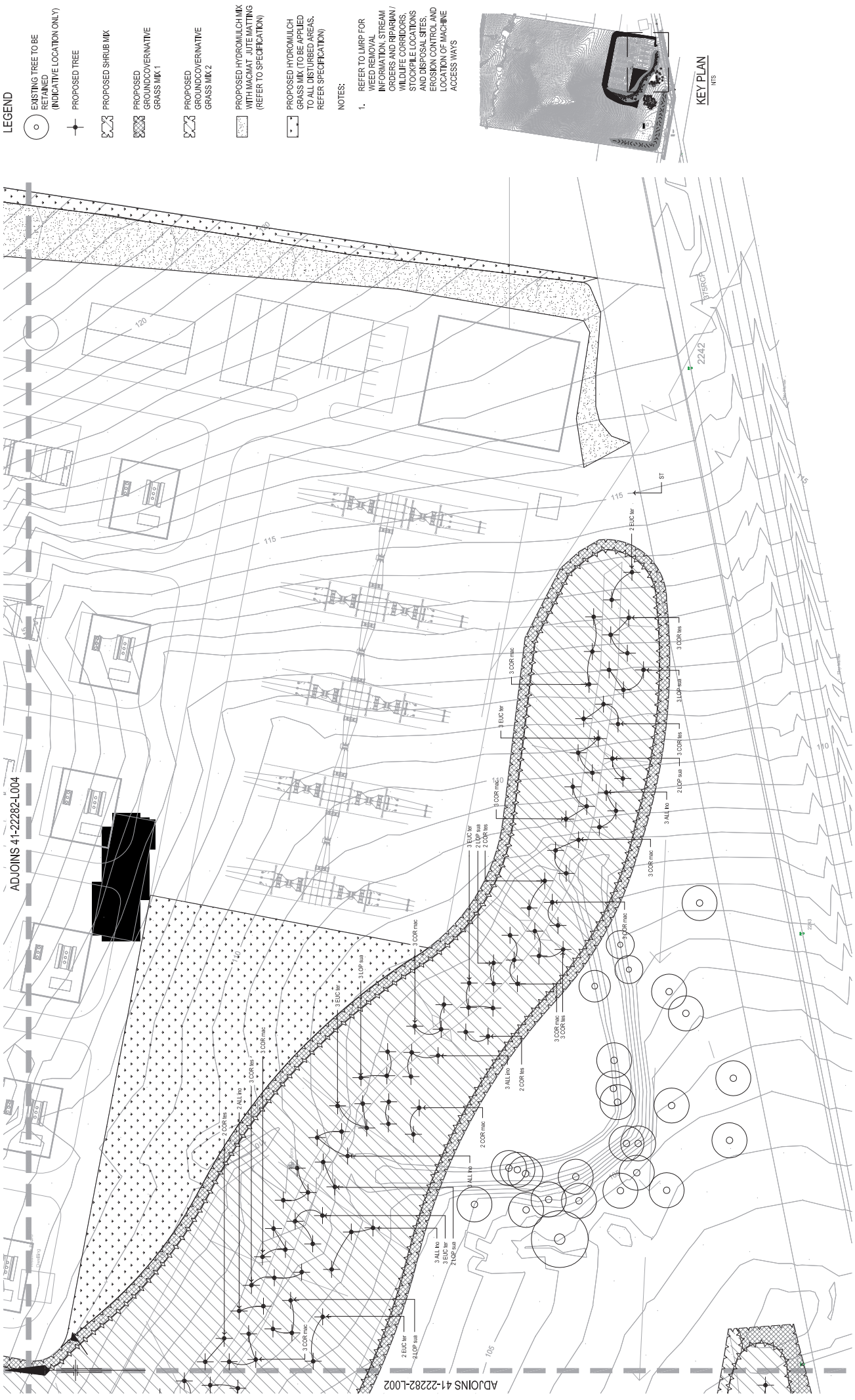
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- LEGEND**
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 - PROPOSED TREE
 - PROPOSED SHRUB MIX
 - PROPOSED GROUND COVER NATIVE GRASS MIX 1
 - PROPOSED GROUND COVER NATIVE GRASS MIX 2
 - PROPOSED HYDROMULCH MIX WITH MACI MAT JUTE MATTING (REFER TO SPECIFICATION)
 - PROPOSED HYDROMULCH GRASS MIX (TO BE APPLIED TO ALL DISTURBED AREAS. REFER TO SPECIFICATION)

NOTES:

1. REFER TO LMRP FOR WEED REMOVAL INFORMATION. STREAM ORDERS AND RIPARIAN/ WILDLIFE CORRIDORS, STORAGE LOCATIONS, SIGNAGE, EROSION CONTROL AND LOCATION OF MACHINE ACCESS WAYS

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SCALE
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PROJECT
 WESTLINK PTY LTD.

TITLE
 WESTLINK POWERSTATION
 LANDSCAPE DETAILED DESIGN
 LANDSCAPE PLANTING LAYOUT 1

DESIGNER
 C.HUMPHREYS

CLIENT
 WESTLINK PTY LTD.

DRAWN
 C.HUMPHREYS

CHECKED
 C.HUMPHREYS

DATE
 20 December 2008

SCALE
 AS SHOWN

PROJECT
 WESTLINK PTY LTD.

TITLE
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 LANDSCAPE PLANTING LAYOUT 1

DESIGNER
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 C.HUMPHREYS

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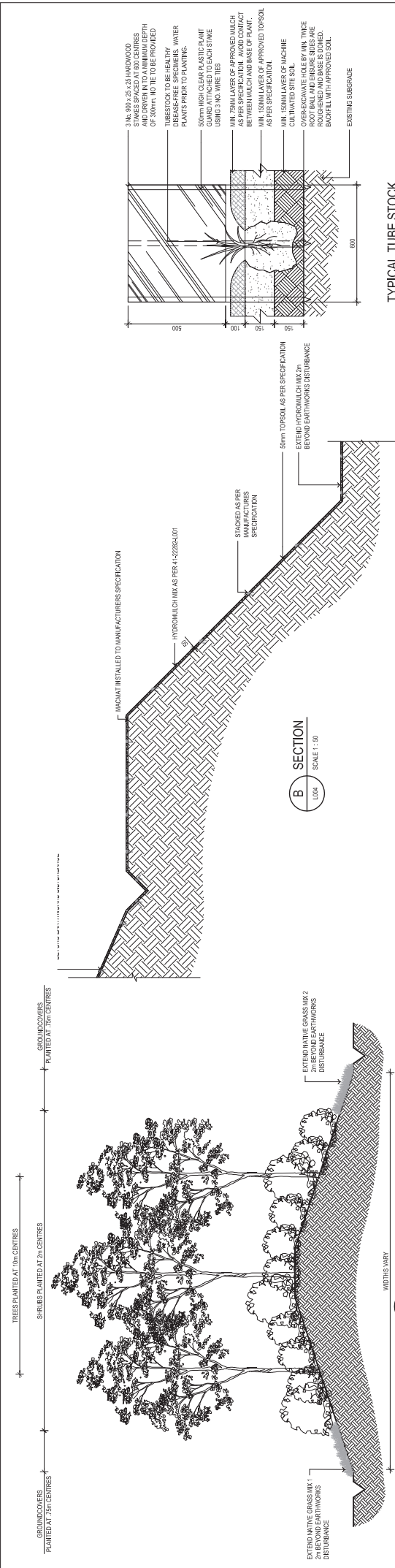
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LANDSCAPE DETAILED DESIGN

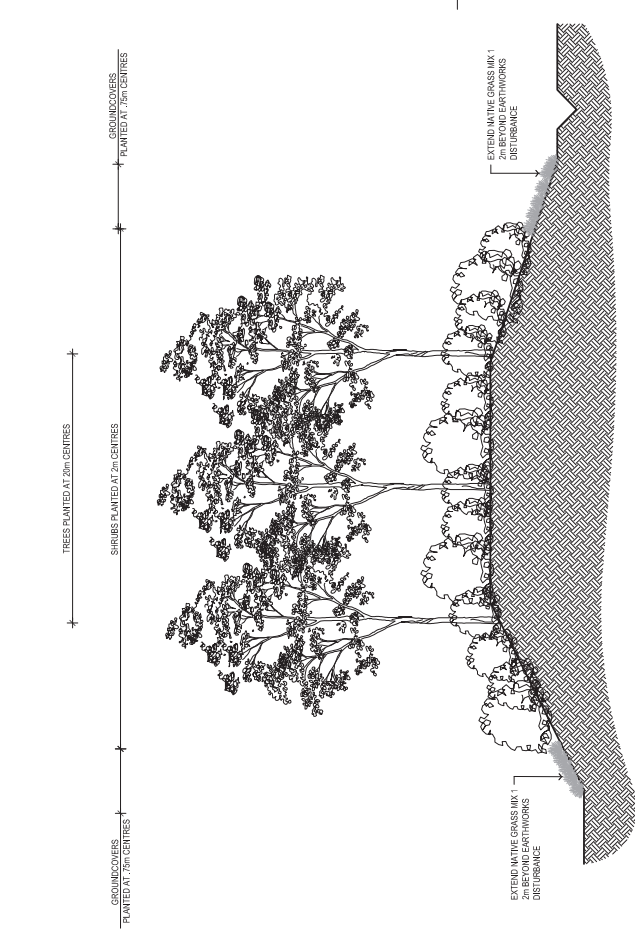
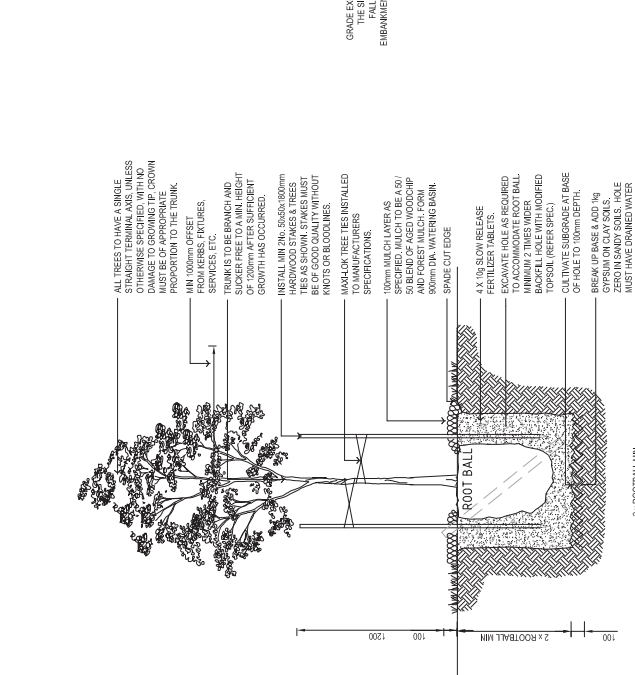
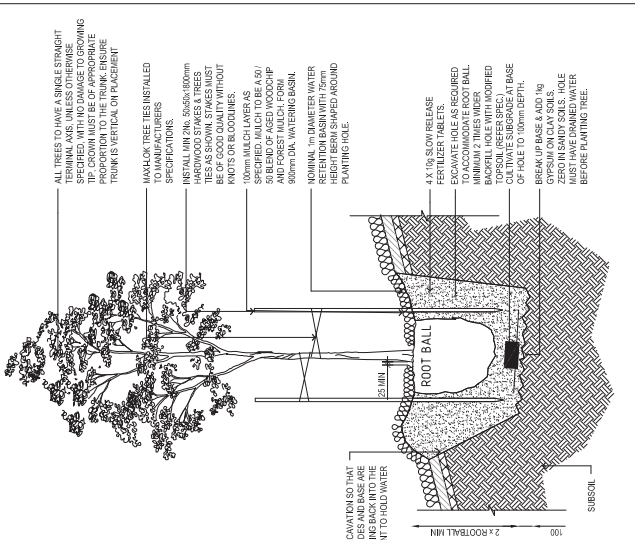
LANDSCAPE PLANTING LAYOUT 1

Drawing No: 41-22282-L001

Rev. A



TYPICAL TUBE STOCK PLANTING DETAIL
SCALE 1:10



TYPICAL MATURE TREE PLANTING IN SLOPING GROUND
SCALE 1:20

TYPICAL ADVANCED SIZE TREE PLANTING
SCALE 1:20

A SECTION
SCALE 1:200

B SECTION
SCALE 1:50

C SECTION
SCALE 1:200

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Project: WESTLINK POWERSTATION
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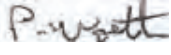

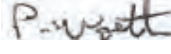

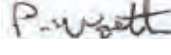
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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	C.O’Neill	E. Nichaloau		P. Wootton		17/12/09
B	C.O’Neill	E. Nichaloau		P. Wootton		01/02/10
0	C. O’Neill	E. Nichaloau		P. Wootton		23/02/10

**APPENDIX 11: WESTLINK POWER PROJECT VISUAL IMPACT AND
LANDSCAPE ASSESSMENT**



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Westlink

Westlink Power Project
Visual Impact and Landscape Assessment

August 2009

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Appendices

- A Photomontages

1. Visual Impact and Landscape Assessment

1.1 Introduction

Westlink Pty Ltd (Westlink) is proposing a staged development of a natural gas-fired power station of up to 1,000 megawatts (MW) capacity, at a site north of Gatton in South-East Queensland. This proposed generation development is known as the Westlink Power Project (WPP), and would comprise staged installation of six open-cycle gas turbines. Turbine unit sizes for the project would depend on the outcome of detailed design works, an equipment selection process and negotiations with plant suppliers. Gas turbines with a rated capacity of between 100 and 200 MW would be considered.

The proposed plant would be designed as a standby or “peaking” power station, intended to run when demand for electricity increases rapidly or to provide backup power when other power stations experience outages, are shut down for maintenance or are subject to other power supply constraints. It is envisaged that the plant may be expected to run up to 20 per cent of the time.

GHD Pty Ltd (GHD) was engaged by Westlink to complete a Visual Impact and Landscape (VIL) Assessment for the WPP. GHD has extensive experience in the creation of 3-dimensional (3D) visualisations to communicate siting options and visual impact assessment of new infrastructure, including transmission lines, roads, rail and pipeline corridors, in addition to power stations and treatment plants.

The VIL Assessment concentrated on the proposed WPP, situated approximately two kilometres north of the Gatton Township (refer to Figure 1). The study area is a 70 hectare property located on Fords Road, Adare, described as Lot 191 on plan CSH2361. The VIL Assessment comprises findings from field investigations, Geographic Information System (GIS) viewshed modelling, development of 3D snapshots of the proposed WPP building structures, and review of existing studies and literature.

A number of terms are frequently used in this assessment:

- ▶ View – what can be seen;
- ▶ Vantage points – a specific location from which a view can be obtained. This term is referred to in the GIS modelling when comparing current views to modelled views; and
- ▶ Viewshed – the areas from which a specific location can be seen, for example, surrounding residential dwellings.

Where possible, this assessment has attempted to be objective and to incorporate multiple sources of visual characteristics and values. It is, however, recognised that visual assessment is subjective and individuals may associate different visual experiences to the study area.

A component of the VIL Assessment is a review of landscape character. The assessment of landscape character describes the visual character and history of the site and identifies how it may be affected by the proposed development. The property and its surrounds are described in the context of landscape ecology and incorporate the concepts of patch-corridor-matrix in describing the pattern of existing vegetation. The character of the landscape with respect to physical landform patterns and elements reviewed using the Australian standard definitions and concepts espoused in the “Australian Soil and Survey Field Handbook” (McDonald *et al.* 1990).

Landscape features are determined and/or influenced by physical, biological and cultural factors and may include geology and soils, vegetation and land use. These factors may also influence the visual setting and are discussed throughout the assessment.

1.2 Overview of the Project

Westlink propose to develop the WPP on a 70 hectare site (the Development Site), approximately two kilometres north of Gatton. The proposed footprint for the WPP covers approximately seven hectares in the south-east corner of the site. Figure 1 highlights the overall site boundary and its location relative to the Township of Gatton.

The WPP is proposed to be constructed on a pad established at 114 reduced levels (RL) measured in metres above sea level. The estimated size of the construction pad for six gas turbine generation units of nominal 150 MW is approximately 140 metres by 280 metres. The VIL Assessment focuses on the impact of the tallest structures of the WPP after completion of all development stages, comprising:

- ▶ Six exhaust stacks at 30 metres above ground level (AGL); and
- ▶ Six air inlet towers at 25 metres AGL.

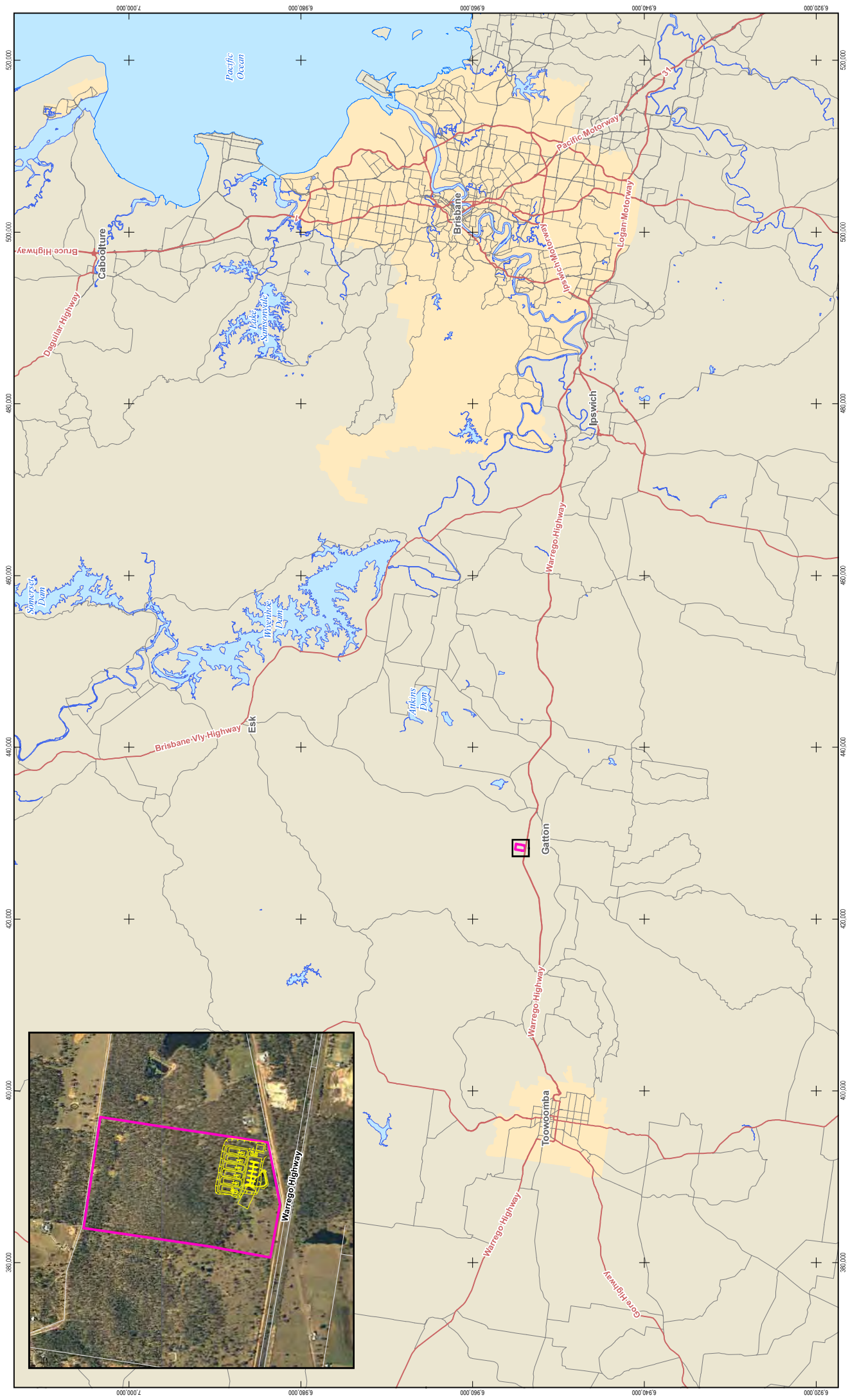
Concept designs have been completed and an initial layout prepared for the WPP, showing the general equipment location and orientation within the Development Site (refer Figure 2). The main elements and elevation of the proposed WPP infrastructure are shown in Figure 3.

Other infrastructure incorporated in the overall WPP includes a switchyard, maintenance shed, and offices.

When undertaking the concept design a number of mitigation measures were employed to minimise the visual impact of the WPP. These include:

- ▶ A detailed site selection to locate the WPP adjacent to infrastructure of a similar nature. The site selected is adjacent to the APA Gatton Compressor Station, opposite the Energex Bulk Supply Substation, and near the Gatton Landfill, allowing the WPP to be situated in an area of similar visual context;
- ▶ Location of the WPP footprint within the Development Site to minimise vegetation clearing, and utilise topography and existing vegetation as a visual barrier; and
- ▶ Sympathetic building design, including using non-reflective building materials and appropriate colour schemes to minimise the extent to which the most prominent features (air intakes and stacks) would be visible within the local area.

The concept design shown in Figures 2 and 3 comprises a “worst-case scenario” by which the largest potential gas turbine units available for the project were selected for assessment. It should be noted that detailed design may result in smaller units ultimately being selected. The VIL Assessment also reviewed the WPP at completion, as opposed to installation in the three stages proposed, meaning this aspect is also assessing the “worst-case scenario”.



Job Number 41-21379
 Revision B
 Date 5 AUG 2009

Westlink Pty Ltd
 Westlink Power Project Visual Impact Assessment

Figure 1

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Figure 1

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1:400,000 (at A3)

Kilometres

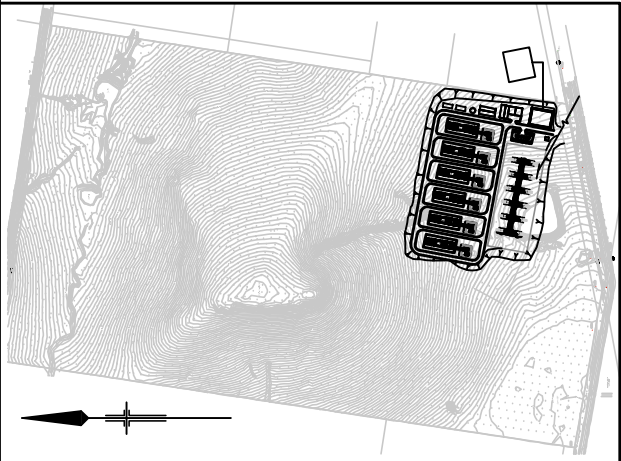
0 5 10 15 20

Map Projection: Transverse Mercator
 Horizontal Datum: Geosentric Datum of Australia
 Grid: Map Grid of Australia 1984, Zone 56

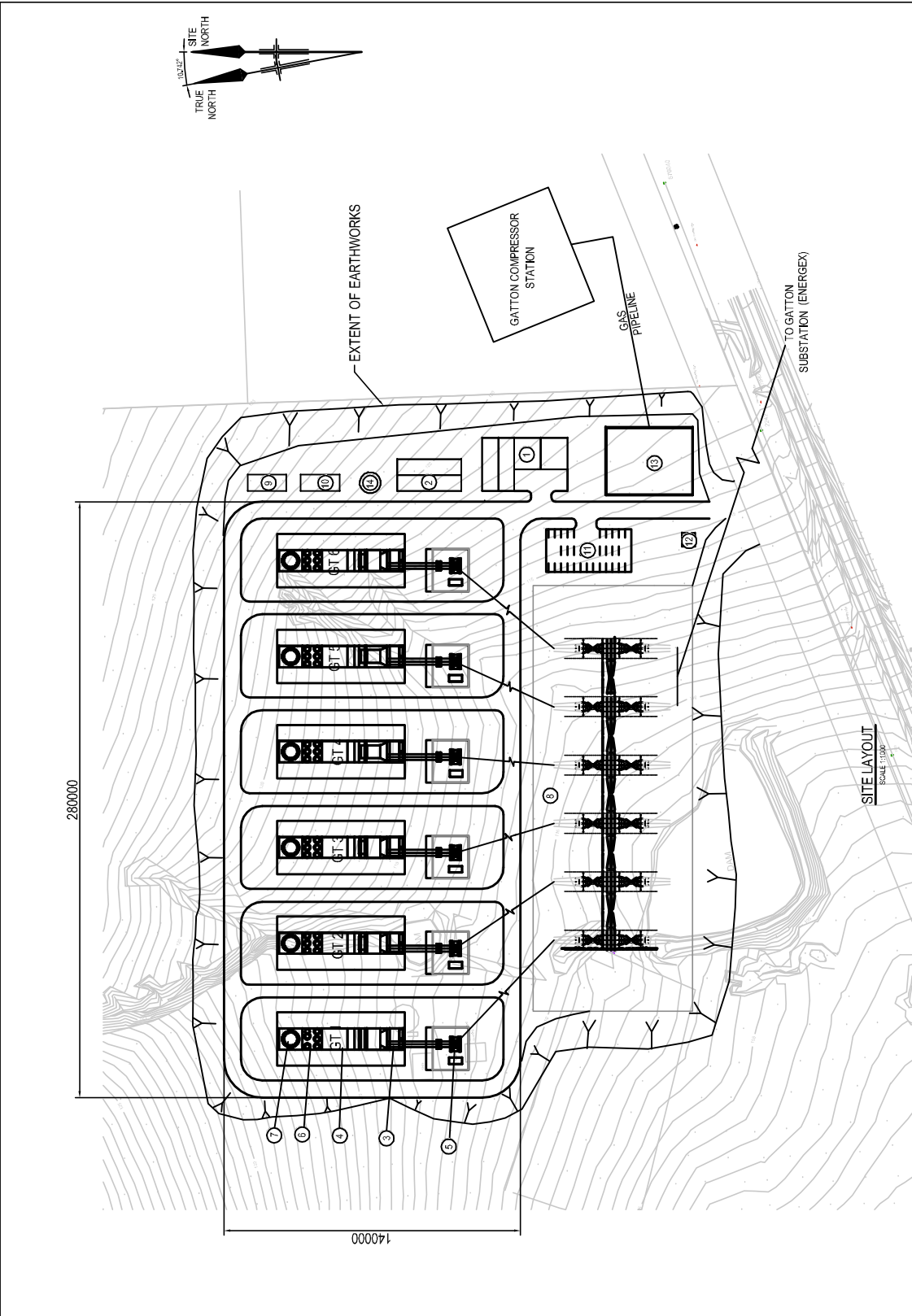
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Site Boundary Highway Major Road
 Water Body Built-Up Areas



SITE LOCATION
SCALE: 1:5000



SITE LAYOUT
SCALE: 1:1000

DESCRIPTION	HEIGHT (m)
1 CONTROL AND ADMIN BUILDING	7.0
2 WAREHOUSE AND WORKSHOP	14.0
3 GAS TURBINE AIR INTAKE	26.0
4 GAS TURBINE ENCLOSURE	8.5
5 TRANSFORMER	5.0
6 COOLING FANS	13.0
7 EXHAUST STACK	30.0
8 SWITCHYARD	11.0
9 OTHER TANKS & PUMPS	7.0
10 FIRE SYSTEM	4.0
11 CAR PARK	-
12 SECURITY HOUSE	4.0
13 GAS SKID (IF REQUIRED)	6.0
14 FIRE TANK	9.0

- NOTES:**
- SITE LOCATION, SIZING AND LAYOUT INDICATIVE ONLY.
 - EXISTING DAM TO BE FILLED IN.

NO.	REVISION	DATE	BY	CHECKED	APPROVED
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		17/07/09			

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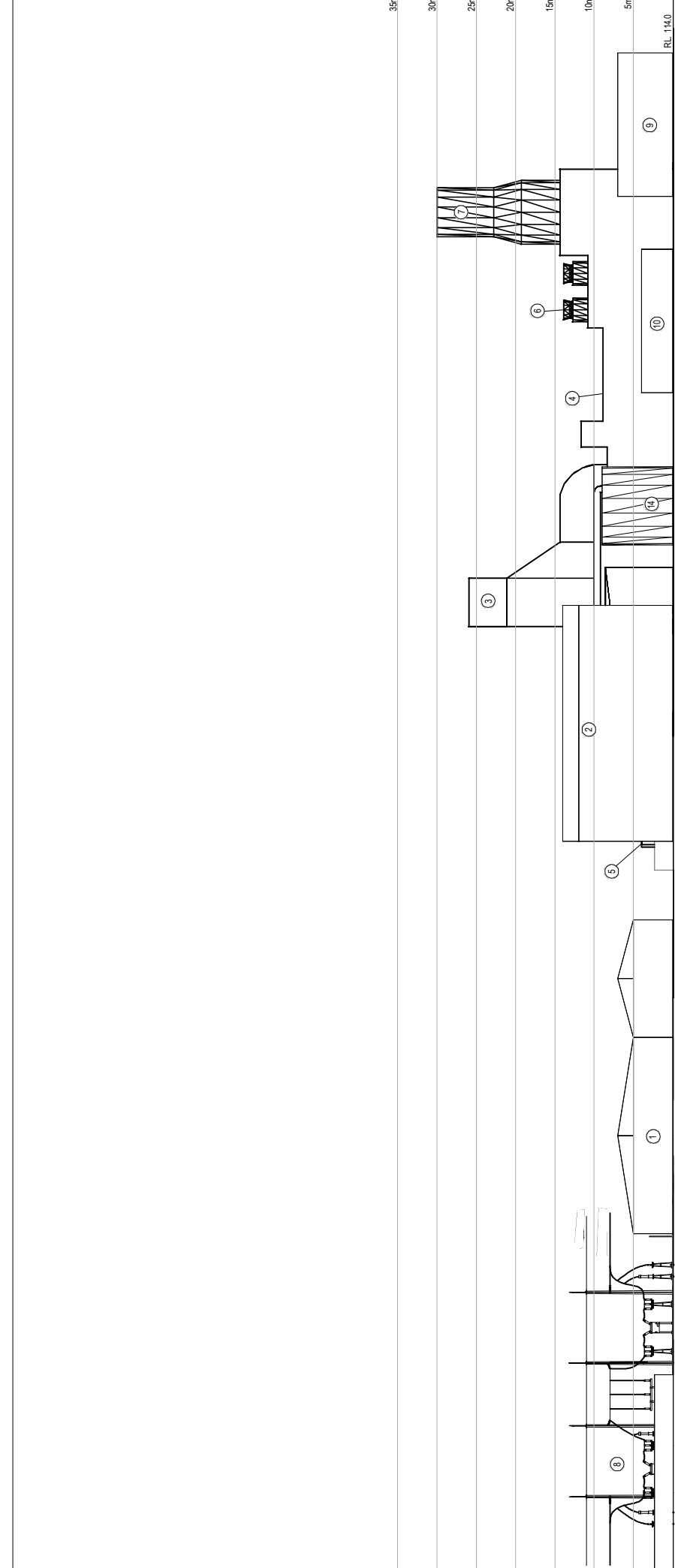
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 Project: **WESTLINK POWERSTATION DEVELOPMENT ASSISTANCE**
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 Drawing No: **41-21379-SK004**

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EAST ELEVATION
SCALE 1:200

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<p>CLIENT COMMENTS INCORPORATED A ISSUED FOR CLIENT REVIEW</p> <p>Note: - Includes signatures on original issue of drawing and revision if drawn</p>		<p>17/07/19</p>	<p>17/07/19</p>	<p>17/07/19</p>
<p>No. []</p>	<p>Revision []</p>	<p>Date []</p>	<p>Checked/Approved []</p>	<p>Date []</p>

PRELIMINARY

1.3 Site Context

1.3.1 Visual Factors

The visual characteristics of the Development Site and the surrounding area are:

- ▶ Warrego Highway to the south;
- ▶ Fords Road (which provides vehicular access to the site) to the south;
- ▶ The Township of Gatton approximately two kilometres to the south;
- ▶ Industrial uses adjacent and to the south-east of the site incorporating the:
 - Gatton Gas Compressor Station and associated above ground pipelines and valves (refer Figure 4);
 - Energex Bulk Supply Substation (refer Figure 5); and
 - Gatton Landfill Facility (refer Figure 6).
- ▶ Infrastructure, including adjacent high voltage electricity transmission lines; and
- ▶ The cleared high-pressure gas pipeline easement running adjacent to Fords Road in both an easterly and westerly direction from the Gatton Gas Compressor Station.

A site visit of the Development Site and surrounding area identified a large number of structures between 15 and 30 metres of height in and around the Township of Gatton, most prominent (excluding infrastructure discussed above) were water towers, grain silos, telecommunication towers and further electricity transmission infrastructure.

Figures 4 to 6 depict the existing visual amenity of the area and demonstrate the visual context of placing power generation infrastructure in this area.



Figure 4 Gatton Gas Compressor Station



Figure 5 Energex Bulk Supply Substation



Figure 6 Gatton Landfill Facility

1.4 Landform

The surrounding landform between the Development Site and the Township of Gatton is predominantly flat with a slight hill to the south of the overall site. Significant landform changes occur to the north of the site, where the terrain begins to rise gradually into ranges branching off the Great Dividing Range.

The southwest corner of the Development Site is situated within a local depression, and is prone to flooding after significant rain events. The slope profile is flat in the southwest corner and gradually rises from the lower slopes through to mid-slopes. From the western and northern edges of the high point, the upper slopes become steeper in profile. Figure 7 shows landform slope analysis of the overall site.

The landform character of the site is generally defined by an irregular shaped hill, located northwest from the centre of the property. A crest line divides the site from northwest to southeast, creating two large simple slopes, giving variations in relief across the whole site of approximately 50 metres. The largest of four dams on site, found in the southeast corner, is fed by a long open depression running from the high point on the crest of the hill towards the southeast corner. A second long open depression traverses the northern boundary feeding two smaller dams and continues beyond the eastern boundary. Figure 8 shows landform element analysis of the site.

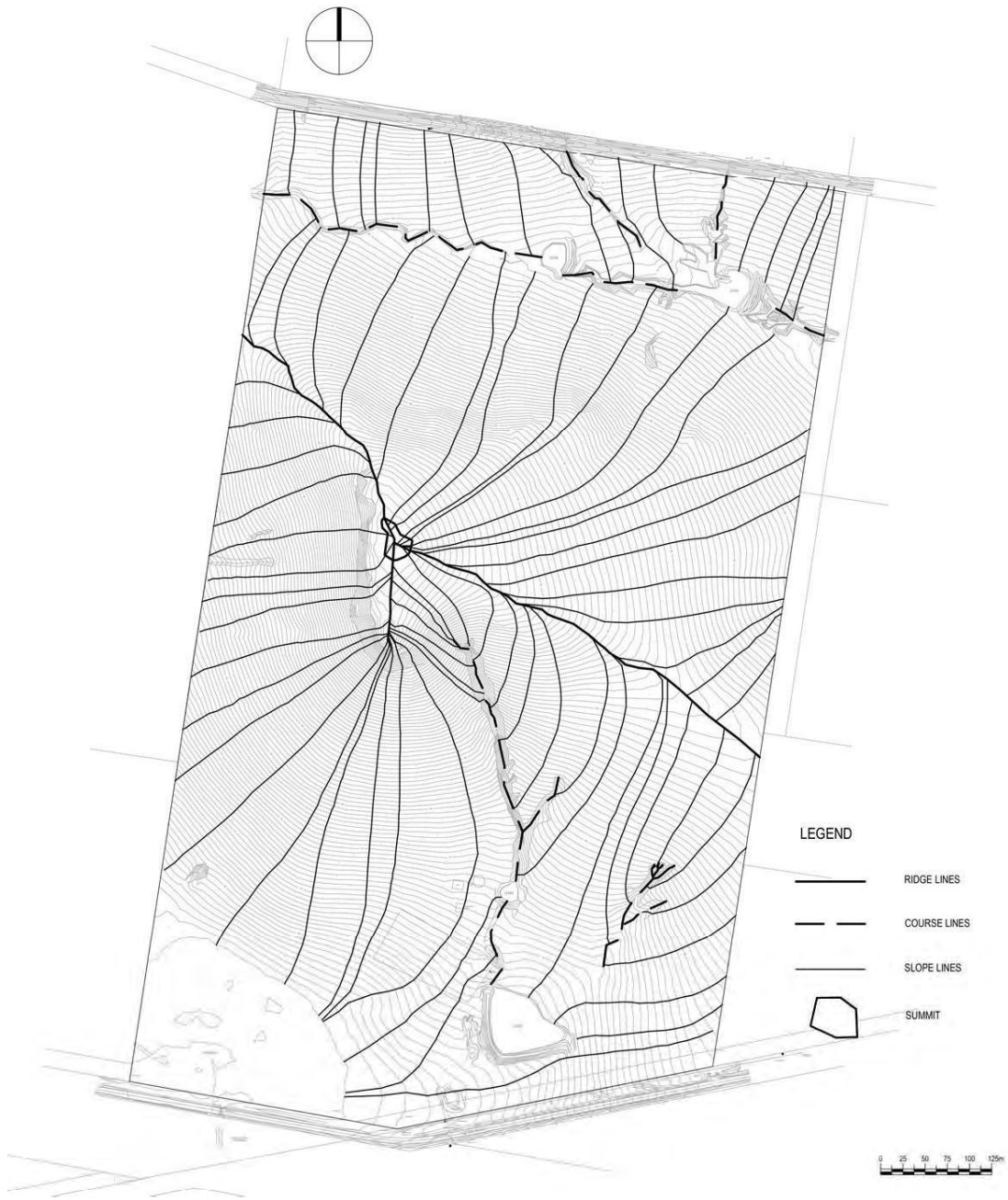


Figure 7 Landform Slope Analysis

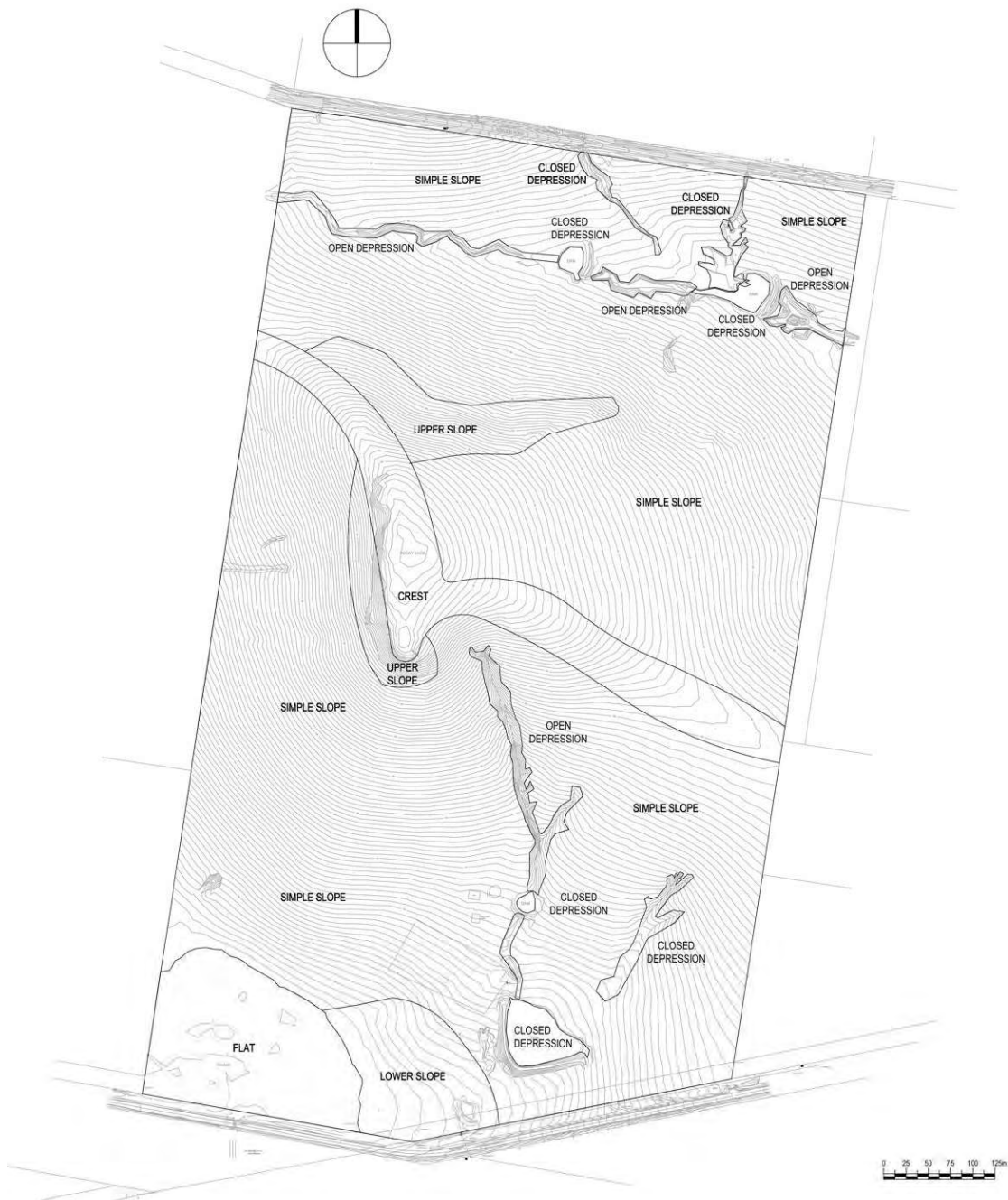


Figure 8 Landform Element Analysis

1.5 Vegetation

The 70 hectare site comprises approximately 55 hectares of remnant vegetation, predominantly in the northern section and outside the WPP footprint. This vegetation is classified as 'Remnant not of concern regional ecosystem' (*Vegetation Management Act 1999*). The overall site represents approximately one quarter of a larger area of remnant vegetation that extends across adjoining properties in an east-west direction (Conics, 2009).

A firebreak with a width of approximately 50 metres exists within the site from the fence line on the northern, western and eastern boundaries. The majority of the property has been mapped as a medium to low risk area under the Lockyer Valley Regional Council's Potential Bushfire Risk Mapping plan (June 2008).

Vegetation forms identified on site are described as:

- ▶ *Trees* – Woody plant more than two metres tall with a single stem or branches well above the base;
- ▶ *Shrubs* – Woody plant multi-stemmed at the base or if single stemmed less than two metres tall;
- ▶ *Tussock Grasses* – Forms discrete but open tussocks usually with distinct open shoots, or if not, then forming a hummock; and
- ▶ *Sod Grasses* – Grass of short to medium height forming compact tussocks in close contact at their base and uniting as a densely interfacing leaf canopy.

Growth height classes are a measurement of indicative plant heights for various growth forms found on the property. Table 1 provides the plant relative heights for the different vegetation forms.

Table 1 Vegetation Growth Height Classes

Vegetation Type	Vegetation Height	Height Classification
Trees	12.01m-20m	Tall
	6.01m-12m	Mid-High
Shrubs	1.01m-3m	Tall
	0.51m-1m	Mid-High
Grasses	0.51m-1m	Extremely Tall
	0.26m-0.5m	Mid-High
	<0.25m	Low

1.5.1 Vegetation Formation Classes

Structural formation classes are derived from vegetation canopy separation or foliage cover, relative to how dense or sparse those areas are. Structural formation classes and the differing densities of vegetation found on the WPP site are described in Table 2 and have been spatially located in Figure 9.

Table 2 Vegetation Structural Formation Classes

Vegetation Type	Formation Class	Crown Cover Class/Foliage Cover	Field Criteria to Estimate Cover Class
Trees	Woodland	Sparse	Crowns clearly separated
	Open Woodland	Very Sparse	Crowns well separated
	Isolated Trees	Isolated Plants	Trees about or greater than 100m apart
	Isolated Clumps of Trees	Isolated Clumps of Plants	Clumps of two to five woody plants 200m or further apart
Shrubs	Isolated Shrubs	Isolated Plants	Shrubs about or greater than 25m apart
	Isolated Clumps of Shrubs	Isolated Clumps of Plants	Clumps of two to five woody plants 50m or further apart
Grasses	Closed Grassland	>70%	Crowns touching to overlapping
	Mid-Dense Grassland	30-70%	Crowns touching or slightly separated
	Open Grassland	10-30%	Crowns clearly separated



Figure 9 Location of Vegetation Structural Formation Classes

Examples of vegetation formation classes at the WPP site are shown in Figures 10 to 13, depicting a variety of classes. Overall the ground layer presents as a mixture of Mid-dense Tussock and Sod grasses, tending to become denser towards the boundaries.

Understorey and ground layer conditions appear to vary across the property, possibly due to previous fire events (Conics, 2009). Fire events affecting the canopy condition along the ridge through the centre of the site are evident and a large proportion of older trees have been killed by fire during the past five or ten years (Conics, 2009).



Figure 10 Site Photograph 1 – Existing Dam on the southeast Corner of Site

The native vegetation is at its lowest density along the southern boundary, with clearance of native forests leaving mostly isolated specimens and clumps of trees. The largest of four dams, visible in Figure 10, located in the southeast corner has isolated clumps of trees adjacent and around the bunding of the dam.



Figure 11 Site Photograph 2 – Northern Boundary

Denser areas of tall woodland can be found on the northern and western parts of the property. These areas appear to have also been previously subject to logging, leading to relatively immature trees being present. The proposed WPP will be located on a footprint of approximately seven hectares in the south-eastern corner; meaning most of the vegetation located on site will remain undisturbed.

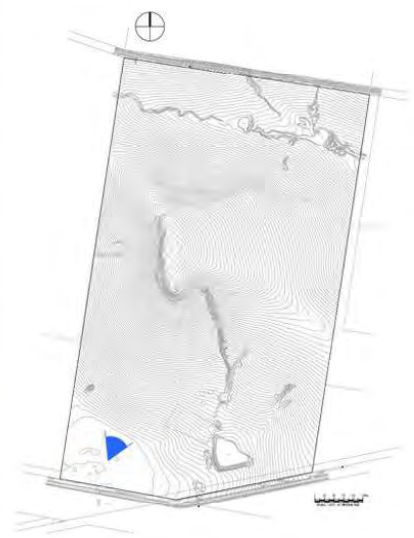


Figure 12 Site Photograph 3 – Southern Depression

The upper stratum on site predominantly comprises tall open woodland, interspersed with pockets of denser tall woodland. The dominant species include *Corymbia maculate*, *Coymbia henryi*, *Eucalyptus crebra* and *Eucalyptus fibrosa subsp. Fibrosa* (Conics, 2009). The complexity of the upper stratum appears to have been affected by timber harvesting, resulting in relatively immature trees present, with older growth “habitat” trees less predominant throughout the site.

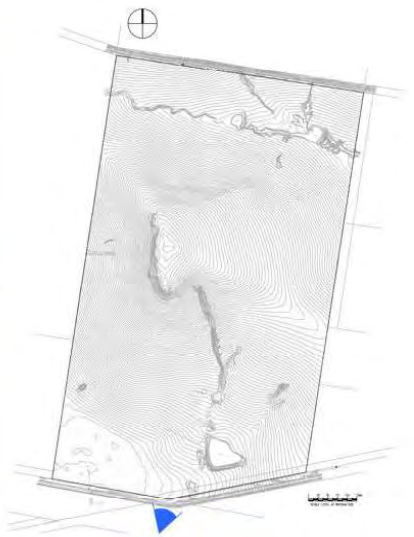


Figure 13 Site Photograph 4 – Fords Road Boundary

In the south-east corner of the site the understorey is less frequent across the site and is predominantly comprised of mid to high trees. Shrubs vary in height and are located infrequently across the whole site. Figure 9 shows a location where shrubs are more prevalent towards property boundaries, until reaching the boundary fire break clearance. Overall the understorey comprises a small amount of the total stratum. A broken belt of shrubs present along the southern boundary acts as a vegetation buffer between the WPP and Fords Road (demonstrated in Figure 13).

1.5.2 Significant Species

Conics (2009) conducted a search of wildlife online and the Environmental Protection and Biodiversity Conservation (EPBC) databases. Two significant species were identified as having potential to occur at the site, *Cryptostylis hunteriana* (Leafless Tongue-orchid) and *Thesium australe* (Austral Toadflax). Leafless Tongue-orchid is found within rainforest environments and no such habitat is present on site to support this species. Potential habitat does exist for *Thesium australe* (Austral Toadflax), however site investigations did not locate any of this species (Conics, 2009).

2. Methodology

2.1 Overview

The nature of a visibility analysis is subjective and dependent on a number of factors, which can include:

- ▶ The relationship of the viewer to the visibility (i.e. whether the person is a permanent resident, traveller, worker);
- ▶ Exposure to the view (i.e. whether it is a brief glimpse or an outlook from a house);
- ▶ Distance from a particular vantage point;
- ▶ The sensitivity of the view;
- ▶ The degree of human modification (i.e. naturalness);
- ▶ Consistency with surrounding landscape;
- ▶ The number of viewers;
- ▶ Vegetation cover;
- ▶ Topography;
- ▶ Existence of other similar height and style structures within the region; and
- ▶ Orientation of views (i.e. from houses or open space).

To reduce the reliance on subjective criteria, this assessment has utilised objective methodology where appropriate, including the use of computer generated images to convey the nature and context of the project in the receiving landscape. Regardless of the approaches used, a significant subjective element is required to undertake the assessment, whether in the methodologies used, selection of the assessment criteria or by assigning values to each criteria. Consequently, the assessment process has been clearly documented to allow the reader to understand the process undertaken and the justification for the decisions reached.

The images used in the computer modelling have been based on the current concept design available at the time of the assessment. It must also be recognised that these images are not intended to be accurate down to minor details but rather have been developed to show the scale and form of potential visual impacts. The concept design represented in this assessment is the “worst-case scenario” (i.e. the largest possible infrastructure when all stages of the project have been completed) and are subject to change during the detailed design, and as such may be of a smaller nature to infrastructure presented.

2.2 Assessment Methodology

The assessment of the visual impacts has included the following:

- ▶ Identification of the potential landscape alterations;
- ▶ GIS viewshed analysis to identify those areas where the WPP can be seen from;
- ▶ Development of photomontages for the WPP from various vantage points; and
- ▶ A visual impact assessment based on visual modification and viewer sensitivity.

The following assessment primarily addresses fixed structures (stacks and air intakes) as they will be the permanent and consistent visual element of the project.

2.2.1 Geographic Information System Viewshed Analysis

The WPP would be partially visible from a number of local vantage points. A significant number of views are shielded by local topography and will also be removed or minimised by screening vegetation. This further limits the extent to which the WPP will be seen. To account for topography and vegetation screening, GIS assessment has been undertaken to model the viewshed of the WPP. Topographic screening is addressed utilising contour data for the region. Screening vegetation has been conservatively modelling by assigning an average tree height to more significant vegetation strands close to the WPP that are likely to offer screening to sensitive areas. Screening impacts from scattered or landscaped vegetation has not been included due to the complexity of such an assessment, so the analysis underestimates the level of screening in many areas.

GIS software ArcView was used to undertake a viewshed analysis to determine from where the WPP will be visible. This was prepared using the following approach:

- ▶ Deriving a digital elevation model (DEM) from five (5) metre contour data for the region;
- ▶ Incorporating concept design drawings of the WPP pad into the DEM;
- ▶ The larger remnants of existing vegetation, external to the site, were given a height value of 15 metres (based on an average vegetation height assessed during the site visit), and added to the DEM to take into account potential vegetation screening; and
- ▶ Running a viewshed model (a standard functionality within ArcView) with the approximate standing height of an observer set at 1.5 metres above ground level.

2.2.2 Photomontages

From the viewshed analysis potential areas from which the proposed WPP may be seen were identified and a site visit completed to obtain photos. The vantage points were marked in the field using a hand-held Global Positioning System (GPS), and the photos taken at these points.

Photomontages were developed to demonstrate the visual impact from various vantage points within these regions. Photomontages depict the modification to views as a result of the proposed WPP, and aid in the assessment of overall visual impacts.

The 3D modelling was utilised to create the photomontages and consisted of:

- ▶ Using ERDAS Imagine Virtual GIS (a 3D modelling software program), the DEM was overlaid with colour aerial photography;
- ▶ A two dimensional “Autocad” drawing of the proposed WPP was imported into ERDAS, with structure heights of the most visible plant structures extruded to create a three dimensional model of the fully developed WPP;
- ▶ Representative tree models were digitised and imported around the proposed site and where necessary, in front of chosen vantage points, to cater for vegetated areas identified in aerial or land based photography (for existing vegetation scenario);
- ▶ Proposed screening trees (for landscaping scenario only);

- ▶ Representative buildings were digitised and imported around the proposed WPP footprint and, where necessary, in front of chosen vantage points. Houses were extruded by five metres, whilst sheds were extruded by three metres. In these situations the building outlines were shown as solid blocks only;
- ▶ Identified vantage points were marked using a hand held GPS unit and these positions used to generate snapshots within the model; and
- ▶ These snapshots were then placed against real-life photos.

As the snapshots are generated at an approximate head height for a viewer, the foreground is often poorly represented as a consequence of the image quality of the aerial photography. To overcome this problem, the foreground of the real-life photograph has been superimposed on the snapshot to further enhance the visual representation. In this way, the WPP image remains correct in scale, location and representation, and the snapshots provide a more realistic image.

2.2.3 Assessing the Visual Impact

GHD methodology for visual impact assessment is based on well accepted methods for impact assessment (Zube *et al.* 1975, Williamson 1979, Williamson 2004) and were used with appropriate modification to meet the requirements of this study. Specifically, the assessment has considered:

- ▶ The type of viewer (resident, tourist, highway user etc);
- ▶ Distance from the proposed WPP;
- ▶ Period of time that they will have this view (that is, a glimpse or an extended view from a residence);
- ▶ The physical modification of the view as measured by change to the centre field of view;
- ▶ The sensitivity of that view (a combination of context and distance); and
- ▶ An overall assessment of the visual impact on a low, moderate or high scale.

Visual Modification

A central field of view is considered to be an arc of 50°. Based on the GIS assessment, the proportion of this arc taken up by the proposed WPP was estimated and a visual modification impact value assigned. Where the 3D modelling indicated that only portions of the WPP would be visible from a given location, this assessment has looked at only that part of the site in assessing the change to the field of view. Impacts from changes to the field of view are detailed in Table 3.

Table 3 Changes to Field of View

Change to Field of View	Impact
Less than 5° of view	<i>Low</i> The development will take up less than 5% (that is 2.5°) of the central field of view (50°). The development, unless particularly conspicuous against the background, will not intrude significantly into the view.
5° to 30° of view	<i>Medium</i> The development may be noticeable, and its degree of visual intrusion will depend greatly on its ability to blend in with its surroundings.
More than 30° of view	<i>High</i> Developments that fill more than 50% of the central field of vision will always be noticed, and only sympathetic treatments will mitigate visual effects.

Viewer Sensitivity

Viewer sensitivity for a development is subject to the context of the view, the number of viewers and distance from it. If the viewer sees a major industrial facility in the context of a natural area, they are more likely to have experienced a greater impact than if they were viewing in the context of an industrial site. Viewer expectations of a visual experience area also considered. While some areas of scenic beauty (for example a remote National Park) may have low numbers of viewers, the viewer expectation will be one of attractive scenery and high scenic quality.

Distance from an object plays a significant role in reducing sensitivity. Due to perspective, the visible size of an object reduces with distance. As the distance from the object increases, the ability to perceive contrast between features diminishes, as does the perception of colour. As the distance to the view increases, discernable visual detail decreases and the size of the object in the field of view is reduced and the capacity to screen the object is increased.

Table 4 Viewer Sensitivity for Developments

Viewer Context	Period of View	Number of Viewers	Foreground 0 – 1 km	Middleground 1 – 3 km	Background > 3 km
Residential:					
- Rural	Long	Low	High	High – Moderate	Moderate
- Low/Medium Density	Long	Moderate	High - Moderate	Moderate	Moderate - Low
- High Density	Long	High	High - Moderate	Moderate	Moderate - Low
Recreational:					
- Natural Areas (e.g. National Parks)	Medium	Moderate	High	High	Moderate
- Recreational Areas (e.g. Golf Courses, Parks)	Medium	Moderate	High - Moderate	Moderate	Moderate - Low
Business:					
- Commercial Areas (e.g. CBD)	Long	High	High - Moderate	Moderate	Low
- Industrial Areas	Long	Moderate	Low	Low	Low
- Agricultural Areas	Long	Low	Moderate	Low	Low
Roads:					
- Tourist Roads	Short	Moderate	High - Moderate	Moderate - Low	Low
- Other Roads	Short	High - Low	Moderate	Moderate	Low

Visual Impact Rating

By assessing visual modification and viewer sensitivity, an overall visual impact assessment is possible. The matrix provided in Table 5 has been used as the basis for assigning visual impacts.

Table 5 Visual Impact Assessment Matrix

		Viewer Sensitivity		
		High	Moderate	Low
Visual Modification	High	High	High	Moderate
	Medium	High	Moderate	Low
	Low	Moderate	Low	Low

3. Results

When assessing the visual impact of each vantage point the mitigation measures listed in Section 1.2 (siting of the WPP in an area containing like infrastructure, placement of the WPP footprint within the site to allow maximum retention of vegetation, sympathetic building design and materials etc.) were considered incorporated into the concept design, and hence assessed as part of this study.

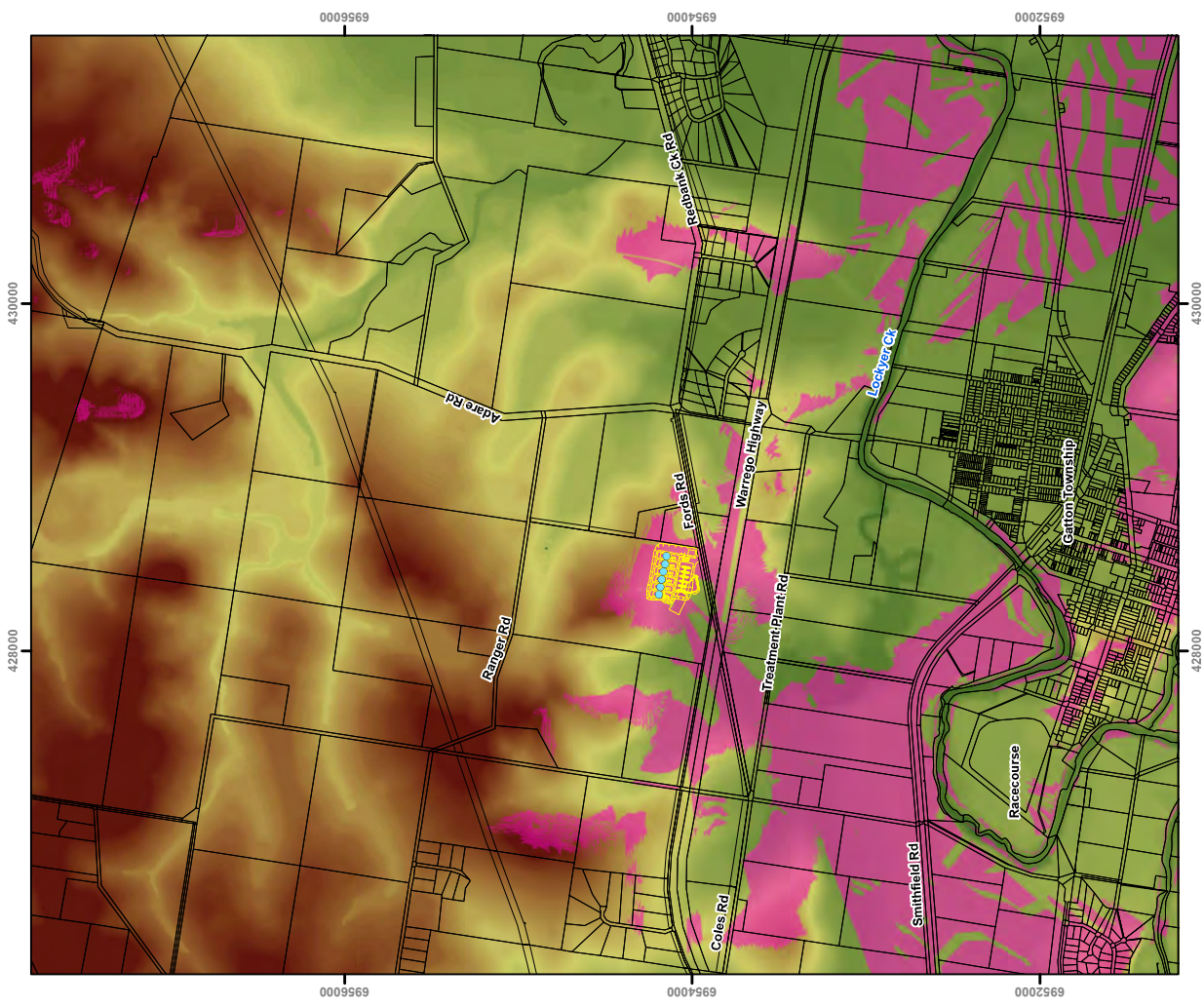
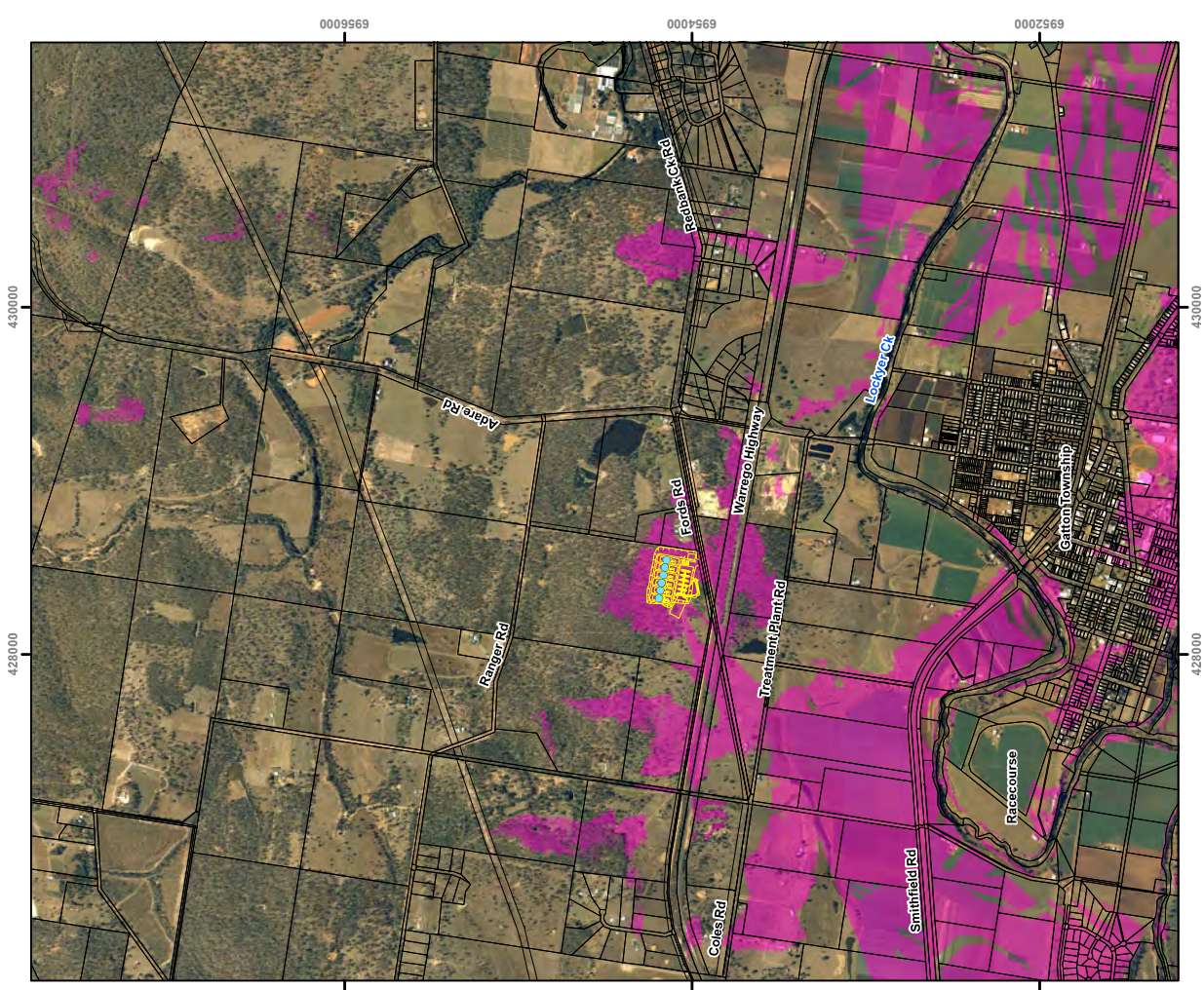
The WPP viewshed analysis identified areas where the proposed WPP, or parts of it, may be visible. Figure 14 contains the viewshed analysis results; portions highlighted in magenta represent areas where the proposed WPP, or parts of it, may be visible.

Using the following criteria 12 vantage points were selected as they:

- ▶ Provided a good representation from nearby residences that may potentially see the proposed WPP (it should be noted the selected vantage points were from public areas only, no private properties were accessed); or
- ▶ Provided a good representation from highly frequented public areas such as the Warrego Highway, residential estates, golf courses, or elevated areas throughout the Township of Gatton.

Figure 15 shows the areas where vantage points were selected to provide an overall assessment of the potential visual impacts from the proposed WPP.

Several vantage points selected demonstrated that the proposed WPP was unlikely to be visible due to topography and/or vegetation constraints (particularly areas to the north of the site). Photomontages were generated for each vantage point where infrastructure from the proposed WPP was expected to be visible (as indicated from the 3D model). The photomontages generated for each vantage point are located in Appendix A.



1:30,000

0 250 500 750 1,000 Metres

Map Projection: Geographic Coordinate System
 Horizontal Datum: Geocentric Datum of Australia
 Grid: Map Grid of Australia 1994, Zone 56

Legend

- Stacks
- Viewshed
- Areas that may have potential views of the stacks
- Proposed WPP Footprint

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Assumptions: Viewsheds are indicative only. Minor variations may be due to

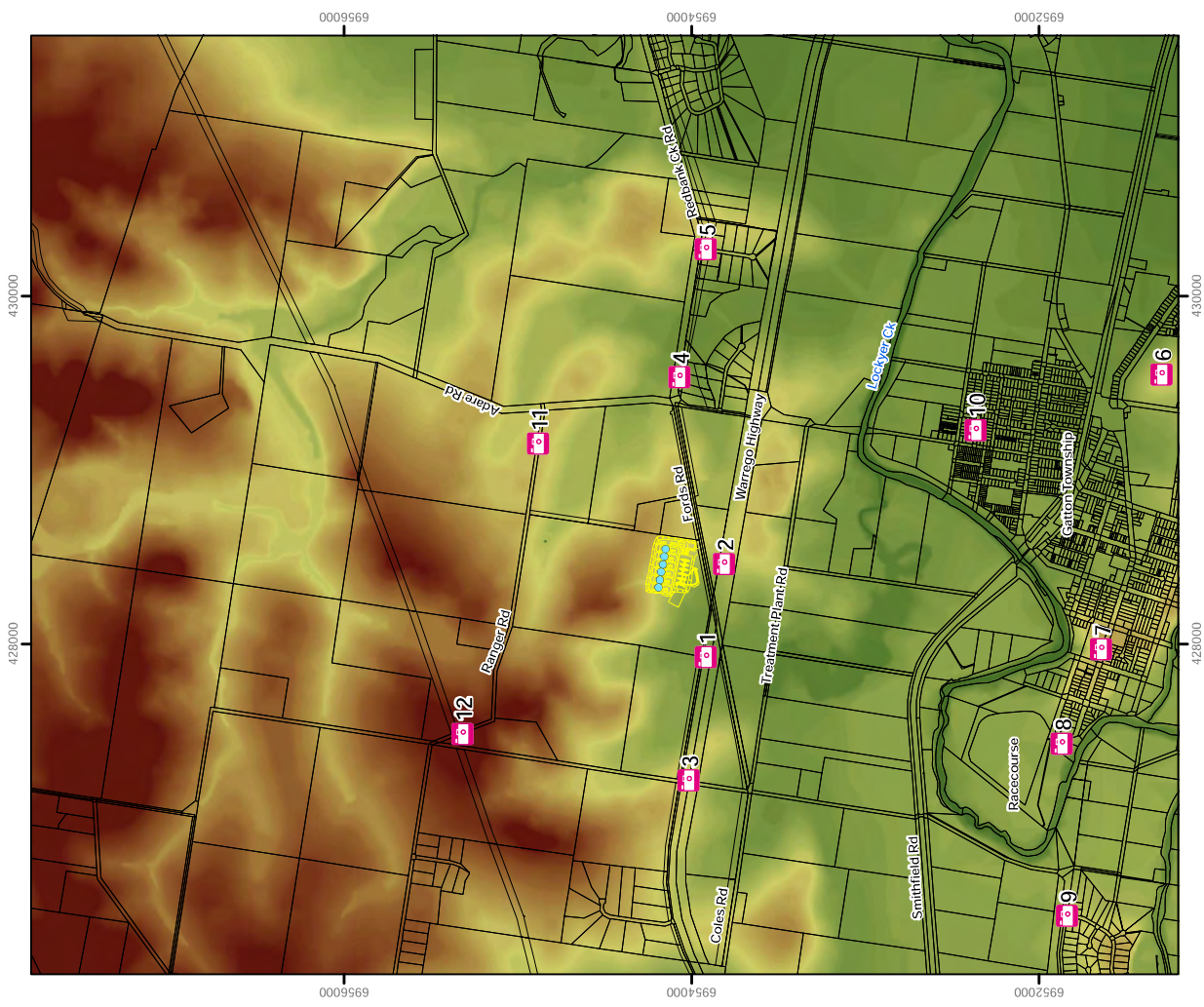
1. Vegetation clearing or planting since 2001 in which the aerial photography was taken
2. Individual trees, small clumps of trees and buildings/structures have not been integrated into the model
3. Digital elevation model was based on 5m contours
4. Surrounding vegetation was assumed at 15m high

Figure 14
Viewshed Analysis

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Westlink Power Project
 Visual Impact Assessment

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Legend

- Stacks
- Vantage Points
- Proposed WPP Footprint

Elevation (metres)

High: 205
Low: 0

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1:30,000

0 250 500 750 1,000 Metres

Map Projection: Geographic Coordinate System
 Horizontal Datum: Geocentric Datum of Australia
 Grid: Map Grid of Australia 1994, Zone 56

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Data source: Cadastre Feb 2009 (DERW), Aerial photography 2007 (DERW), DEM derived from 5m contours (DERW), Detailed site survey (Westlink) and Proposed WPP Design (GHD).

3.1 Visual Impacts from Viewsheds

The photomontages for the 12 vantage points are located in Appendix A and discussed below.

Warrego Highway

The Warrego Highway runs adjacent to the southern boundary of the site, with the site visible from travellers moving in east and west directions.

Users of the Warrego Highway travelling west (from Brisbane to Toowoomba) would be expected to only have glimpses of the WPP (represented in Vantage Point 2). While the site would be in the viewers foreground it would be shielded by existing vegetation between the highway and the site, and vegetation located in the median strip between the east and west lanes of the highway. In a visual context, travellers moving west would have views of the Gatton Landfill and the Energex Bulk Sub Station, and these form the prominent impact through that area.

Users of the Warrego Highway travelling east (from Toowoomba to Brisbane) would be expected to see portions of the WPP, though only when the site enters the foreground (closer than one kilometre). In a visual context the traveller would then pass the proposed WPP and have views of the Energex Bulk Sub Station and the Gatton Landfill. The view of the WPP would be of a short duration and in the visual context of the area is considered a low impact.

Residential Areas and Activities to the East

The closest residential area to the proposed WPP lies approximately one kilometre to the east. Topography of the area, coupled with existing vegetation, indicates that this area would not be able to view any of the WPP infrastructure (Vantage Point 4).

Further to the east lie more residences and commercial operations (such as Pohlman's Plant Nursery). This area is more elevated than the residents closer to the WPP. 3D modelling (Vantage Point 5) indicates that the existing vegetation, separation distance (greater than 1.5 kilometres), and topography would obstruct any views of the WPP.

Residential Areas and Activities to the West and North

The topography of the overall site includes a large hilly area north of the proposed WPP footprint, within the overall Development Site, and visually shields residences to the north from the infrastructure. To the west, topography is also elevated between residences and the proposed WPP footprint.

The topography, in combination with existing vegetation, obstructs views of the proposed WPP (Vantage Points 3, 11 and 12).

Residential Areas and Activities to the South

South of the Development Site is the Township of Gatton; incorporating residential areas, commercial operations and industrial activities.

Elevated areas in and around Gatton have the potential to view the proposed WPP. Vantage Point 10 assessed the closest medium density residential district. The 3D modelling indicates that elevation in the topography south of the Warrego Highway and existing vegetation would obstruct views of the proposed WPP from this vantage point.

Elevated areas in and around Gatton have the potential to view the proposed WPP.

Vantage Points 7 and 9 were assessed as the most elevated residential areas south of the proposed WPP. The 3D modelling indicates that the tallest infrastructure (stacks and air intakes) will be visible and appear in the viewers' far middleground to background region (between 2.5 to 3 kilometres away). Views of this infrastructure would be dependent on localised obstructions (such as other houses, sheds and vegetation). With the design mitigation measures incorporated the proposed WPP it is not expected to significantly intrude into the view.

Public areas with a potential view of the tallest infrastructure associated with the proposed WPP include the Gatton Golf Course and the Gatton Racecourse (Vantage Points 6 and 8). Viewers at these venues are 2.5 kilometres or more from the proposed development and would not be expected to experience a high or moderate level of modification to the existing view. Existing vegetation and other structures between these sites and the proposed WPP place reduce the already low visual impact of the proposed WPP.

3.2 Visual Impact Assessment

Based on the methodology outlined in Section 2.2 a visual assessment of each Vantage Point was completed (refer to Table 6).

Table 6 Visual Impact Assessment

Vantage Point	Viewer Type	Context of View	Period of View	Number of Viewers	Distance	Visual Modification	Sensitivity of View	Visual Impact Rating
1	Motorist, tourist	Other roads, views from highway (east bound)	Short	High	500 metres	Medium	Moderate	Moderate
2	Motorist, tourist	Other roads, views from highway (west bound)	Short	High	330 metres	Low	Moderate	Low
3	Motorist, tourist, residential	Other roads, views from highway (east bound)	Short	High	1,200 metres	Low	Low	Low
		Rural residential outlook	Long	Low		Low	High - Moderate	Moderate - Low
4	Residential	Rural residential outlook	Long	Low	1,000 metres		WPP will not be visible (refer Appendix A)	
5	Residential	Rural residential outlook	Long	Low	1,750 metres		WPP will not be visible (refer Appendix A)	
6	Recreational	Recreational area, view from golf course	Medium	Moderate	3,000 metres	Low	Moderate - Low	Low
7	Residential	Low to Medium density residential outlook	Long	Moderate	2,500 metres	Low	Moderate	Low
8	Recreational	Recreational area, view from racecourse	Medium	Moderate	2,500 metres	Low	Moderate	Low
9	Residential	Low to Medium density residential outlook	Long	Low	3,000 metres	Low	Moderate	Low
10	Residential	Low to Medium density residential outlook	Long	Low	1,900 metres		WPP will not be visible (refer Appendix A)	
11	Residential	Rural residential outlook	Long	Low	1,000 metres		WPP will not be visible (refer Appendix A)	
12	Residential	Rural residential outlook	Long	Low	1,450 metres		WPP will not be visible (refer Appendix A)	

4. Further Mitigation Measures

The project would introduce power generation infrastructure into an area that consists of complimentary infrastructure. To mitigate the visual impact of the proposed WPP, Westlink has incorporated a number of mitigation measures into the concept design, including:

- ▶ A detailed site selection to locate the WPP adjacent to infrastructure of a similar nature. The site selected is adjacent to the APA Gatton Compressor Station, opposite the Energex Bulk Supply Sub-station, and near the Gatton Landfill, allowing the WPP to be situated in an area of similar visual context;
- ▶ Location of the WPP footprint within the Development Site to minimise vegetation clearing, and utilise topography and existing vegetation as a visual barrier; and
- ▶ Sympathetic building design, including using non-reflective building materials and appropriate colour schemes to minimise the extent to which the most prominent features (air intakes and stacks) would be visible within the local area.

To further mitigate visual impacts in the foreground of the project area, primarily for users of the Warrego Highway and land use directly south of the Warrego Highway, it is proposed to landscape the site and create a visual buffer.

4.1 Landscaping

Mitigation of negative visual amenity can in part be achieved through successful revegetation of areas surrounding the proposed WPP development, particularly along the southern property boundary. Planting of native/endemic species must be a priority for any landscape/revegetation scheme. Provision of tree species that grow to a mature height of greater than 20 metres and have large canopy spread would provide effective screening. The mature height would be achieved over an approximate ten to fifteen year period, assuming a new growth rate of approximately 1.8 to 3.6 metres annually.

Conics (2009) list suitable native species, which should be used for buffer planting, screening and revegetation, such as *Eucalyptus* and *Corymbia species*. Planting for screening and revegetation purposes should allow a minimum separation distance of 20 metres between trees and infrastructure.

An existing belt of shrubs on the southern property boundary should be enhanced through installation of new shrub specimens' native/endemic to the site such as *Jacksonia* and *Hovea*. Planting of these species this would add to the density and size of the belt and provide a greater level of screening.

Where possible, native species should be planted to retain the existing landscape character and enhance natural habitats on site. A concept landscape plan has been developed to allow creation of photomontages with revegetation measures and determine the reduction in visual impact from doing so. The concept landscaping is shown in Figure 16; Appendix A contains the photomontages for each vantage point with revegetation mitigation measures applied.

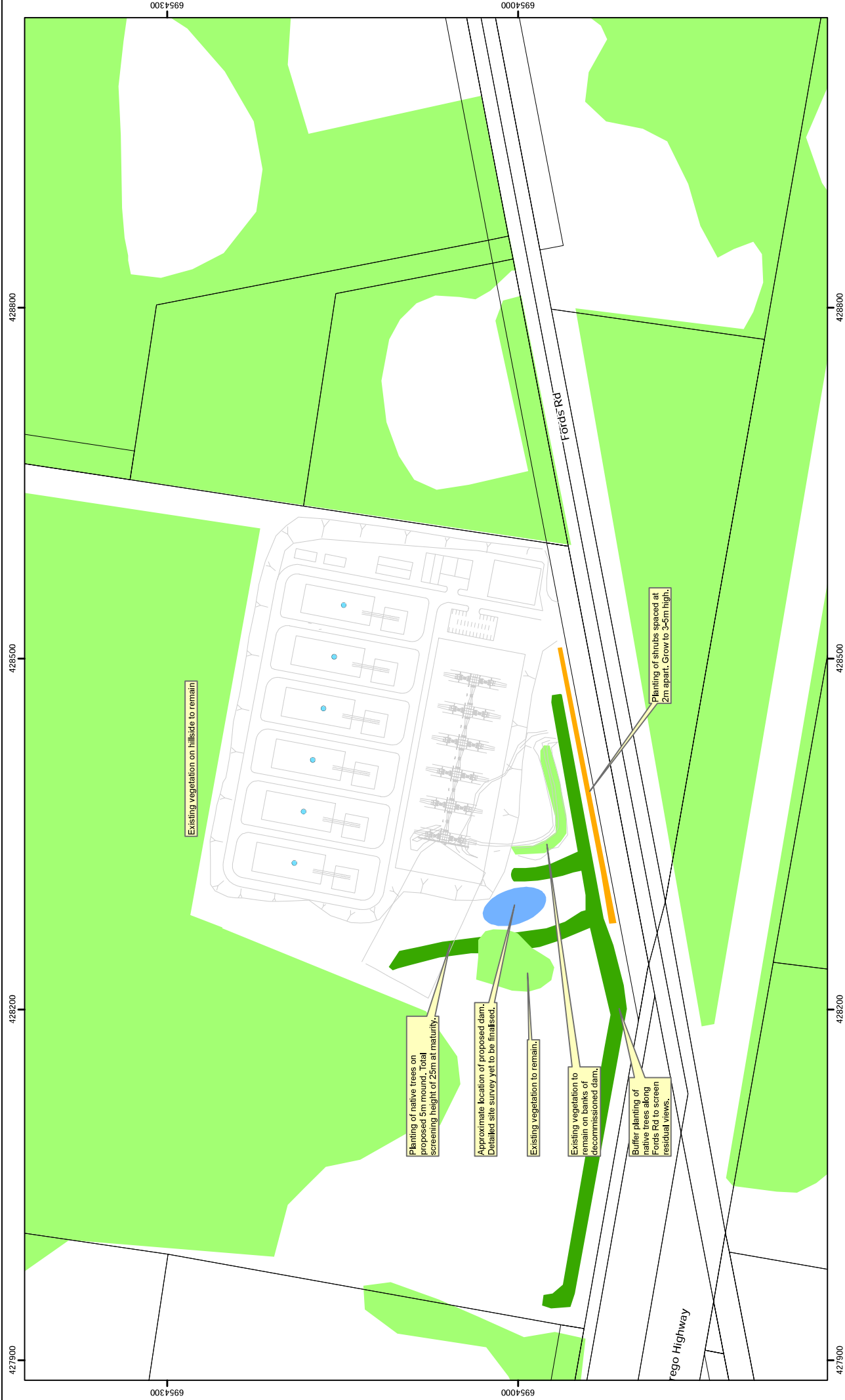
Revegetation with native/endemic species would enhance the natural habitat and support diversity of flora and fauna on site.

4.2 Visual Impacts after Additional Mitigation Measures

An assessment of the visual impact after implementation of concept landscape plan would result in the lessening of the visual modification for Vantage Point 1 to Low through a reduction in the amount of visual modification. Hence, the impact of the users of the Warrego Highway would be reduced to Low.

The remainder of the visual impacts assessed (Vantage Points 2 to 12) ratings remain unchanged. However, it should be noted that while most of these points have a viewer sensitivity of Moderate they would typically only be able to see the taller infrastructure (air intakes and stacks) and would not be significantly visually impacted by the project. With the design mitigation measures incorporated the proposed WPP is not expected to be particularly conspicuous against the background and is not expected to significantly intrude into the view.

Vantage Points 4, 5, 10, 11 and 12 would not be able to view any infrastructure and would not be visually impacted by the project.



1:3,000

0 20 40 60 80 100 Metres

Map Projection: Geographic Coordinate System
 Horizontal Datum: Geocentric Datum of Australia
 Grid: Map Grid of Australia 1994, Zone 56

N

Legend

- Stacks
- Existing vegetation
- Proposed WPP Footprint
- Proposed planting of tree species
- Proposed planting of shrub species
- Cadastre

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 Date | 4 AUGUST 2009

Figure 16
 Landscape Concept Plan

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Data source: Cadastre Feb 2009 (DERM), Landscape Concept Plan and Proposed WPP Design (GHD) and Detailed site survey (Westlink).
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5. Conclusion and Recommendations

5.1 Conclusion

A VIL Assessment was conducted to determine the potential visual impact of the WPP. Incorporated into the assessment were design mitigation measures to lessen the potential visual impact of the WPP, including:

- ▶ A detailed site selection to locate the WPP adjacent to infrastructure of a similar nature. The site selected is adjacent to the APA Gatton Compressor Station, opposite the Energex Bulk Supply Sub-station, and near the Gatton Landfill, allowing the WPP to be situated in an area of similar visual context;
- ▶ Location of the WPP footprint within the Development Site to minimise vegetation clearing, and utilise topography and existing vegetation as a visual barrier;
- ▶ Sympathetic building design, including using non-reflective building materials and appropriate colour schemes to minimise the extent to which the most prominent features (air intakes and stacks) would be visible within the local area; and
- ▶ Landscaping of the Development Site is also proposed to mitigate impact to views in the foreground (closer than one kilometre) of the WPP.

Eastbound users of the Warrego Highway would experience the greatest visual impact, although only for short periods while passing. The impact is Low post landscaping for this vantage and the proposed WPP is located among like infrastructure, which is also visible from the highway. After full maturity of the proposed vegetation landscaping the photomontage depicts that only portions of the tallest infrastructure may be visible.

Vantage points that would experience the WPP as a component of the background may experience Moderate to Low visual impact. With the design mitigation measures incorporated the proposed WPP is not expected to be particularly conspicuous against the background and is not expected to significantly intrude into the view.

Five of the assessed vantage points would not view the proposed WPP.

Overall, the proposed WPP is assessed to have a Low impact on the visual amenity of the area. In a visual context, the site location is consistent with the surrounding land uses and as such the development is not anticipated to alter visual perceptions of that area.

5.2 Recommendations

Prior to construction of the WPP it is recommended that the concept landscape plan be developed into a detailed landscaping plan which would include:

- ▶ Confirmation of screening and buffer revegetation locations;
- ▶ Specification of native flora for revegetation;

- ▶ Specification of appropriate quantities of plants; and
- ▶ Specification and design of the proposed dam and other bunding options.

6. References

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Appendix A
Photomontages



Site Photo - May 2009



Photomontage with Proposed WPP (no landscaping)



Location of Vantage Point 1



Photomontage of Proposed WPP (with landscaping after 10-15 years)

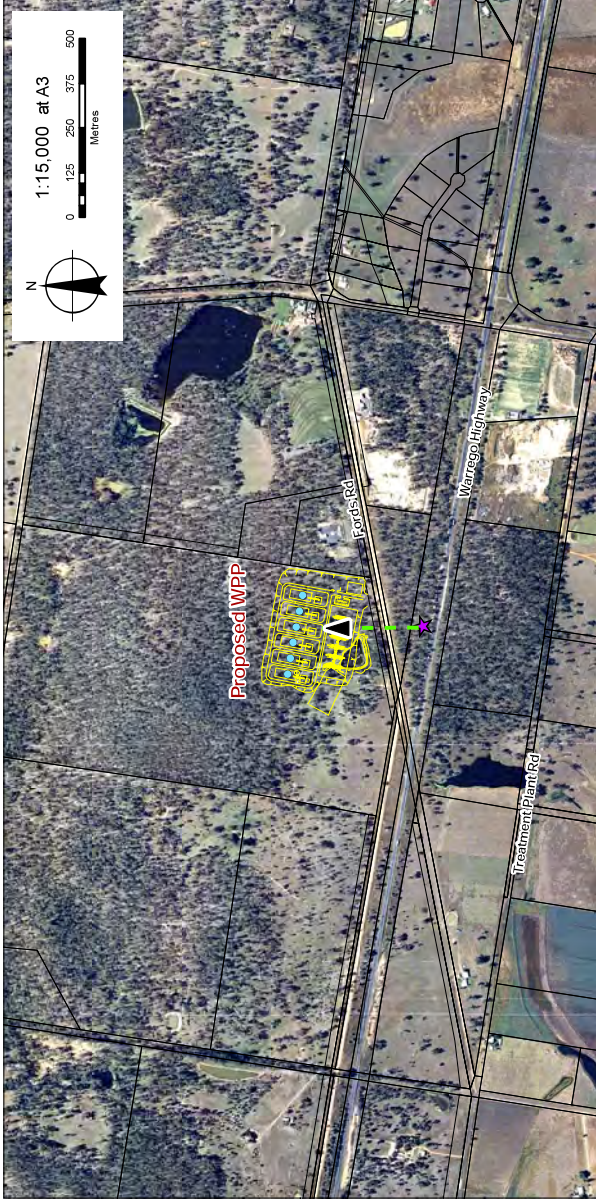
Please Note: Photomontages are indicative only.
 Assumptions include:
 1. Existing surrounding vegetation was assumed at 15m high
 2. The mature height of planted vegetation on-site (approximately 20m) would be achieved over an approximate 10-15 year period or at an approximate rate of 1.8-3.6m of new growth per year (subject to rainfall and climatic conditions).
 3. The mature height of planted shrubs on-site (approximately 3m) would be achieved over an approximate 4 year period (subject to a range of climatic conditions). Typical average rainfall, average temperatures and planning design layout).



Site Photo - May 2009



Photomontage with Proposed WPP (no landscaping)



Location of Vantage Point 2



Photomontage of Proposed WPP (with landscaping after 10-15 years)

Please Note: Photomontages are indicative only. Assumptions include:

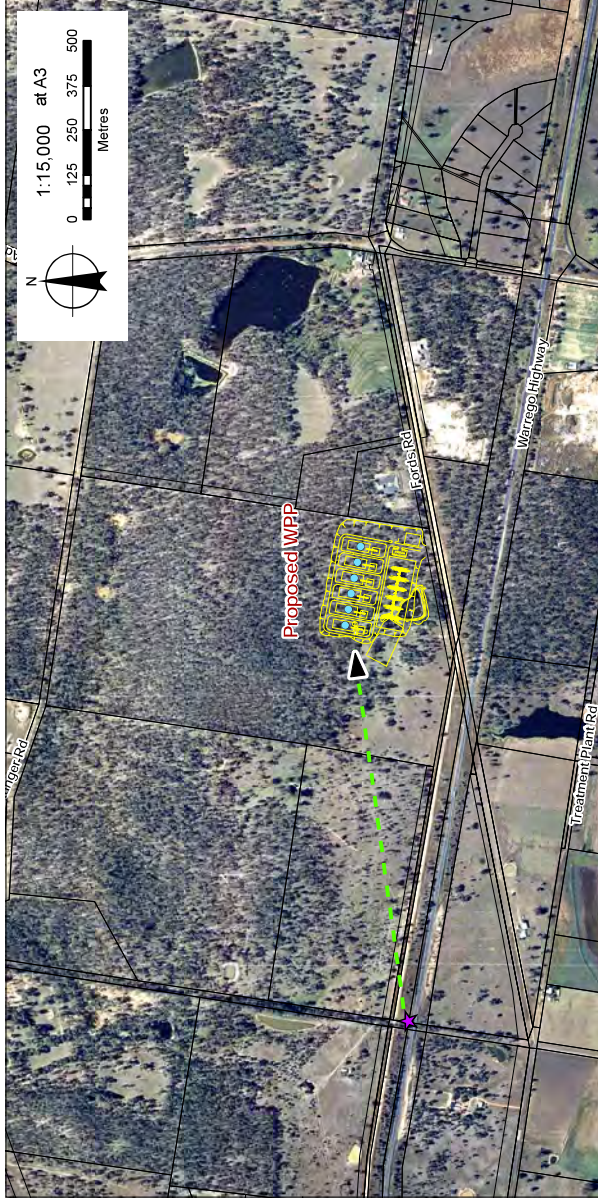
1. Existing surrounding vegetation was assumed at 15m high
2. The mature height of planted vegetation on-site (approximately 20m) would be achieved over an approximate 10-15 year period or at an approximate rate of 1.3-3.0m of new growth per year (subject to rainfall and climatic conditions).
3. The mature height of planted shrubs on-site (approximately 5m) would be achieved over an approximate 5 year period (subject to a range of variables such as soil type, rainfall, average temperatures and planting design layout).



Site Photo - May 2009



Photomontage with Proposed WPP (no landscaping)



Location of Vantage Point 3



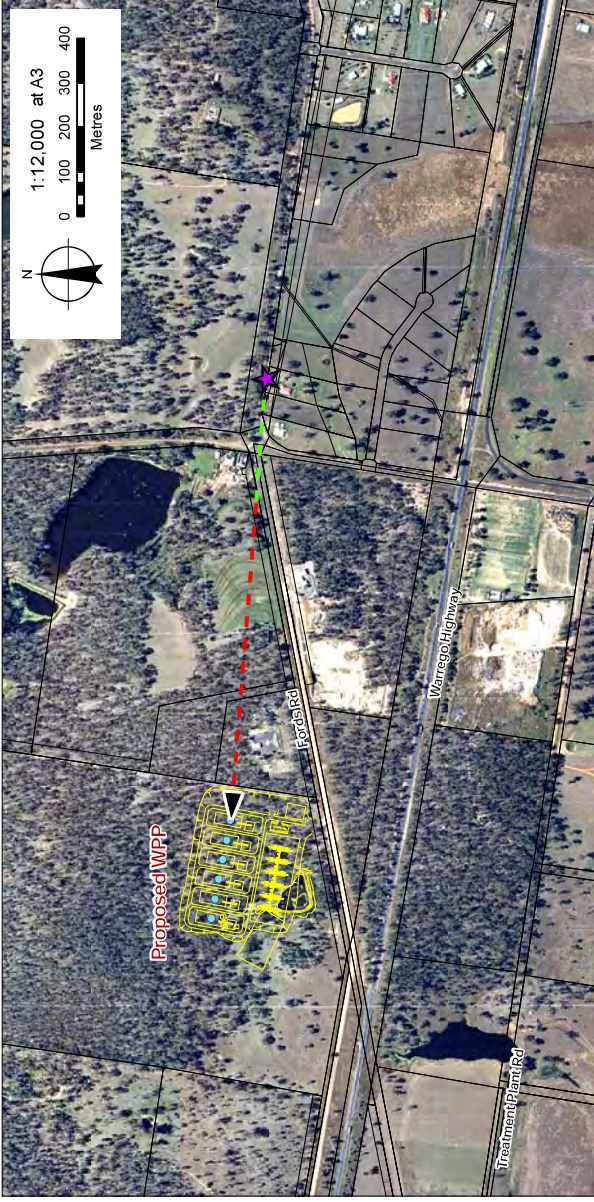
Photomontage of Proposed WPP (with landscaping after 10-15 years)

Please Note: Photomontages are indicative only. Assumptions include:

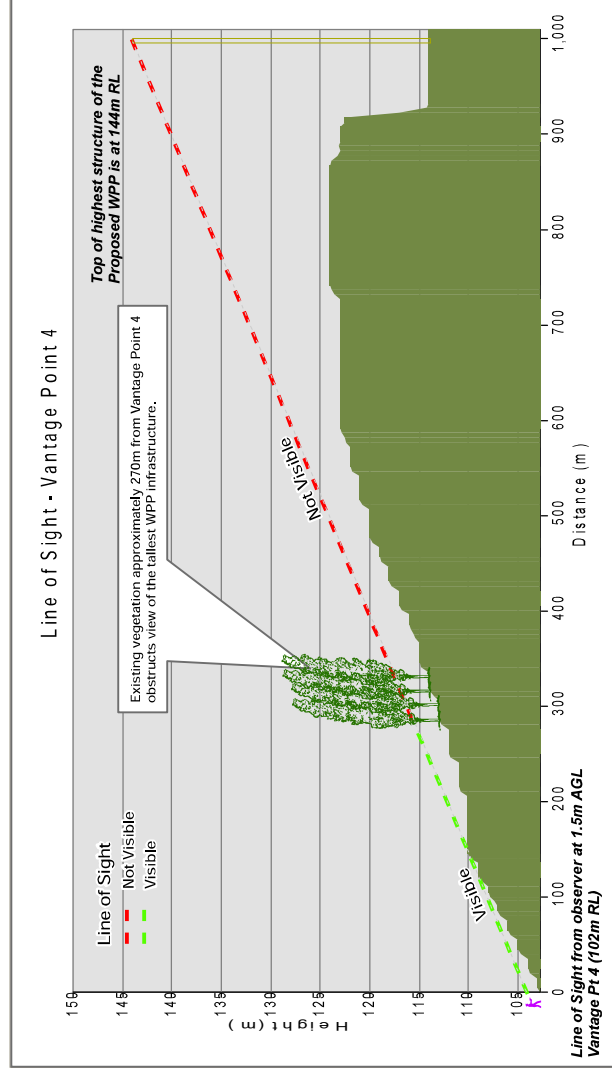
1. Existing surrounding vegetation was assumed at 15m high
2. The mature height of planted vegetation on-site (approximately 20m) would be achieved over an approximate 10-15 year period or at an approximate rate of 1.3-3.0m of new growth per year (subject to rainfall and climatic conditions).
3. The mature height of planted shrubs on-site (approximately 5m) would be achieved over an approximate 5 year period (subject to a range of variables such as soil type, rainfall, average temperatures and planting design layout).



Site Photo - May 2009



Location of Vantage Point 4



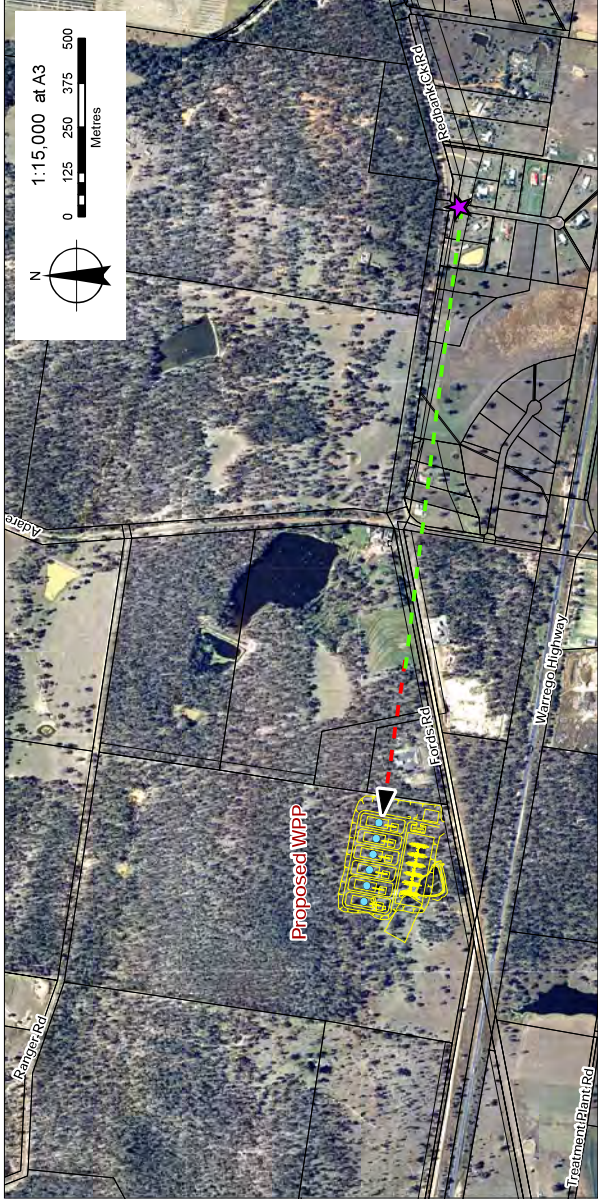
Terrain profile demonstrating the Proposed WPP will not be visible from Vantage Point 4



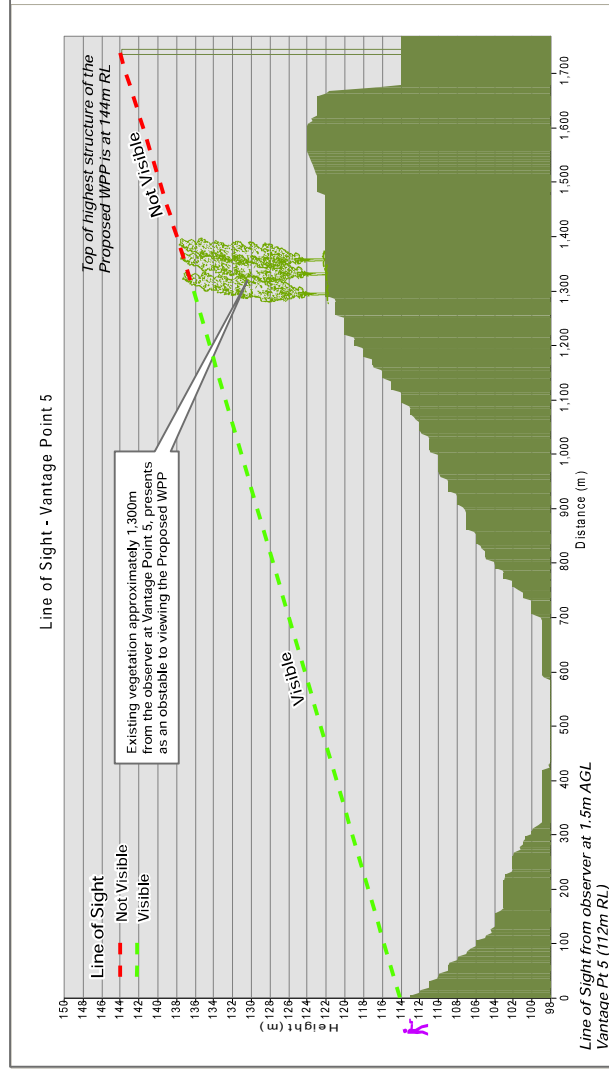
View from Vantage Point 4 is expected to be unaltered by installation of the Proposed WPP



Site Photo - May 2009



Location of Vantage Point 5



Terrain profile demonstrating the Proposed WPP will not be visible from Vantage Point 5



View from Vantage Point 5 expected to be unaltered by installation of the Proposed WPP

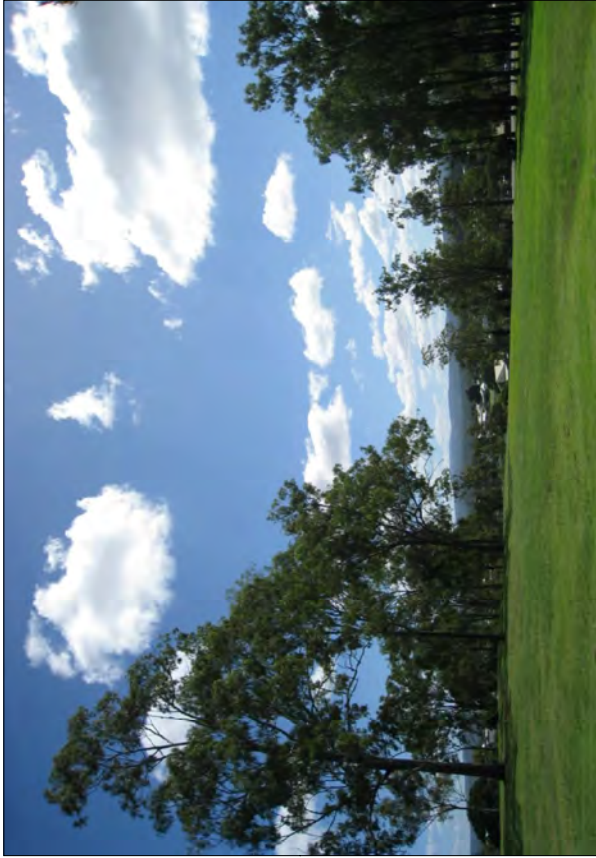


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Legend
 Stacks
 Vantage Point 5
 Proposed WPP Footprint

Job Number 41/21379
 Revision B
 Date 4 AUGUST 2009

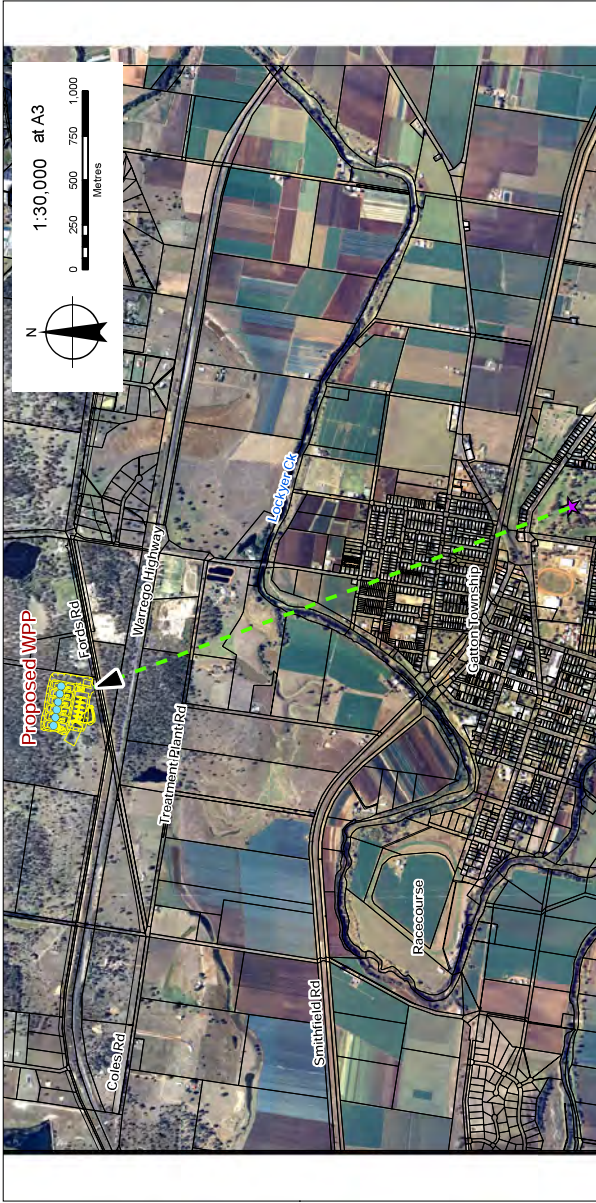
Westlink Power Project
 Visual Impact Assessment
 Figure A5
 Vantage Point 5
 Deroydon Court (Entrance)



Site Photo - May 2009



Photomontage with Proposed WPPP (no landscaping)



Location of Vantage Point 6



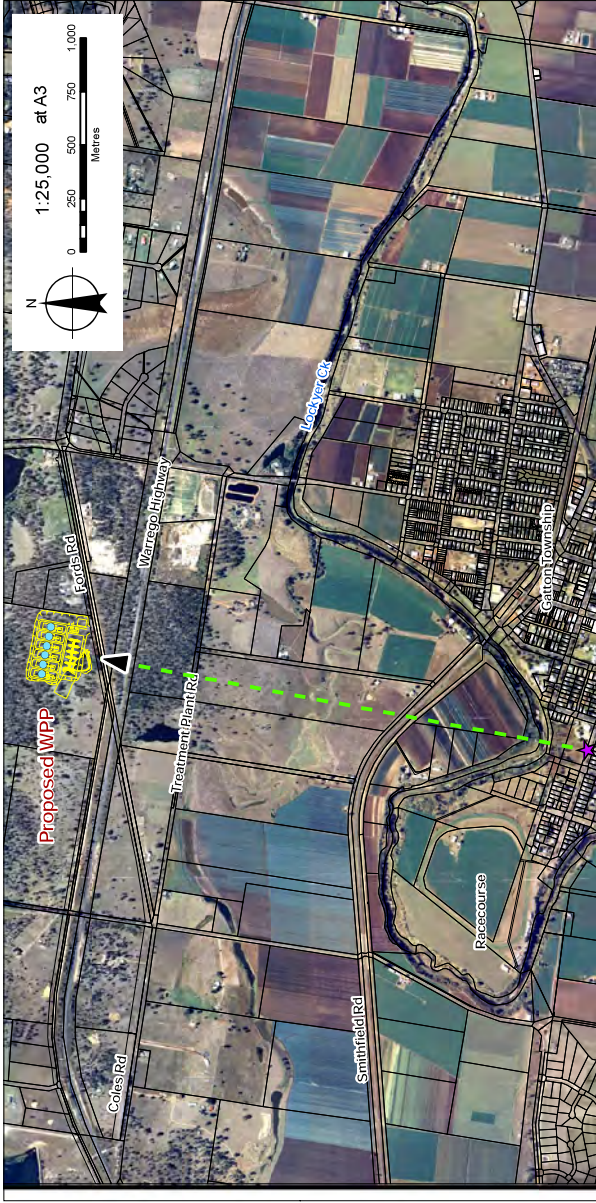
Photomontage of Proposed WPPP (with landscaping after 10-15 years)

Please Note: Photomontages are indicative only. Assumptions include:

1. Existing surrounding vegetation was assumed at 15m high
2. The mature height of planted vegetation on-site (approximately 20m) would be achieved over an approximate 10-15 year period or at an approximate rate of 1.3-3.0m of new growth per year (subject to rainfall and climatic conditions).
3. The mature height of planted shrubs on-site (approximately 5m) would be achieved over an approximate 5 year period (subject to a range of variables such as soil type, rainfall, average temperatures and planting design layout).



Site Photo - May 2009



Location of Vantage Point 7



Photomontage with Proposed WPPP (no landscaping)



Photomontage of Proposed WPPP (with landscaping after 10-15 years)

Please Note: Photomontages are indicative only. Assumptions include:

1. Existing surrounding vegetation was assumed at 15m high
2. The mature height of planted vegetation on-site (approximately 20m) would be achieved over an approximate 10-15 year period or at an approximate rate of 1.3-3.6m of new growth per year (subject to rainfall and climatic conditions).
3. The mature height of planted shrubs on-site (approximately 5m) would be achieved over an approximate 5 year period (subject to a range of variables such as soil type, rainfall, average temperatures and planting design layout).



Site Photo - May 2009



Photomontage with Proposed WPP (no landscaping)



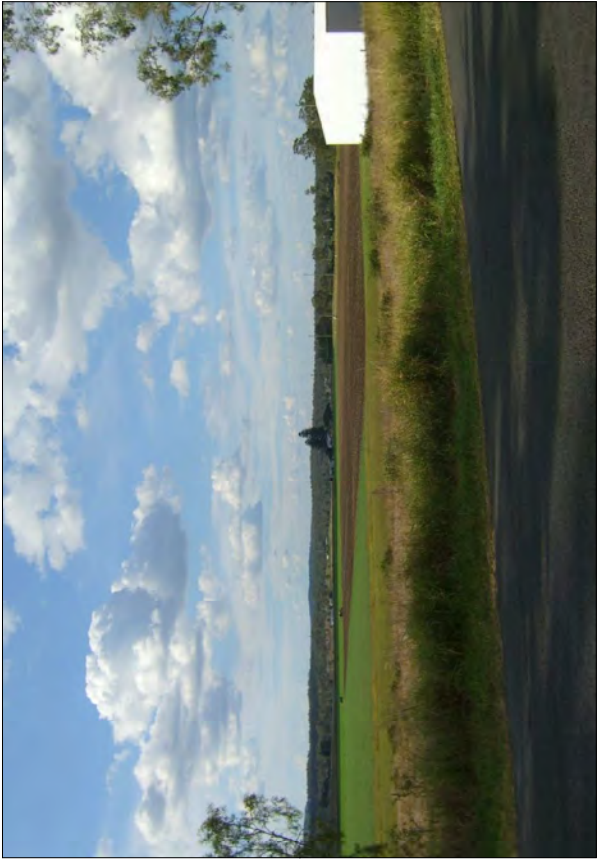
Location of Vantage Point 8



Photomontage of Proposed WPP (with landscaping after 10-15 years)

Please Note: Photomontages are indicative only. Assumptions include:

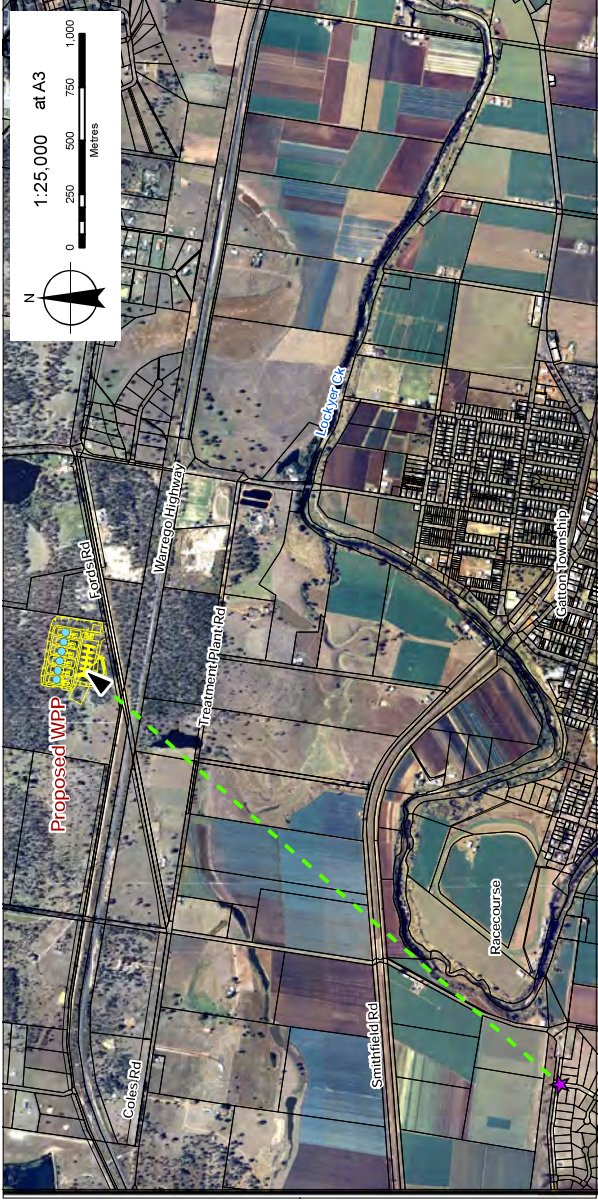
1. Existing surrounding vegetation was assumed at 15m high
2. The mature height of planted vegetation on-site (approximately 20m) would be achieved over an approximate 10-15 year period or at an approximate rate of 1.3-3.0m of new growth per year (subject to rainfall and climatic conditions).
3. The mature height of planted shrubs on-site (approximately 5m) would be achieved over an approximate 5 year period (subject to a range of variables such as soil type, rainfall, average temperatures and planting design layout).



Site Photo - May 2009



Photomontage with Proposed WPP (no landscaping)



Location of Vantage Point 9



Photomontage of Proposed WPP (with landscaping after 10-15 years)

Please Note: Photomontages are indicative only. Assumptions including:

1. Existing surrounding vegetation was assumed at 15m high
2. The mature height of planted vegetation on-site (approximately 20m) would be achieved over an approximate 10-15 year period or at an approximate rate of 1.3-3.0m or new growth per year (subject to rainfall and climatic conditions).
3. The mature height of planted shrubs on-site (approximately 5m) would be achieved over an approximate 5 year period (subject to a range of variables such as soil type, rainfall, average temperatures and planting design layout).



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- Legend
- Stacks
 - Vantage Point 9
 - Proposed WPP Footprint

Westlink Power Project
 Visual Impact Assessment

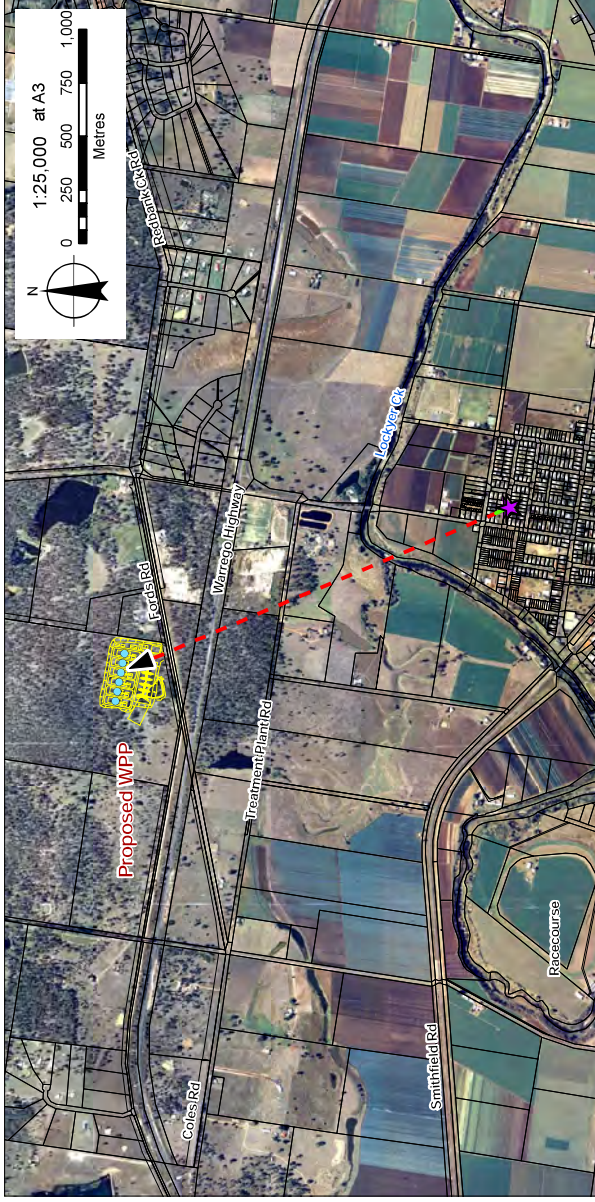
Job Number 41/21379
 Revision B
 Date 4 AUGUST 2009

Figure A9
 Old Toowoomba Rd and Parklea Dr

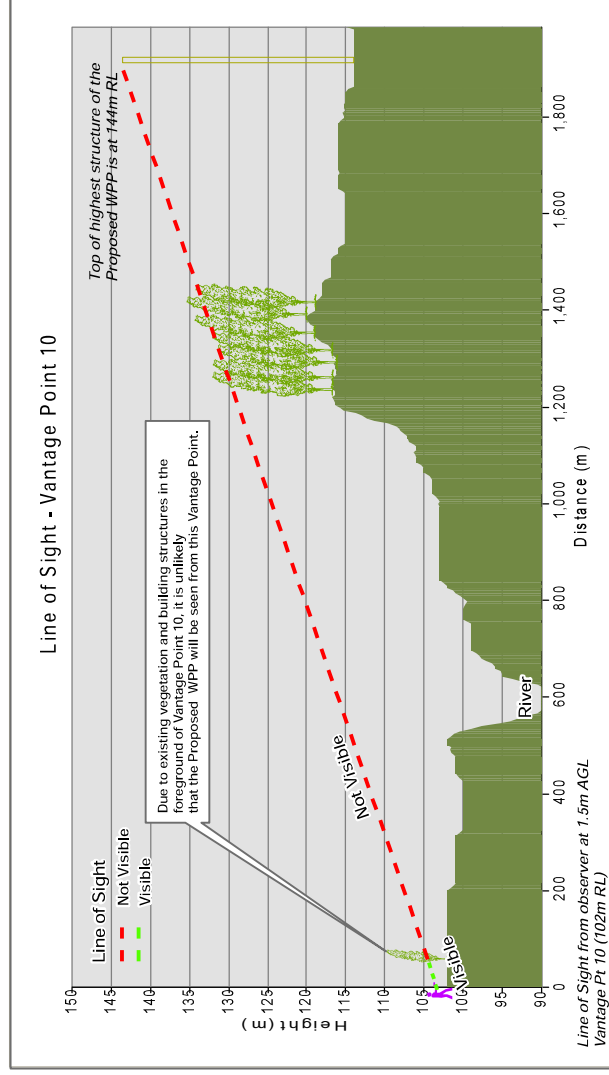
1/58 Channon St Gympie QLD 4570 Australia T 61 7 5462 9444 F 61 7 5462 9433 E gypmail@ghd.com.au W www.ghd.com.au



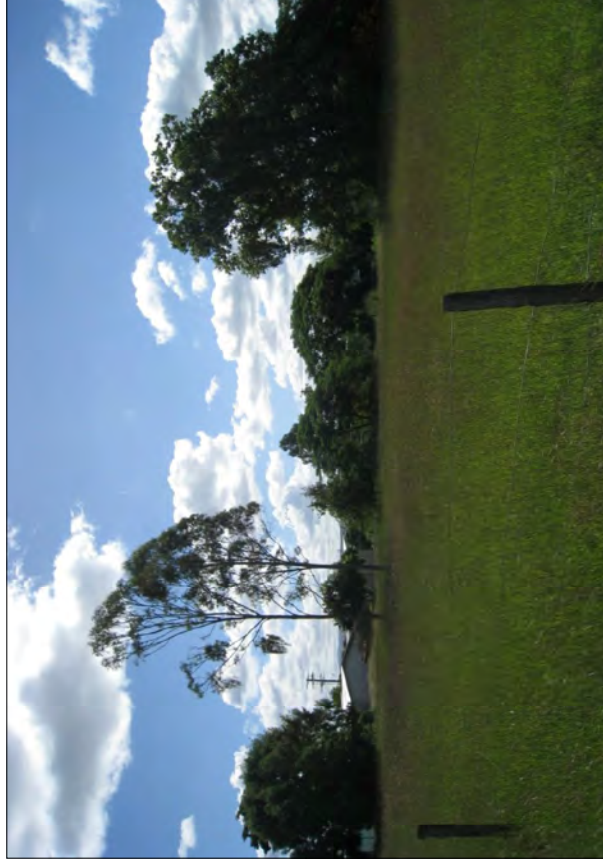
Site Photo - May 2009



Location of Vantage Point 10



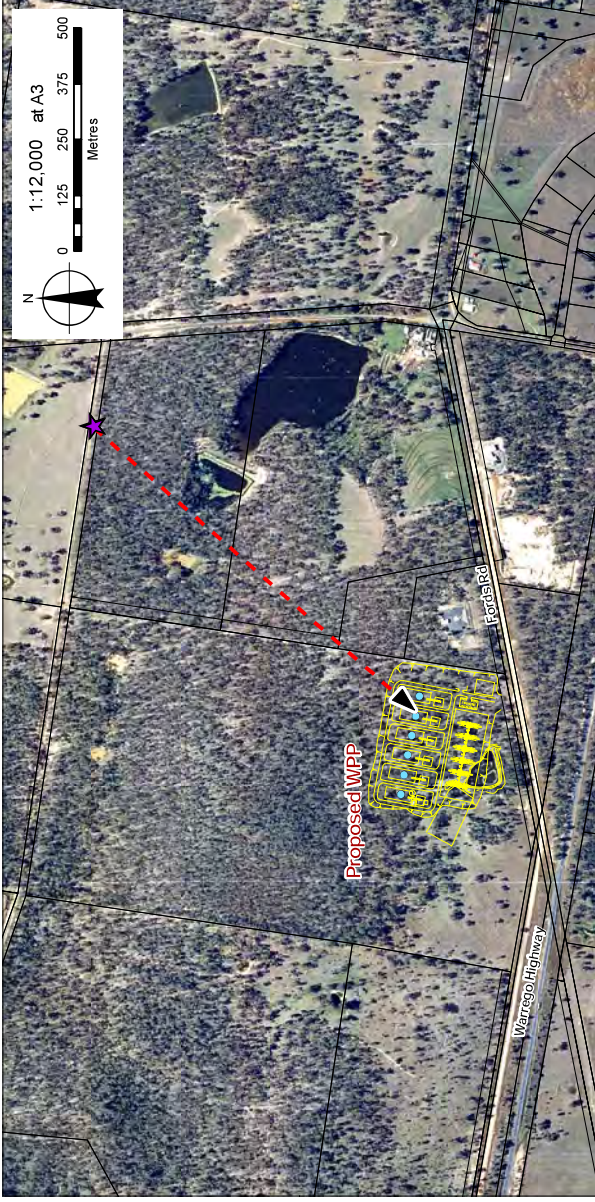
Terrain profile demonstrating the Proposed WPP will not be visible from Vantage Point 10



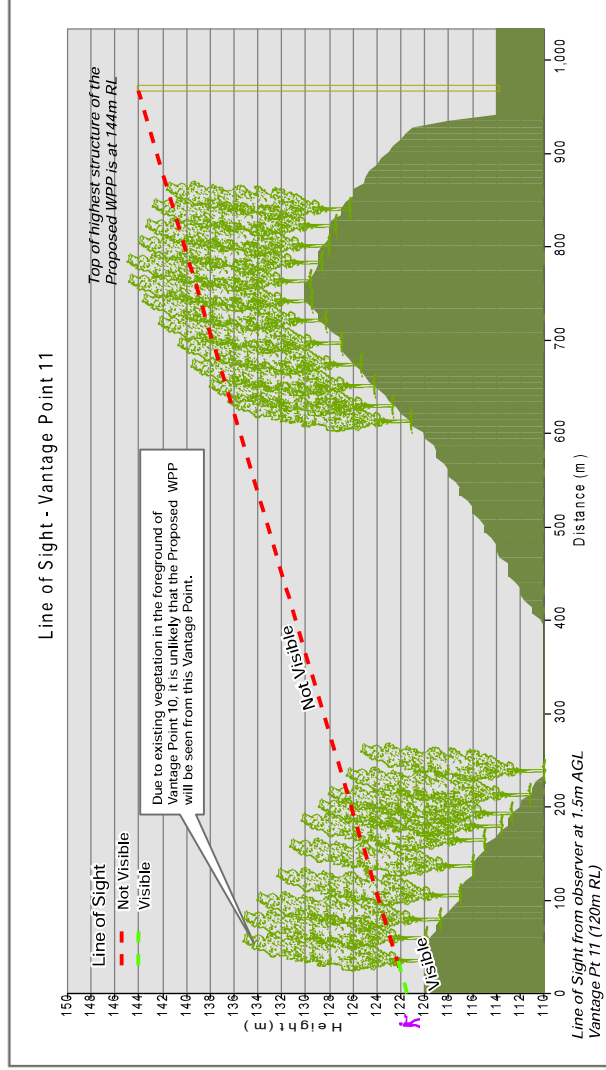
View from Vantage Point 10 is expected to be unaltered by installation of the Proposed WPP



Site Photo - May 2009



Location of Vantage Point 11



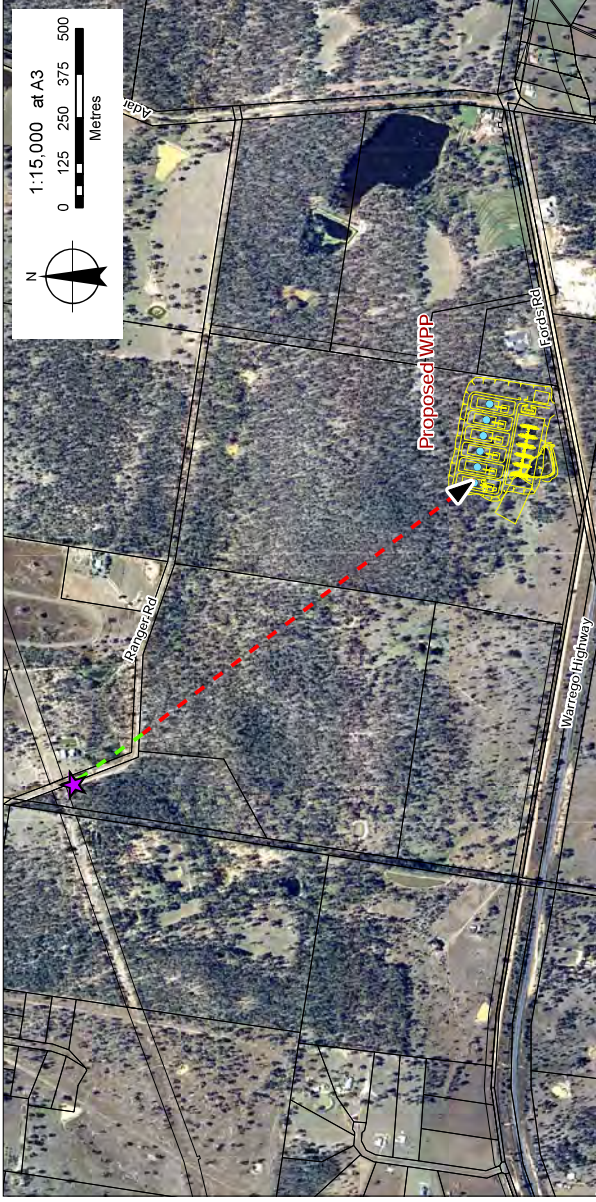
Terrain profile demonstrating the Proposed WPP will not be visible from Vantage Point 11



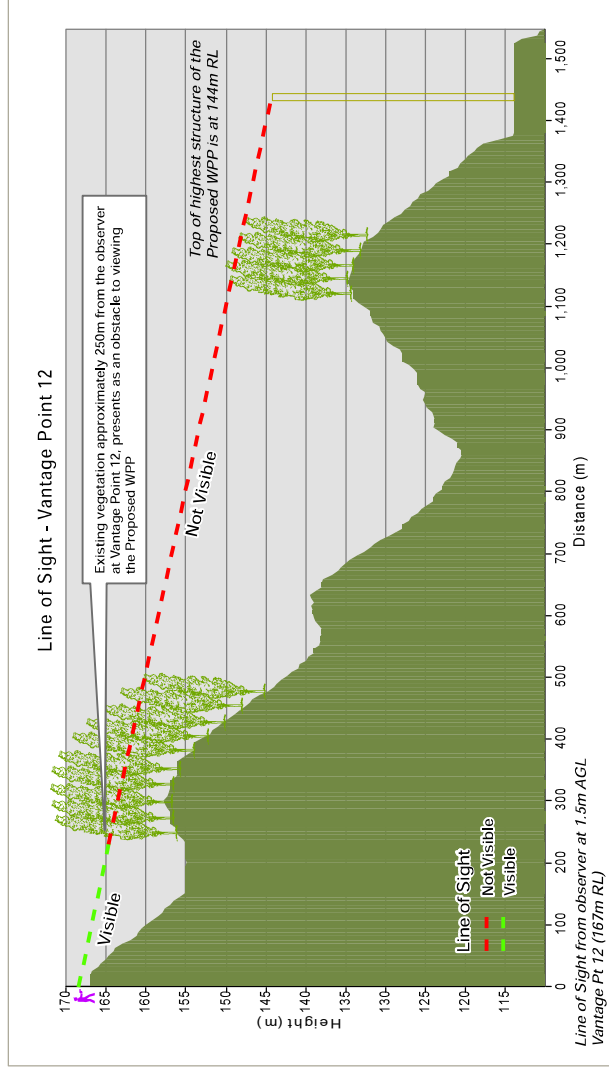
View from Vantage Point 11 expected to be unaltered by installation of the Proposed WPP



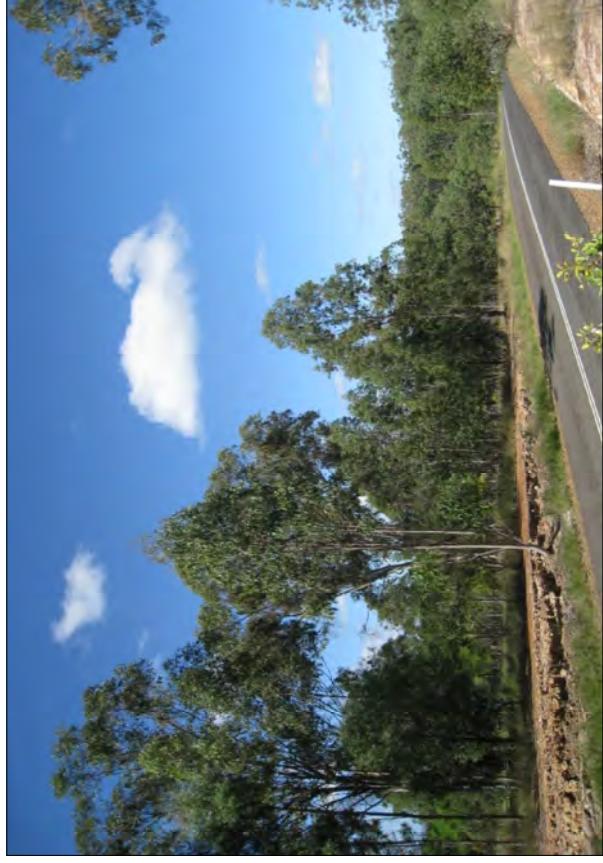
Site Photo - May 2009



Location of Vantage Point 12



Terrain profile demonstrating the Proposed WPP will not be visible from Vantage Point 12



View from Vantage Point 12 expected to be unaltered by installation of the Proposed WPP



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- Legend
- Stacks
 - Vantage Point 12
 - Proposed WPP Footprint

GHD

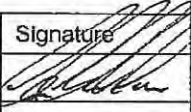
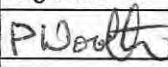
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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	J Bohn	C Charalambou		P Wootton		31/08/09
A	DRAFT					14/05/09
B	DRAFT					08/07/09
C	DRAFT					06/08/09

**APPENDIX 12: WESTLINK POWER PROJECT VISUAL IMPACT
ADDENDUM REPORT**



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Westlink Pty Ltd

Westlink Power Project
Visual Impact Addendum
Report

February 2010

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Attachments

- A Survey Report
- B Amended Photomontage Images
- C Landscape Revegetation and Management Plan
- D Detailed Landscape Specification
- E Queensland DPI Hardwoods Advice

1. Introduction

1.1 The Project

In response to rapidly growing demand for electricity, Westlink Pty Ltd (Westlink) is proposing a staged development of a natural gas-fired power station at a site north of Gatton in South-East Queensland, referred to as the Westlink Power Project (WPP).

The proposed WPP is to be located on a parcel of land near the township of Gatton; approximately 90 km west of Brisbane and approximately two kilometres north of Gatton, immediately north of the Warrego Highway on Fords Rd, Adare.

On the 4th of September 2009, Westlink lodged with the Lockyer Valley Regional Council (LVRC) a Development Application (DA) complete with a detailed Review of Environmental Factors (REF) for the WPP. Specifically, the DA is over Lot 191 on Crown Plan CSH2361 situated in the County of Cavendish, Parish of Lockyer contained in Certificate of Title, Title Reference 17000028 and is seeking a:

- Development Permit for a Material Change of Use (MCU) for the Electricity Generation Infrastructure;
- Development Permit for Environmentally Relevant Activity (ERA) No.14; and
- Development Permit for Operational Work (OW) for Vegetation Clearing.

The proposed use is more specifically defined as a natural gas-fired power station, consisting of the following elements:

- Staged installation of six open-cycle gas turbines;
- An electrical switchyard;
- A gas receiving unit;
- An operations building, workshop, administration building and car park; and
- Associated safety and monitoring equipment.

The proposed WPP is to be built in stages, in line with growing demand for electricity. Subject to development approval, the first stage of the project is expected to consist of 200 to 300 MW of generating capacity, with future expansion leading to a total project comprising up to 1,000 MW of open cycle gas turbines.

1.2 Purpose

This report forms an addendum to Chapter 12 – Visual Amenity (and Appendix F) of the Review of Environmental Factors (REF) dated August 2009 submitted with the WPP Development Application.

Although matters relating to visual impact were not specifically raised by Council as

part of its formal information request, Westlink wishes to include more detailed information to assist Council in making an informed decision on the project. The additional information that has been acquired is outlined below.

1.2.1 Measured Foreground Tree Heights

The original REF assumed tree heights of 15m for foreground vegetation.

A detailed survey of foreground vegetation has now been conducted which measured tree heights of up to 30m and determined the average tree height to be approximately 25m. This will have a significant impact on the screening of some parts of the development.

Refer to section 4.2 of the Survey Report located in Attachment A for further detail.

1.2.2 WPP Site Design Additions (Increase in Bund Height)

The proposed bund which surrounds the WPP site is to be increased from RL 114 to RL120 and is designed to more effectively utilise cut material extracted during construction of the WPP base. This increase in bund height will assist in better screening the development from view, as the height of trees planted on the bund as part of the revegetation process will be increased by approximately 6m.

1.2.3 Updated Growth Rate Data

The original REF made provision for tree species with growth rates of approximately 1.8 to 3.6 metres annually for revegetation and visual screening purposes. The Detailed Landscape Plan, prepared as part of this submission, specifically proposes spotted gums as the primary vegetation to be used to provide additional screening of the taller elements of the development. Spotted gums are a native local species on Council's approved species list for revegetation. The Queensland DPI propose, that under appropriate conditions, spotted gum growth rate of at least 3.3m/yr can be achieved in the Gatton region (refer to Attachment D for further detail).

This growth rate has now been assumed for revegetated parts of the site for the purposes of the visual impact analysis. The revegetation process will be supported by irrigation from onsite dams to assist trees in becoming established.

2. Additional Information Provided

2.1 Overview

In light of the additional information now available, Westlink has commissioned further quantitative assessments in order to assist Council to confirm the extent of the visual impact from the proposed development.

The additional work includes:

- ▶ A survey report which utilises additional survey data to predict the visual impact of the proposed development on the surrounding area;
- ▶ Detailed landscape designs and management plans designed to minimise the impact of the WPP on the surrounding area; and
- ▶ Reassessment of the visual impact of the proposal from certain vantage points, including reproduction of photomontages incorporating the findings from the survey and reflecting implementation of the proposed landscape designs and management plans.

This additional work applies an increased level of scientific rigour to the visual assessment process and provides objectively measured data to deliver a higher level of accuracy in determining the visual impact of the WPP on the surrounding area. The extent of this additional work is further detailed below.

2.2 Landscape Management and Revegetation Plan

In order to assess the impact of using additional vegetation to effectively minimise the visual impact of the WPP on the surrounding area, a detailed Landscape Management and Revegetation Plan (LMRP) has been prepared as part of this submission.

The LMRP provides details regarding:

- ▶ species to be used in the revegetation process;
- ▶ identification of existing vegetation to be retained;
- ▶ roles and responsibilities for rehabilitation work;
- ▶ management of risks for flora rehabilitation work;
- ▶ management of risks for weed management;
- ▶ revegetation techniques;
- ▶ planting regime;
- ▶ maintenance program for rehabilitation work;
- ▶ erosion and sediment control;

- ▶ weed control and management; and
- ▶ potential impacts and mitigation measures for rehabilitation.

These details will inform the process for reinstating vegetation throughout the operational, construction and maintenance phases of the project. This information is designed to provide Council with a level of surety that the methods of screening for the purposes of reducing visual impact are able to be effectively implemented. The LMRP also contains the following subordinate document and drawings which provide technical details of how the proposed measures are to be implemented during the construction phase of the development:

- ▶ Landscape Detail Design Planting Layout 1 Drawings 41-22282-L001 to 41-22282-L005; and
- ▶ Detailed Landscape Specification Document.

Please refer to Attachment C and Attachment D of this report for further detail.

2.3 Updated Visual Impact Assessment and Revised Visual Photomontages

Determination of visual impact can be subjective and is often dependent on numerous factors (as described in the REF, Appendix F - Visual impact and Landscape Assessment). In order to minimise the reliance on subjective criteria, the visual assessment employed objective analysis where possible (e.g. the Visual Impact Assessment is based on well established visual modification and viewer sensitivity models).

Given the new information available (outlined in section 1.2 of this report), an updated Visual impact Assessment and revised photomontages have been produced for those vantage points affected by the additional analysis.

The visual montages amended as part of this addendum report are as follows:

- ▶ Vantage Point 3 - Warrego Highway (Heading East);
- ▶ Vantage Point 6 - Golf Course;
- ▶ Vantage Point 7 - Spencer St;
- ▶ Vantage Point 8 - Gatton Racecourse;
- ▶ Vantage Point 9 - Old Toowoomba Rd and Parklea Dr; and
- ▶ Vantage Point 10 - Dwyer Road

It is important to note that the plant concept design and the vantage points assessed are unchanged from the original VIL Report contained in the REF. The revised photomontages are contained with Attachment B.

2.4 Survey Report

To further refine the information provided in the REF, a detailed Survey Report has been completed (refer Attachment A of this report). The following discussion outlines the survey activities.

The Survey Report includes a series of cross-sections for each of the relevant vantage points. These vantage points are those that the original VIL Assessment identified as having residual visuals at locations around Gatton within a 4km distance from the Development Site. The ground profile for each elevation was modelled using the Department of Environment and Resource Management (DERM) digital elevation model and the contour plan discussed above. The extent of vegetation was determined using aerial photography of the area produced by DERM.

The vantage point sections in the survey report have also factored proposed landscaping in accordance with the LMRP prepared for the development. Vegetation growth rates were based on both observed growth rates of Spotted Gum (an existing species on the Development Site), and the Queensland DPI Hardwoods advice Plantation species profiles for Spotted Gums (refer to Attachment E for further detail). The eye height for each vantage point was determined as about 1.5 metres above the Digital Elevation Model (DEM) surface.

3. Key Findings

3.1 Original Findings

The Visual Impact and Landscape (VIL) Assessment provided in Chapter 12 of the REF was based on well accepted methods for impact assessment (Zube et al. 1975, Williamson 1979, Williamson 2004), modified as appropriate to meet the requirements of this study.

The following steps were undertaken as part of this process:

- ▶ Identification of potential landscape alterations;
- ▶ GIS viewshed analysis to identify those areas where the WPP can be seen from;
- ▶ Development of photomontages for the WPP from various vantage points; and
- ▶ A visual impact assessment based on visual modification and viewer sensitivity.

Of particular note the assessment reviewed impacts on twelve (12) vantage points in the following localities:

- ▶ Warrego Highway;
- ▶ Residential Areas and Activities to the East;
- ▶ Residential Areas and Activities to the West
- ▶ Residential Areas and Activities to the North; and
- ▶ Residential Areas and Activities to the South.

The assessment concluded that:

- ▶ five (5) of the assessed vantage points would not view the WPP; and
- ▶ vantage points that would experience the WPP as a component of the background would experience a Moderate to Low visual impact.

It was determined that with design mitigation measures, such as sympathetic building design and landscaping, the proposed WPP is not expected to be particularly conspicuous against the background and is not expected to significantly intrude into the view. Overall it was assessed that after adoption of mitigation measures, the proposed WPP will have a Low impact on the visual amenity of the area.

It must be noted that this addendum report does not seek to contradict the findings of the original VIL Assessment Report. It merely seeks to provide updated information and additional detail which has been newly acquired, to further demonstrate that the proposed development will have a minimal visual impact.

3.2 Survey Report Findings

From each vantage point, cross-sections have been calculated to the tallest structures

being exhaust stack and air intakes for Gas Turbine 1 (Stage 1) and Gas Turbine 6 (Stage 3). The finished height of RL144 has been used for each exhaust stack. Taking into consideration the site design and the surveyed information outlined previously, elevations looking towards the WPP have been developed for each of the vantage points. These have been developed to reflect a tree growth height in revegetated areas of 23.1m after 7 years of growth, as opposed to a fully mature vegetation screening height of approximately 25-30m.

The revised photomontages show that the visual impact of the development is negligible, with the facilities being fully screened upon completion of Stage 3 (i.e. after 7 years of growth); and that view sheds from existing sensitive receivers will not be detrimentally affected.

Refer to Appendix 2 of the Survey Report located in Attachment A of this report for further detail.

3.3 Landscape Management and Rehabilitation Plan Recommendations

A Landscape Management and Revegetation Plan (LMRP) has been produced to govern the management and reinstatement of vegetation in specified areas, throughout the operation, construction and maintenance phases of the Westlink Power Project (WPP). The aim of plan is to:

- ▶ restore and enhance disturbed areas in the post construction phase;
- ▶ maximise survival opportunities for areas of retained vegetation and newly rehabilitated areas; and
- ▶ improve the ecological values of the site by providing a naturally vegetated weed-free area with habitat complexity, food resources and linkages to other areas.

Implementation of this plan will allow vegetation to be re-established on site in a manner that integrates with surrounding bushland. This will assist in achieving effective screening of the development within the 7 year development timeframe. A key feature of this revegetation process is the creation of a natural buffer with aesthetic characteristics resembling natural bushland, which will greatly assist in diminishing the visual impact of the proposal, whilst promoting on-site biodiversity. A key aspect of this plan is to create a varied vegetation community which not only grows to a sufficient height to screen the taller elements of the facilities, but provides an understorey which provides enough density to adequately screen lower elements as well. Accordingly, in addition to tall, fast growing gums, this plan proposes understorey vegetation species with varied growth heights and dense foliage.

Refer to Attachment C - Landscape Management and Rehabilitation Plan of this report for further details.

3.4 Updated Visual Assessment and Montages

Revised photomontages for a number of vantage points have been produced based on updated information, including:

- ▶ average tree heights of up to 25m for existing vegetation (refer the Survey Report in Attachment A);
- ▶ increasing the bund surrounding the plant site to RL 120 (refer LMRP in Attachment C); and
- ▶ adopting growth rates of approximately 3.3m/yr for Spotted Gums (refer Queensland DPI document “*Hardwood Advice Plantation Species Profile - Spotted Gums*” in Attachment E).

Changes to each relevant vantage point photomontage are outlined below.

3.4.1 Vantage Point 3 - Warrego Highway (Heading East)

Along the southern boundary of the adjacent allotment to the west of the WPP, the existing vegetation (approximate tree height of 15-20m on ground level RL105-110), combined with other scattered vegetation in the intervening ground, will provide complete screening of the plant from this vantage point.

Please refer to Figure A3 located in Attachment B of this report for the amended photomontage which supports this conclusion.

3.4.2 Vantage Point 6 - Golf Course

The existing vegetation on the intervening ground immediately south of the Warrego Highway (approximate tree height of 25m on ground level RL115-120), will provide complete screening of the plant from this vantage point.

Please refer to Figure A6 located in Attachment B of this report for the amended photomontage which supports this conclusion.

3.4.3 Vantage Point 7 - Spencer St

The existing vegetation on the intervening ground immediately south of the Warrego Highway (approximate tree height 25m on ground level RL105-115), will provide partial screening of the plant.

However, when screening from existing vegetation is combined with the proposed revegetation plans as described in the Section 3.3, the plant will be fully screened from this location by the completion of Stage 3.

A summary of the degree to which the stack structures would be visible from this vantage point over time is provided in Table 1.

Table 1 Visible portion of stack structures – VP7

Phase	Vertical portion visible (approximate)
Stage 1 - 0 years	3m
Stage 2 - 4 years	3m
Stage 3 – 7 years	0m

At the completion of Stage 1, the top 3 meters of the exhaust stacks protrude above the vegetation. At the completion of Stage 2 this is unchanged, as existing vegetation in the line of sight of the new turbine stacks is at a lower RL, but is compensated for by additional growth in revegetated areas around the site.. As the revegetated areas further develop the plant becomes fully screened by the completion of Stage 3.

Please refer to Figure A7 located in Attachment B of this report for the amended photomontage which supports this conclusion.

3.4.4 Vantage Point 8 - Gatton Racecourse

The existing vegetation on the intervening ground immediately south of the Warrego Highway (approximate tree height 25m on ground level RL100-110), will provide partial screening of the plant.

However, when screening from existing vegetation is combined with the proposed revegetation plans as described in the Section 3.3, the plant will be fully screened from this location by the completion of Stage 3.

A summary of the degree to which the stack structures would be visible from this vantage point over time is provided in Table 2.

Table 2 Visible portion of stack structures – VP8

Phase	Vertical portion visible (approximate)
Stage 1- 0 years	4m
Stage 2- 4 years	1m
Stage 3- 7 years	0m

As described in Section 3.4.3, as the revegetation around the WPP site becomes established it progressively screens residual visible elements of the WPP such that the facilities are fully screened by the completion of Stage 3.

Please refer to Figure A8 located in Attachment B of this report for the amended photomontage which supports this conclusion.

3.4.5 Vantage Point 9 - Old Toowoomba Rd and Parklea Dr

The existing vegetation on the intervening ground immediately south of the Warrego Highway (approximate tree height 25m on ground level RL100-105), will provide partial screening of the plant.

However, when screening from existing vegetation is combined with the proposed revegetation plans as described in the Section 3.3, the plant will be fully screened from this location by the completion of Stage 3.

A summary of the degree to which the stack structures would be visible from this vantage point over time is provided in Table 3.

Table 3 Visible portion of stack structures – VP9

Phase	Vertical portion visible (approximate)
Stage 1- 0 years	10m
Stage 2- 4 years	2m
Stage 3- 7 years	0m

As described in Section 3.4.3, as the revegetation around the WPP site becomes established it progressively screens residual visible elements of the WPP such that the facilities are fully screened by the completion of Stage 3.

Please refer to Figure A9 located in Attachment B of this report for the amended photomontage which supports this conclusion.

3.4.6 Vantage Point 10 - Dwyer Road

The existing vegetation on the intervening ground immediately south of the Warrego Highway (approximate tree height of 25m on ground level RL115-120), will provide complete screening of the plant from this vantage point.

Please refer to Figure A10 located in Attachment B of this report for the amended photomontage which supports this conclusion.

3.5 Updated Visual Impact Summary

The information outlined in Section 3.4 above has a significant bearing on the visual impact ratings for the vantage points discussed above. Accordingly, an updated visual impact rating has been produced for each of these vantage points prior to and post implementation of the proposed mitigation measures (refer Table 7 and Table 5). These ratings supersede those contained in the REF. Vantage points for which revised photomontages have not been produced are shaded grey in the tables. This assessment of visual impact has been undertaken in accordance with the methodology described in Section 2.2.3 of the REF.

Table 4 Updated Visual Impact Summary - prior to mitigation

Vantage Point	Viewer Type	Context of View	Period of View	Number of Viewers	Distance	Visual Modification	Sensitivity of View	Visual Impact Rating
1	Motorist, tourist	Other roads, views from highway (east bound)	Short	High	500 metres	Medium	Moderate	Moderate
2	Motorist, tourist	Other roads, views from highway (west bound)	Short	High	330 metres	Low	Moderate	Low
3	Motorist, tourist, residential	Views from highway (east bound)	Short	High	1,200 metres	Low	Low	Low
		Rural residential outlook	Long	Low		Low	High - Moderate	Moderate - Low
4	Residential	Rural residential outlook	Long	Low	1,000 metres		WPP will not be visible	
5	Residential	Rural residential outlook	Long	Low	1,750 metres		WPP will not be visible	
6	Recreational	Recreational area, view from golf course	Medium	Moderate	3,000 metres		WPP will not be visible	
7	Residential	Low to medium density residential outlook	Long	Moderate	2,500 metres	Low	Moderate	Low
8	Recreational	Recreational area, view from racecourse	Medium	Moderate	2,500 metres	Low	Moderate	Low
9	Residential	Low to medium density residential outlook	Long	Low	3,000 metres	Low	Moderate	Low
10	Residential	Low to medium density residential outlook	Long	Low	1,900 metres		WPP will not be visible	
11	Residential	Rural residential outlook	Long	Low	1,000 metres		WPP will not be visible	
12	Residential	Rural residential outlook	Long	Low	1,450 metres		WPP will not be visible	

Table 5 Updated Visual Impact Summary - post-implementation of mitigation measures

Vantage Point	Viewer Type	Context of View	Period of View	Number of Viewers	Distance	Visual Modification	Sensitivity of View	Visual Impact Rating (at ~ year 7)
1	Motorist, tourist	Other roads, views from highway (east bound)	Short	High	500 metres	Low	Moderate	Low
2	Motorist, tourist	Other roads, views from highway (west bound)	Short	High	330 metres	Low	Moderate	Low
3	Motorist, tourist, residential	Views from highway (east bound)	Short	High	1,200 metres		WPP will not be visible	
		Rural residential outlook	Long	Low				
4	Residential	Rural residential outlook	Long	Low	1,000 metres		WPP will not be visible	
5	Residential	Rural residential outlook	Long	Low	1,750 metres		WPP will not be visible	
6	Recreational	Recreational area, view from golf course	Medium	Moderate	3,000 metres		WPP will not be visible	
7	Residential	Low to medium density residential outlook	Long	Moderate	2,500 metres		WPP will not be visible	
8	Recreational	Recreational area, view from racecourse	Medium	Moderate	2,500 metres		WPP will not be visible	
9	Residential	Low to medium density residential outlook	Long	Low	3,000 metres		WPP will not be visible	
10	Residential	Low to medium density residential outlook	Long	Low	1,900 metres		WPP will not be visible	
11	Residential	Rural residential outlook	Long	Low	1,000 metres		WPP will not be visible	
12	Residential	Rural residential outlook	Long	Low	1,450 metres		WPP will not be visible	

4. Conclusion

This report forms an Addendum to the REF and outlines the findings of a number of updated studies completed to provide further details on visual amenity impacts from the proposed development. The Survey Report provides further detail which supports the conclusion reached in the REF that the proposed development will have a low impact on the visual amenity of the surrounding area. To further assist Council, new photomontages, which reflect the findings of this Survey Report and incorporate the new landscape management plan and designs, have now been produced.

It must be recognised that these images are not intended to be accurate down to minor details, but rather have been developed to show the scale and form of potential visual impacts.

To demonstrate that landscaping and revegetation measures will be effectively implemented as part of the development process, a Landscape Management and Revegetation Plan has also been prepared as part of this submission.

With this information, it is anticipated that Council will have sufficient detail to conclude that the development will have a negligible visual impact on the surrounding area.

DRAFT ONLY*

Attachment A
Survey Report

Westlink Pty Ltd

Westlink Power Project

Survey Report

Simon Baker Registered Surveyor 2048 (Cadastral and Engineering)

December 2009

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1 INTRODUCTION

In response to the rapidly growing demand for electricity, Westlink Pty Ltd (Westlink) is proposing a staged development of a natural gas-fired power station at a site north of Gatton in South-East Queensland referred to as the Westlink Power Project (WPP).

The proposed WPP is to be located on a parcel of land near the township of Gatton; approximately 90 km west of Brisbane and approximately two kilometres north of Gatton, immediately north of the Warrego Highway on Fords Rd, Adare.

On the 4th of September 2009, Westlink lodged with the Lockyer Valley Regional Council (LVRC) a Development Application (DA) complete with a detailed Review of Environmental Factors (REF) for the WPP. Specifically, the DA is over Lot 191 on Crown Plan CSH2361 situated in the County of Cavendish, Parish of Lockyer contained in Certificate of Title, Title Reference 17000028 and is seeking a:

- Development Permit for a Material Change of Use (MCU) for the Electricity Generation Infrastructure;
- Development Permit for Environmentally Relevant Activity (ERA) No.14; and
- Development Permit for Operational Work (OW) for Vegetation Clearing.

The proposed use is more specifically defined as a natural gas-fired power station, consisting of the following elements:

- Staged installation of six open-cycle gas turbines;
- An electrical switchyard;
- A gas receiving unit;
- An operations building, workshop, administration building and car park; and
- Associated safety and monitoring equipment.

The proposed WPP is to be built in stages, in line with growing demand for electricity. Subject to development approval, the first stage of the project is expected to consist of 200 to 300 MW of generating capacity, with future expansion leading to a total project comprising up to 1,000 MW of open cycle gas turbines.

2 PURPOSE

The purpose of this Report is to summarise the findings of a number of detailed survey assessments of the proposed Westlink Power Project (WPP) and adjacent areas.

Specifically the survey activities undertaken were required to produce:

- a detailed 0.5m interval contour plan of the proposed Development Site;
- an assessment of the existing vegetation within and nearby to the Development Site; and
- a series of cross sections within a 4km distance from the Development Site to demonstrate the effectiveness of the existing vegetation and proposed new vegetation in screening the WPP from surrounding areas.

3 THE DEVELOPMENT SITE SURVEY PLAN (0.5M CONTOUR)

A detailed survey of the Development Site was carried out between February and March 2009.

The survey was performed using trigonometric methods with a nominal point separation of 15m over the surveyed area. The level datum for the survey is AHD derived vide PSM68599 (RL103.617), and the meridian is MGA 94 zone 56 determined by post process GPS.

The surveyed data was then reduced using a 12D model. When reduced, a TIN was created and 0.5 metre contours extracted using the same software.

A plot of the 0.5m contours was generated from the field survey with contours in cyan at 0.5m intervals, and contours in magenta at 5m intervals (refer Appendix 1 - Site survey (0.5m contours)).

4 VANTAGE POINT ASSESSMENT

Information regarding the location of the potential features of the WPP plant structures were obtained from the GHD plant layout (refer Appendix 5 – WPP Plant Layout) and have been included in the various cross sections.

4.1 THE TERRAIN

The ground profile for each cross section has been modelled using both: the Department of Environment and Resource Management (DERM) digital elevation model (DEM) map sheet 9342-14; and the detail survey plan for the Development Site as described in Section 3.

The State of Queensland (DERM) is the copyright owner of the DEM information which includes the following Disclaimer:

- The State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws."

The vertical datum for the detail survey of the site is AHD derived vide PSM 68599 (RL103.617). The DEM is AHD derived and was verified against the following PSM's; 139320, 10387, 36084, 1890, 1915, and 1971. In clear areas the variance between the recorded PSM level and that determined by the DEM was approximately 1metre.

4.2 EXISTING VEGETATION

The extent of vegetated areas was determined using aerial photography of the area contained in DERM map sheets: 9342-1441-2001; 9342-1442-2001; 9342-1443-2001; and 9342-1444-2001. This imagery is dated June 2001 and the State of Queensland (DERM) is the Copyright owner of this information which includes the following disclaimer:

- The State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws."

The extent of the vegetation in the vicinity of the WPP plant (refer Appendix 5 – WPP Plant Layout) was surveyed in November 2009 to establish general tree heights, sizes and densities. This vegetation was found to consist mainly of Gum and Iron Bark regrowth with a trunk diameter of less

than 200mm. Larger trees with a trunk diameter of about 300mm are scattered throughout, but the smaller regrowth dominates the area. The height of the vegetation in this area is generally 20m to 25m.

To the east of the site, the height of this more mature stand of vegetation about the Gas Compressor Station was observed to average above 25m with some of the Gums approaching 30m.

The trees on the existing dam wall near Fords Road (on the southern boundary of the site) again appeared to be reasonably young regrowth. These gums generally measured approximately 20m – 23m high and being young regrowth probably would have several metres further to grow.

Trees on the lot in the vicinity of the Energex substation measured on average approximately 25m in height.

The trees between the sewage treatment plant and the rubbish tip were measured to approximately 23m in height.

Existing tree heights were further verified by setting up a “total station” at VP6, VP7, VP8, and VP10, and observing the tree line along the visible ridges. When intersected with the ridge lines identified in the DEM the separation between the tree line and the ridge line was generally 25m.

Accordingly, an average tree height of 25m was adopted as the nominal tree height for existing vegetation in the cross sections discussed in section 4.6. Note in some cases a lesser height is shown where it was determined in the field that the height of vegetation was less than 25m. These areas are mainly directly in front of the existing dam wall and the vegetation along the East side of Lot 36 on RP205167.

4.3 LANDSCAPING

A landscaped bund included in the GHD plant layout drawing (refer Appendix 5 – WPP Plant Layout) is proposed to be constructed to RL120. New vegetation grown on the bund has been shown to a height of 23m (i.e. after 7 years of growth) which is a similar height to some of the existing (regrowth) vegetation.

Vegetation growth rates were based on both observed growth rates of existing species on or near the Development Site and a Department of Primary Industries publication which estimates achievable spotted gum growth rates of 3.3 meters or more per year for regions such as Gatton (refer GHD Visual Impact and Landscape Assessment Report – Addendum Appendix XXX).

Spotted Gum, Iron Bark, Bloodwood, and Moreton Bay Ash are native to the area. Spotted Gum and Iron Bark are the most prevalent.

4.4 EYE HEIGHT

The eye height for each vantage point was determined as about 1.5 metres above the DEM surface.

4.5 POWER PLANT HORIZONTAL AND VERTICLE TARGET

A series of cross section (elevations) were considered for locations around Gatton that potentially might have partial views of the WPP. Two plans showing the location of assessed vantage points

have been included in Appendix 2 – Vantage Points Plan View (Cadastral) and Appendix 3 – Vantage Points Plan View (Aerial).

The 30m exhaust stack and the 25m air intakes on the gas turbine have been shown at a height of RL144 and RL 139 respectively. The location and size of WPP structures has been extracted from the GHD plant layout (refer Appendix 5 – WPP Plant Layout).

4.6 VANTAGE POINT CROSS SECTIONS

Taking into consideration the site design and the surveyed information outlined previously, cross sections looking towards the WPP have been developed for each of the vantage points (refer Appendix 4 – Vantage Points (Cross Sections)).

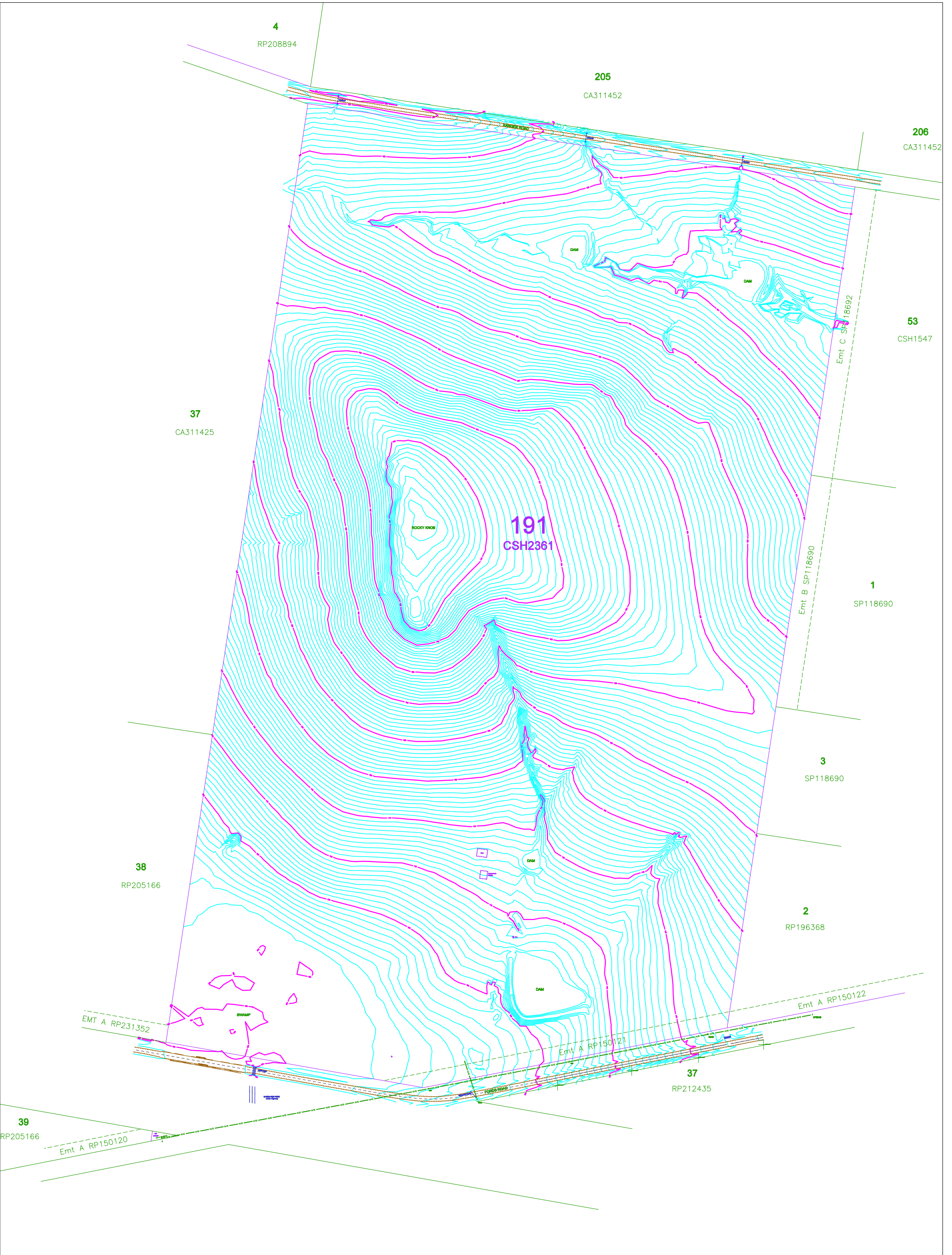
Each cross section produced demonstrates the profile between each vantage point through to the exhaust stack and air intake (the most prominent structures) for Gas Turbine 1 (reflecting the view of Stage 1) and similarly Gas Turbine 6 (reflecting the view of Stage 3).

The cross sections show that existing and planned vegetation will provide an effective screen from all vantage points assessed as having a potential view of the WPP.

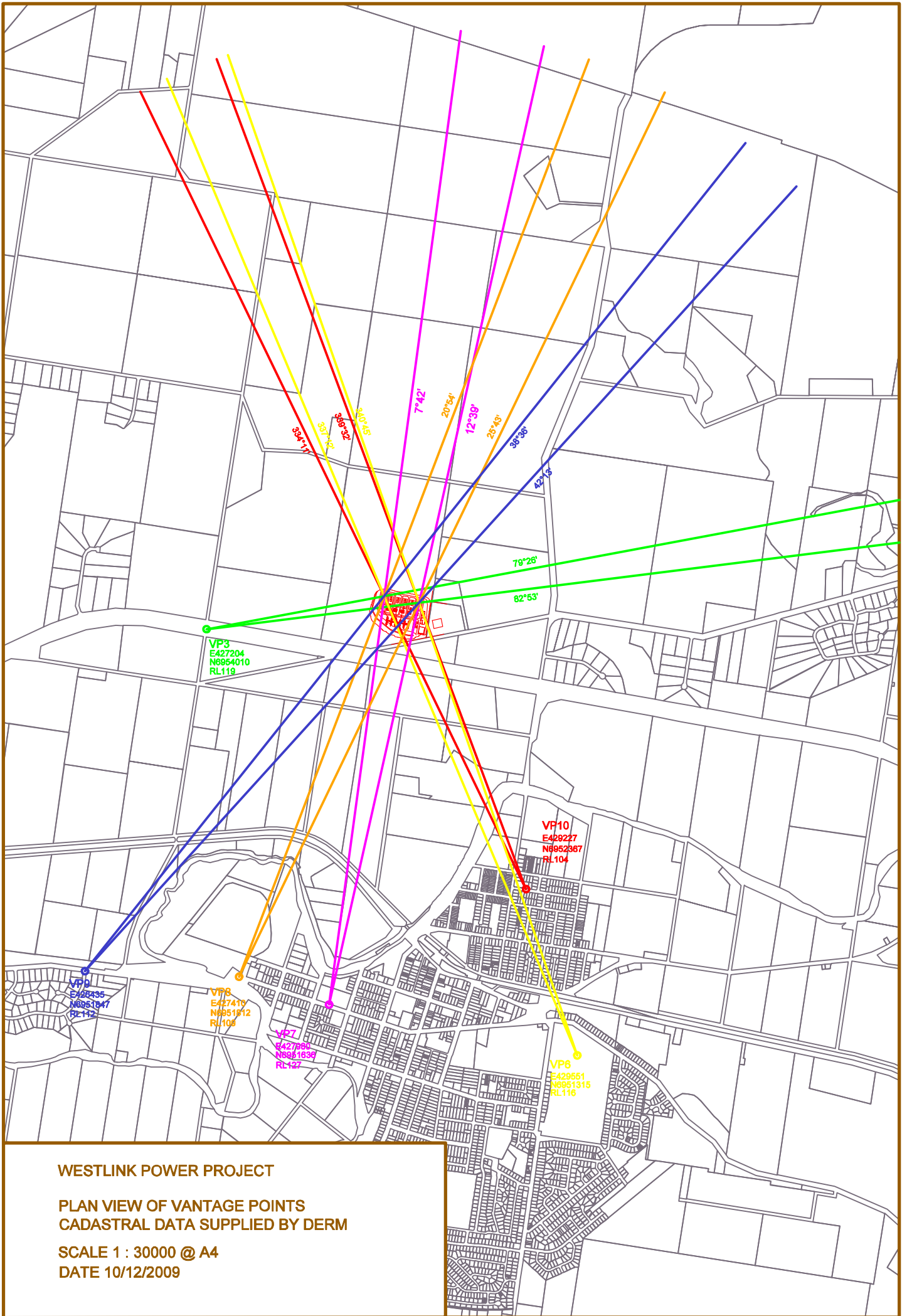
Simon Baker - Registered Surveyor 2048 (Cadastral and Engineering)

18th January 2010

Appendix 1 - Site survey (0.5m contours)



Appendix 2 – Vantage Points Plan View (Cadastral)

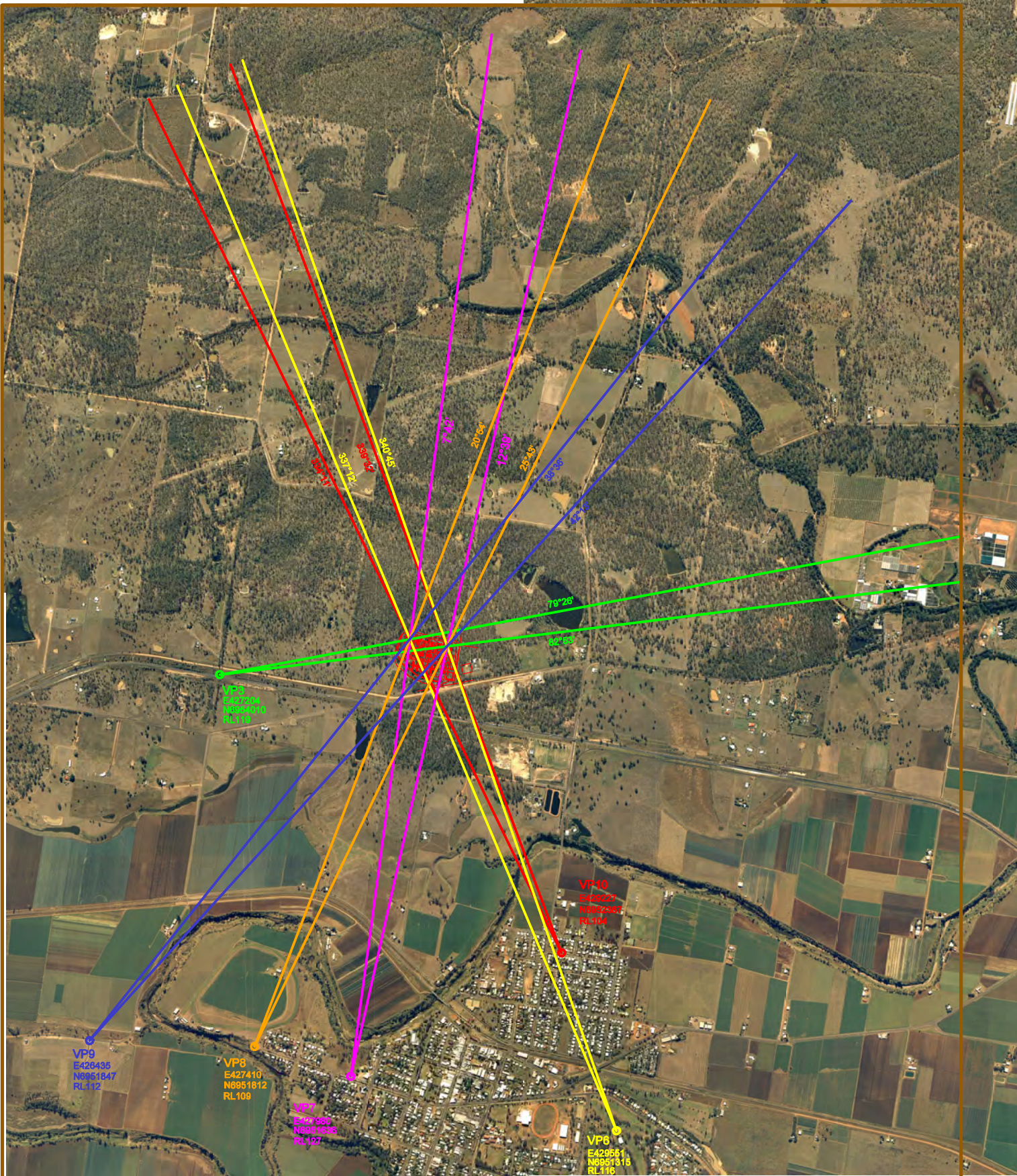


WESTLINK POWER PROJECT

**PLAN VIEW OF VANTAGE POINTS
CADASTRAL DATA SUPPLIED BY DERM**

**SCALE 1 : 30000 @ A4
DATE 10/12/2009**

Appendix 3 – Vantage Points Plan View (Aerial)

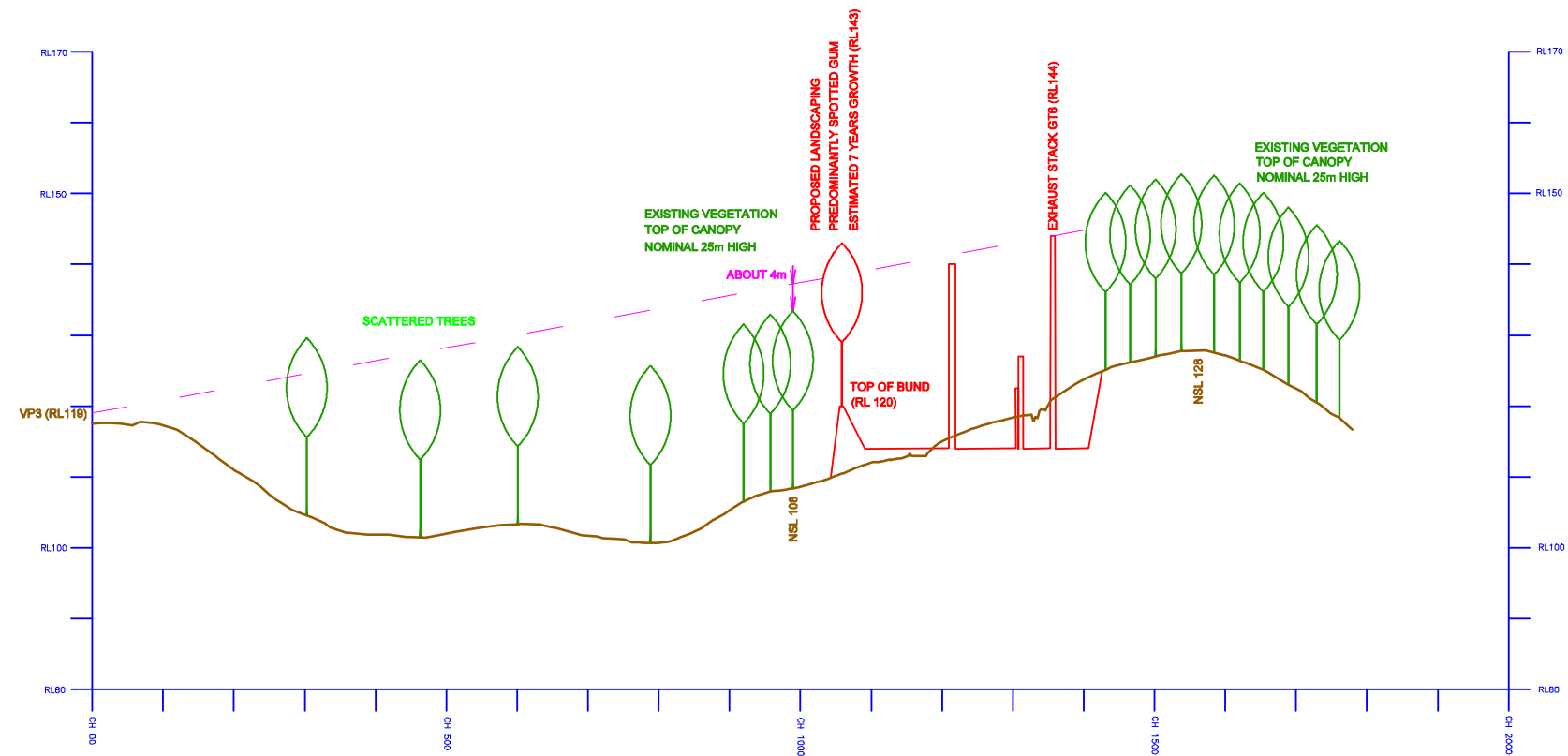
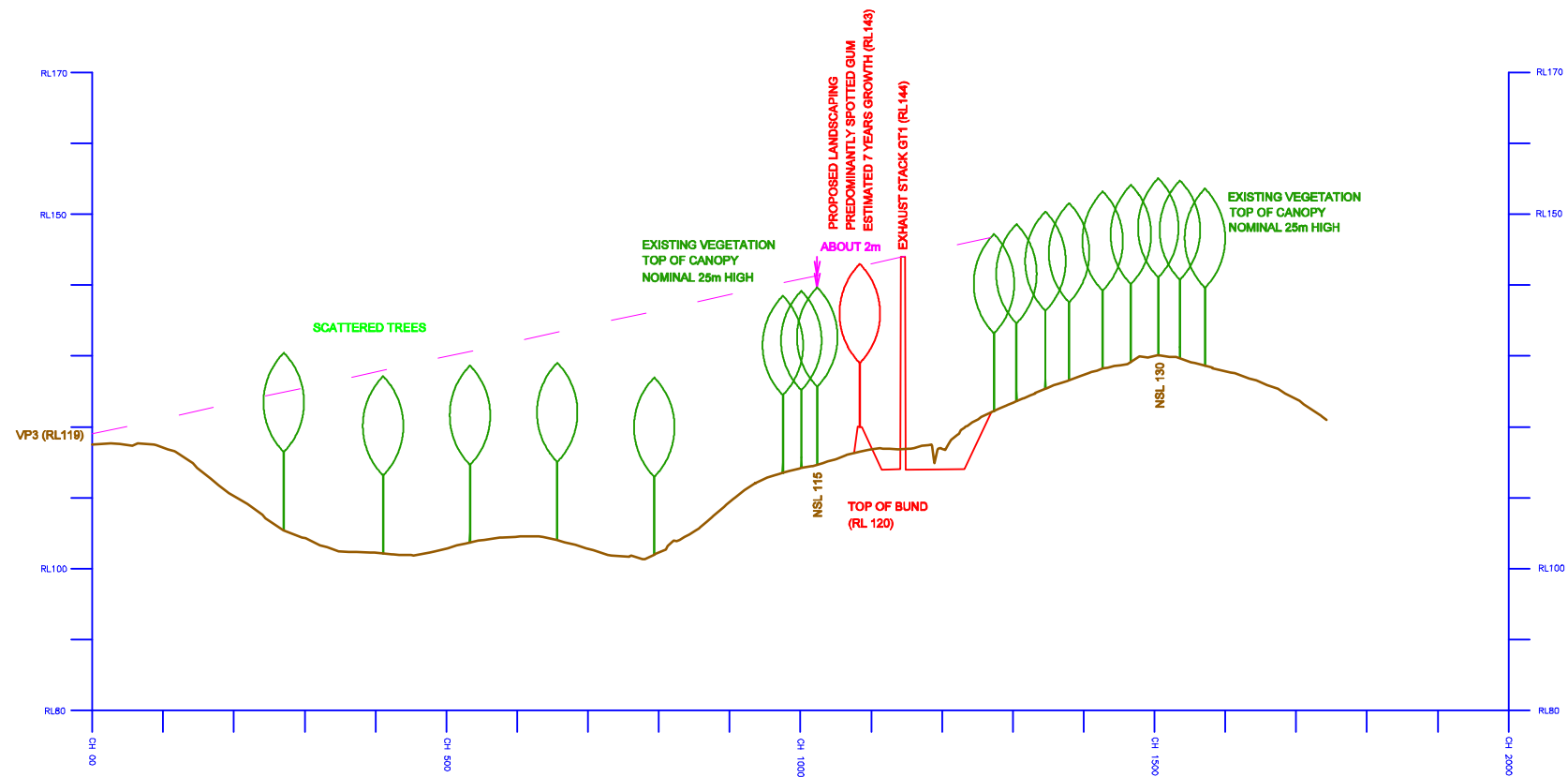


WESTLINK POWER PROJECT

**PLAN VIEW OF VANTAGE POINTS
AERIAL PHOTOGRAPHY SUPPLIED BY DERM**

**SCALE 1 : 30000 @ A4
DATE 10/12/2009**

Appendix 4 – Vantage Points (Cross Sections)



WESTLINK POWER PROJECT

SECTION OF VP3 TO GT1 and GT6

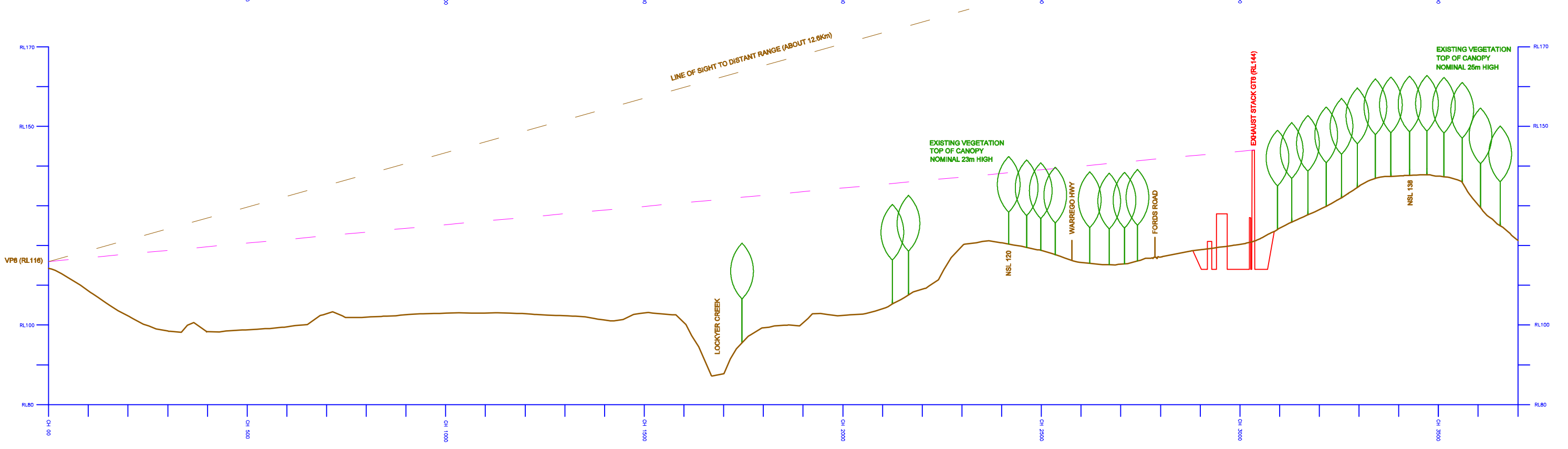
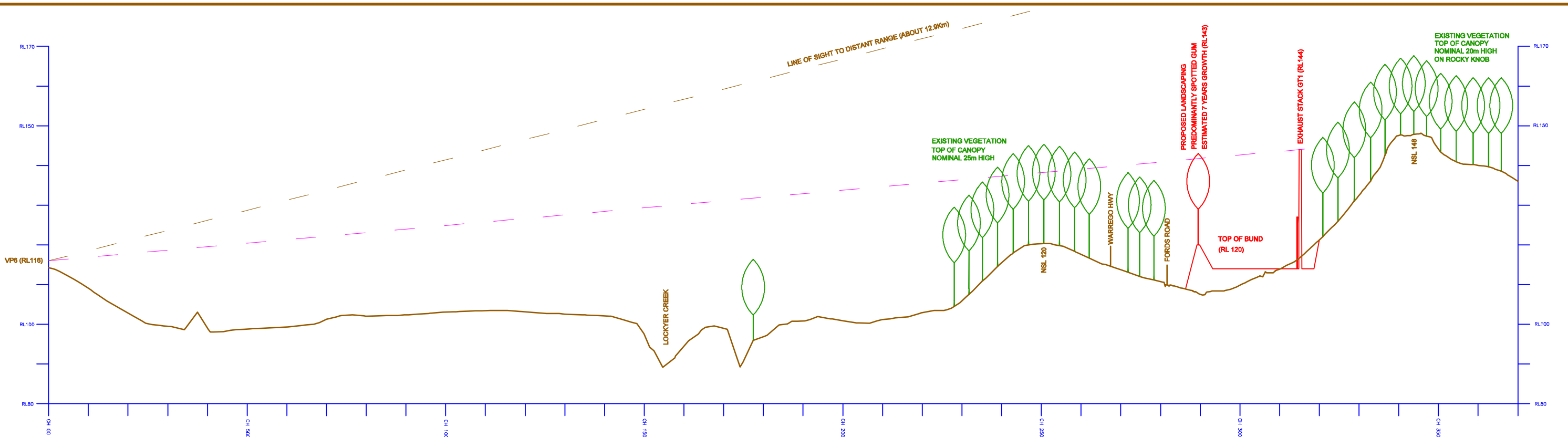
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LEVEL DATUM AHD DERIVED

SCALE 1 : 10000 HORIZONTAL @ A3

SCALE 1 : 1000 VERTICAL @ A3

INFORMATION COMPILED FROM DERM DEM, DERM AERIAL PHOTOGRAPHY AND FIELD SURVEY



WESTLINK POWER PROJECT

SECTION OF VP6 TO GT1 and GT6

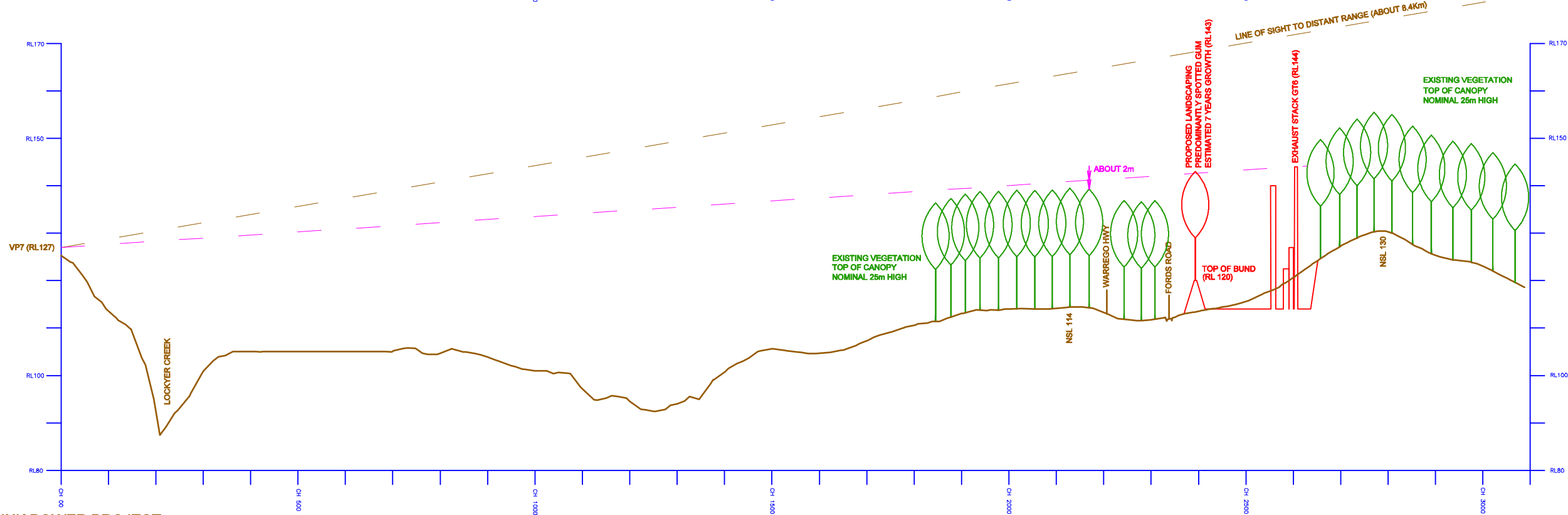
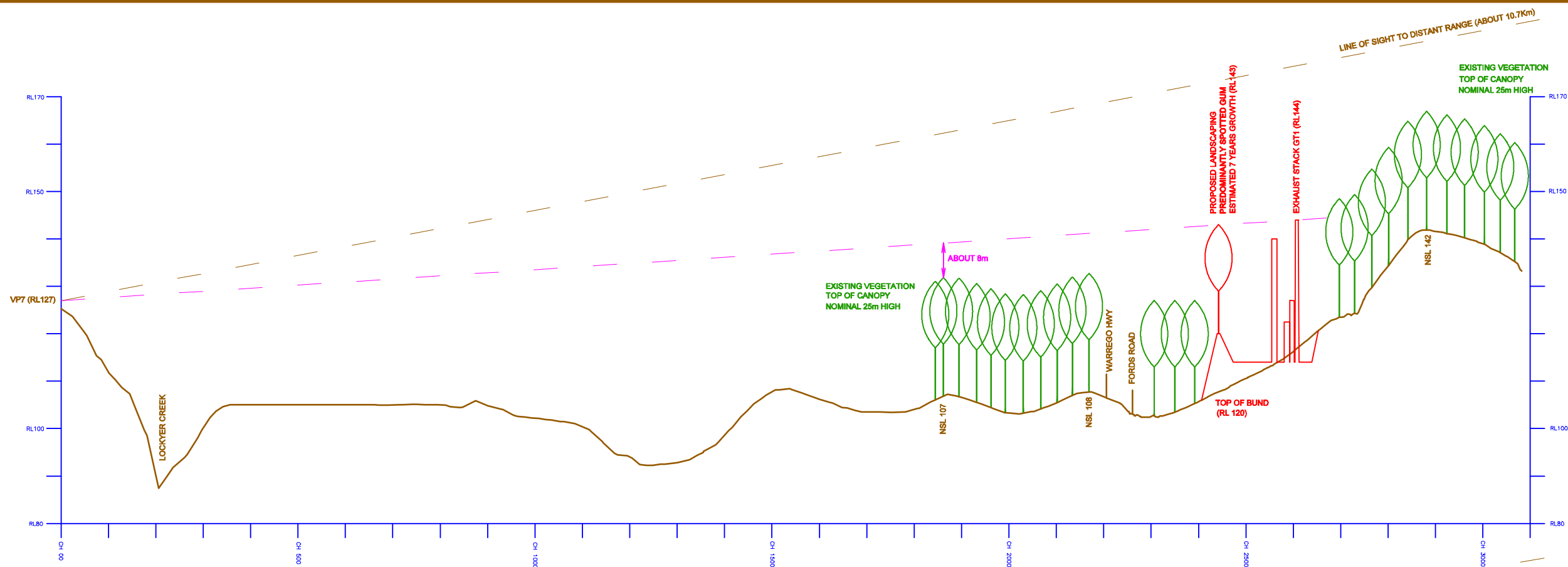
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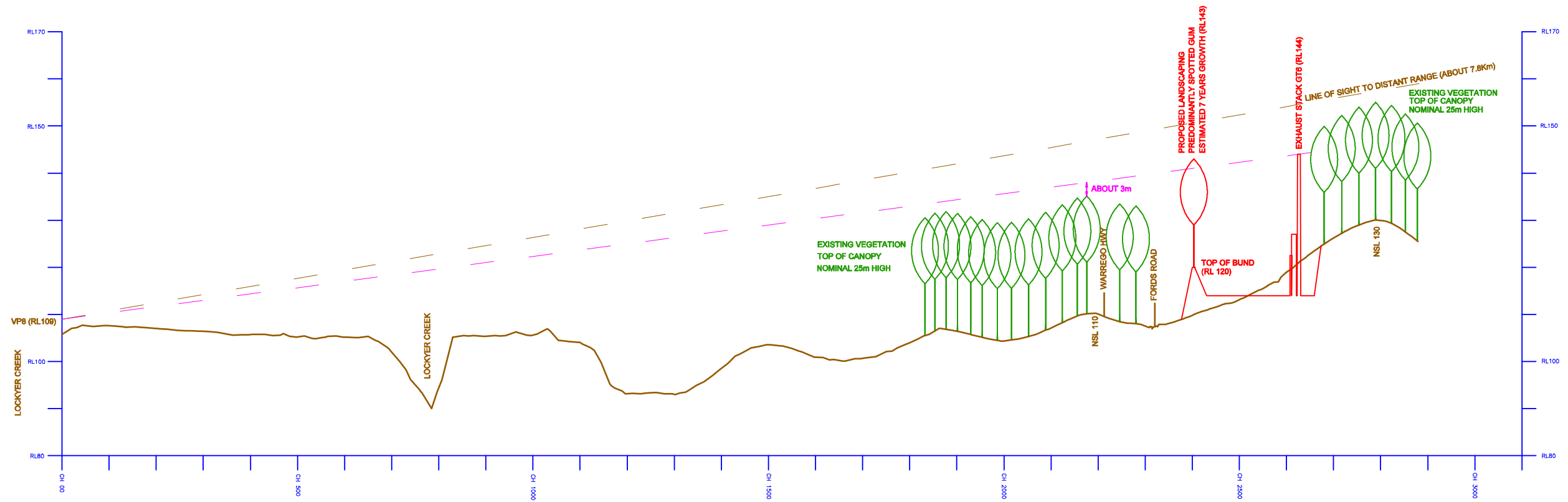
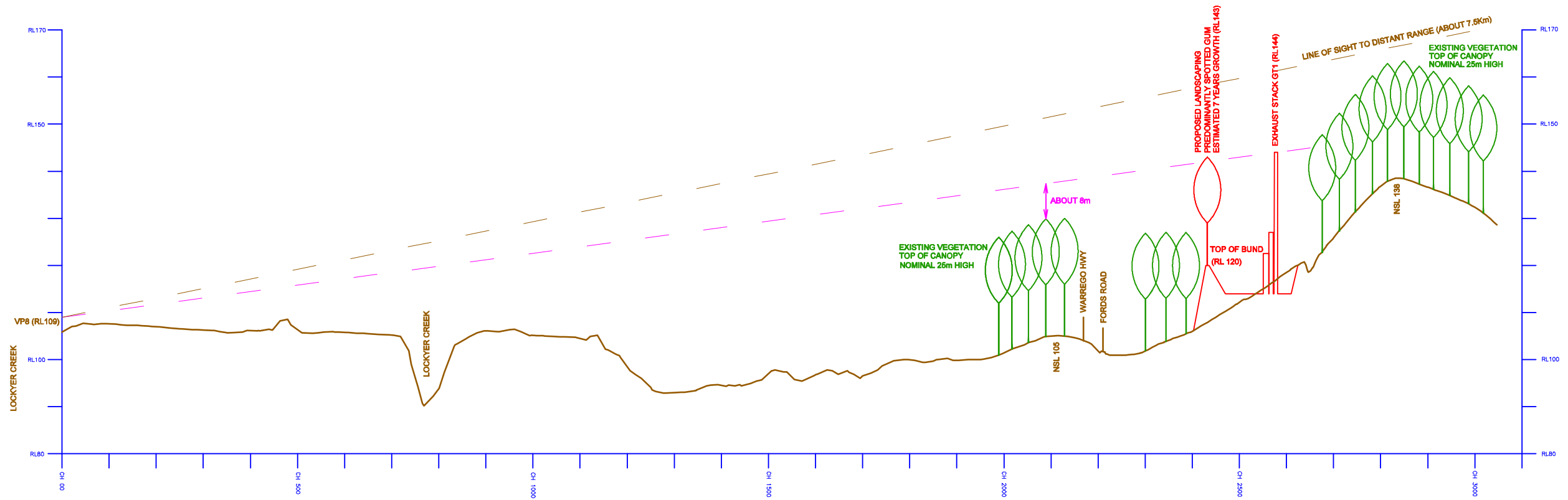
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INFORMATION COMPILED FROM DERM DEM, DERM AERIAL PHOTOGRAPHY AND FIELD SURVEY



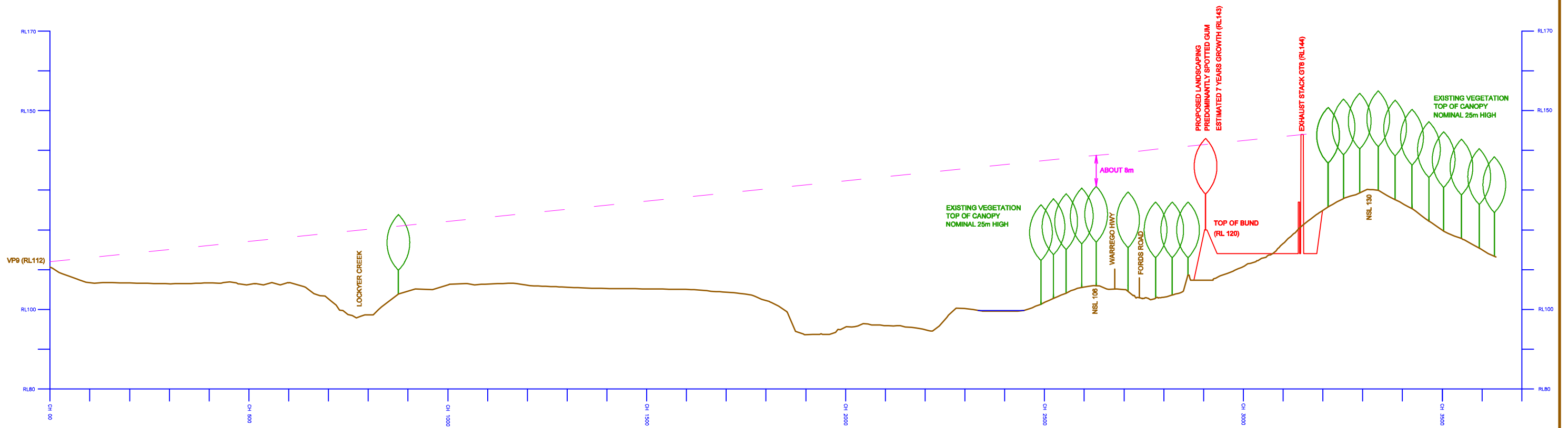
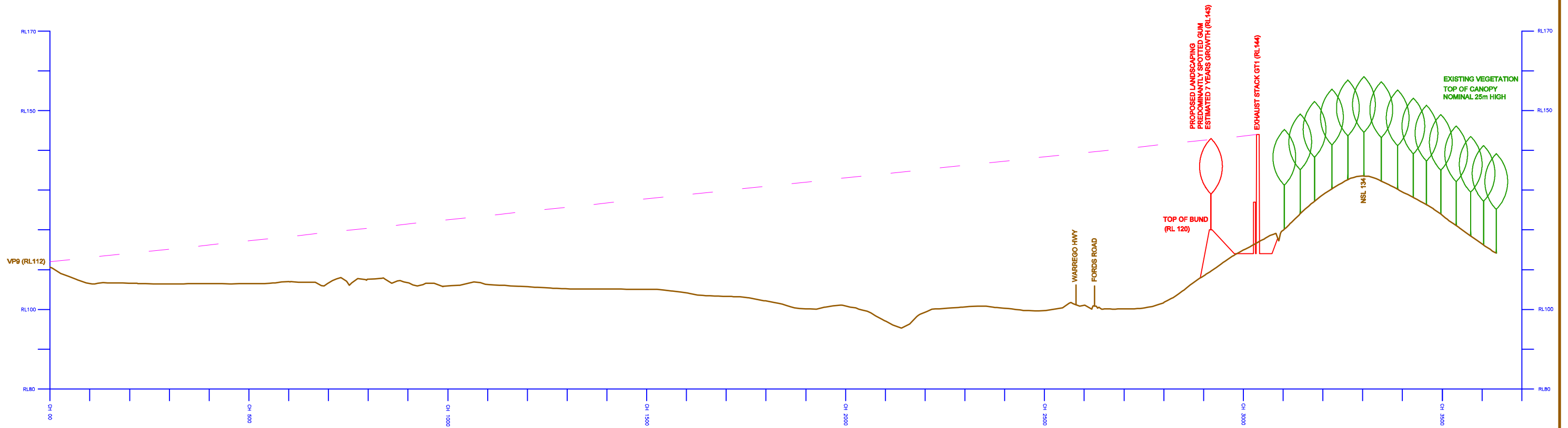
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 SECTION OF VP7 TO GT1 and GT6
 DATE: 1/12/2009

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 INFORMATION COMPILED FROM DERM DEM, DERM AERIAL PHOTOGRAPHY AND FIELD SURVEY



WESTLINK POWER PROJECT
SECTION OF VP8 TO GT1 and GT6
DATE: 1/12/2009

LEVEL DATUM AHD DERIVED
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SCALE 1 : 1000 VERTICAL @ A3
INFORMATION COMPILED FROM DERM DEM, DERM AERIAL PHOTOGRAPHY AND FIELD SURVEY



WESTLINK POWER PROJECT

SECTION OF VP9 TO GT1 and GT6

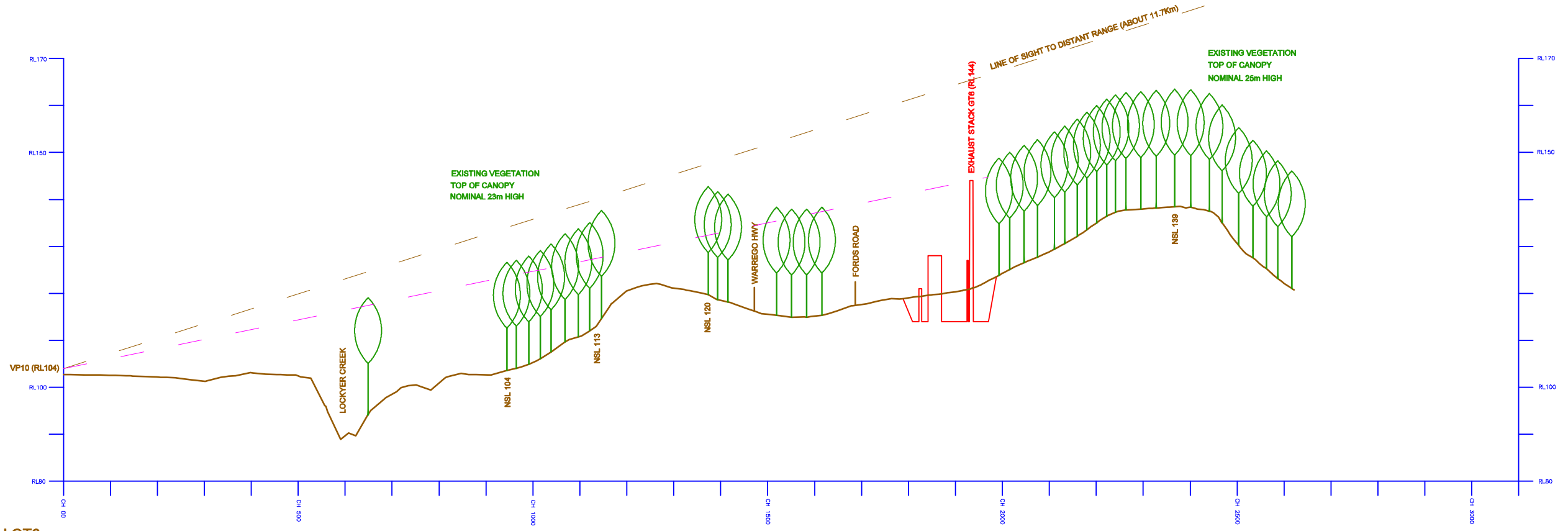
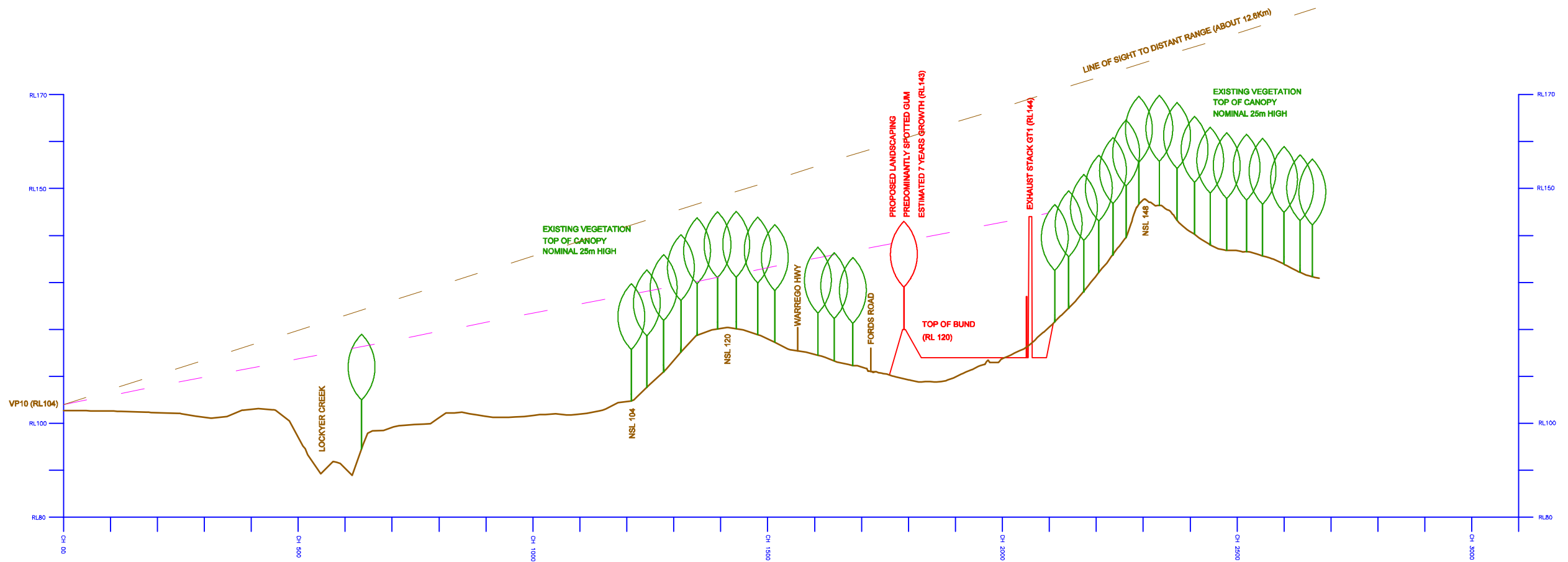
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LEVEL DATUM AHD DERIVED

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SCALE 1 : 1000 VERTICAL @ A3

INFORMATION COMPILED FROM DERM DEM, DERM AERIAL PHOTOGRAPHY AND FIELD SURVEY



WESTLINK POWER PROJECT

SECTION OF VP10 TO GT1 and GT6

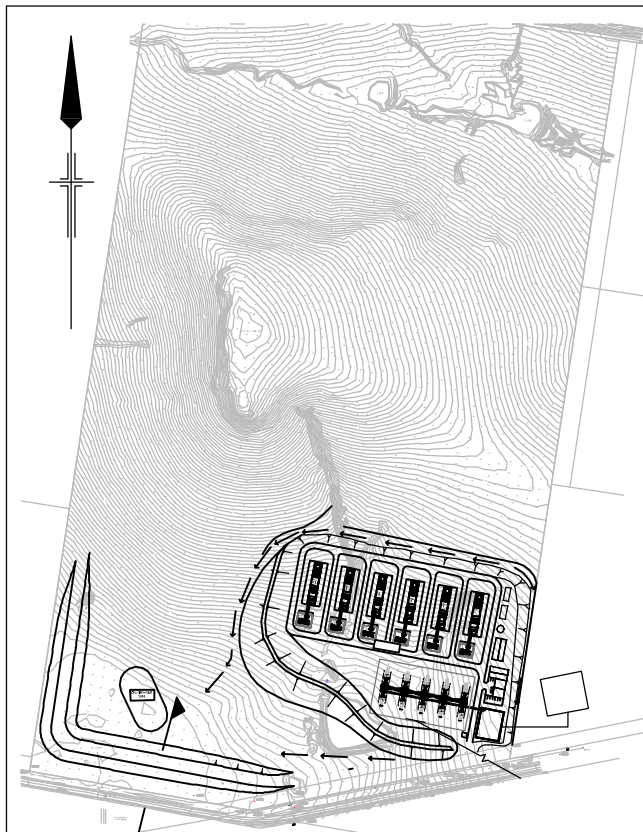
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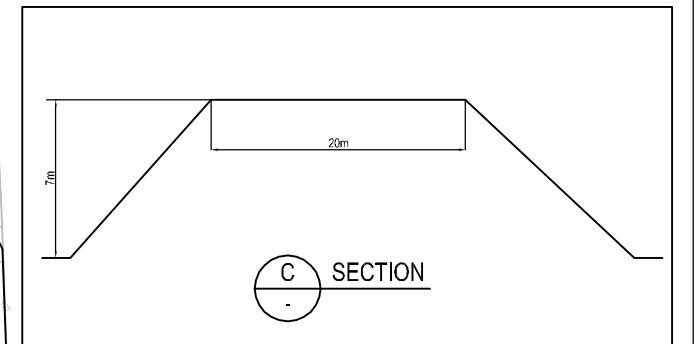
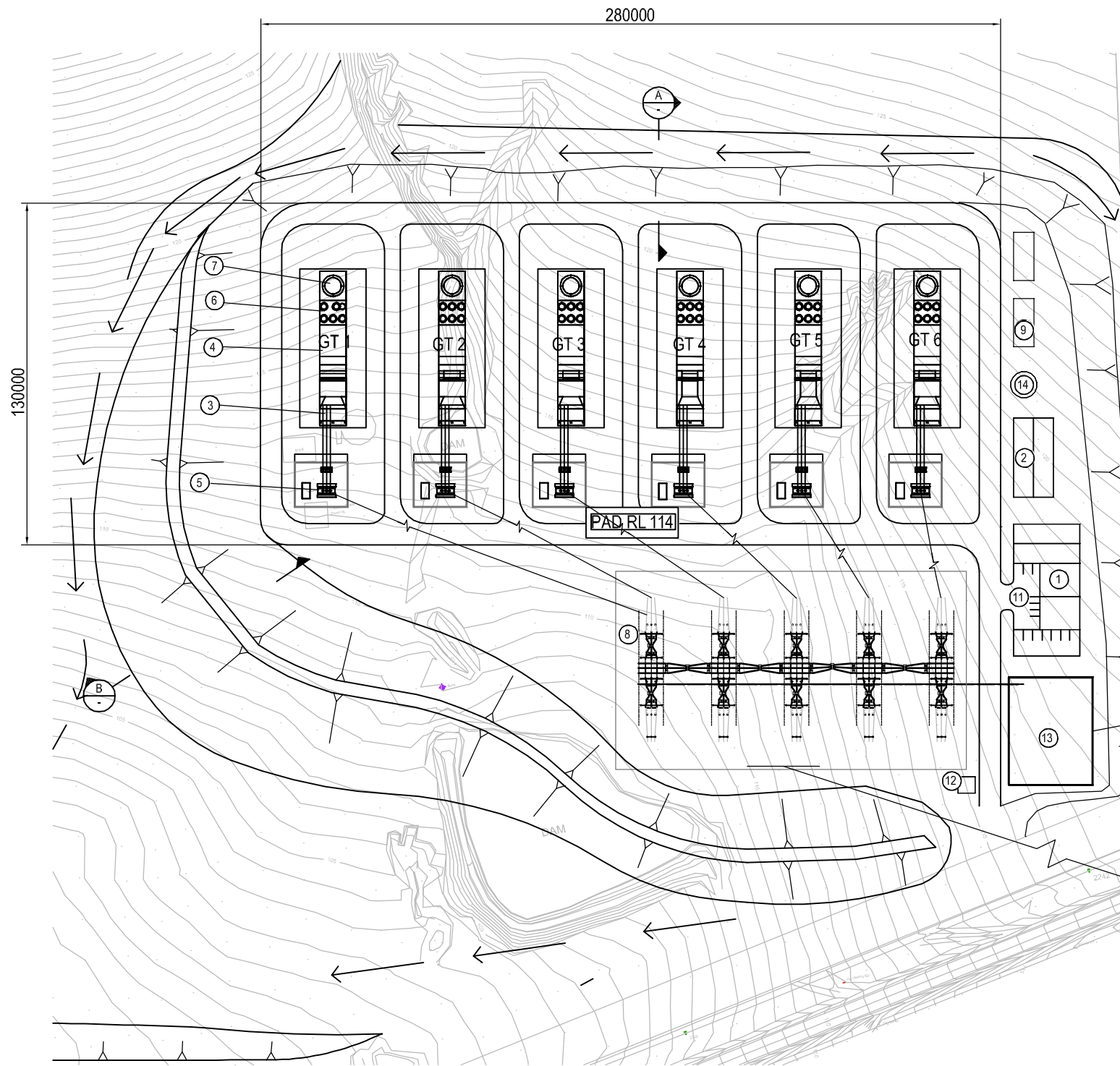
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SCALE 1 : 1000 VERTICAL @ A3

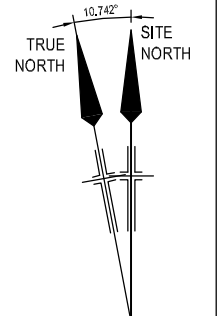
INFORMATION COMPILED FROM DERM DEM, DERM AERIAL PHOTOGRAPHY AND FIELD SURVEY



SITE LOCATION
SCALE 1:5000

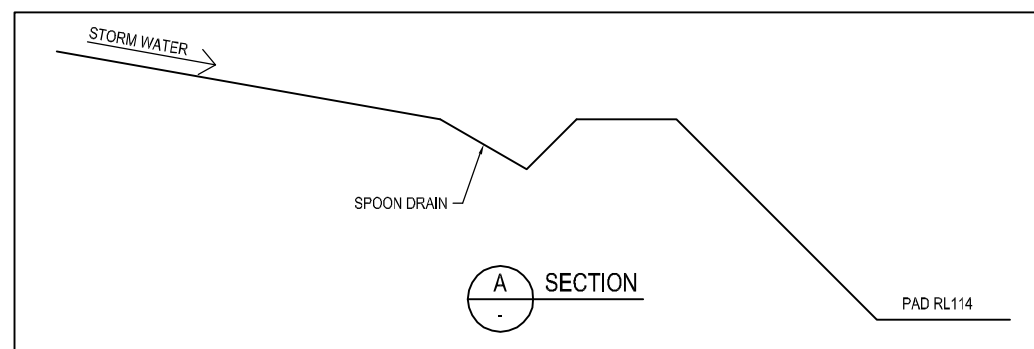


C SECTION



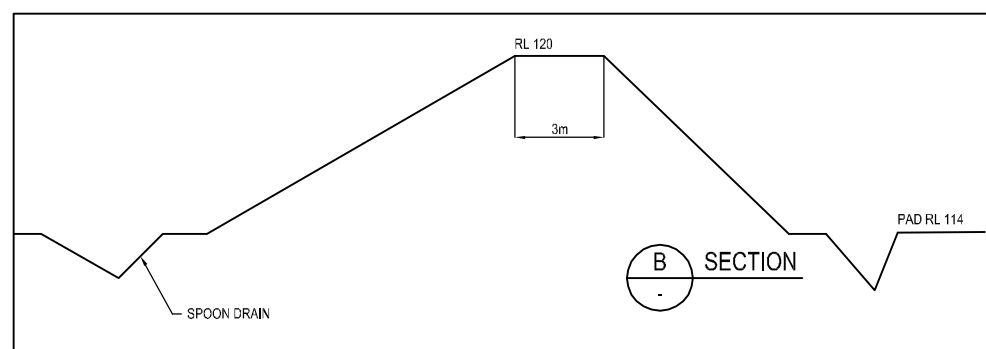
DESCRIPTION	HEIGHT (m)
① CONTROL AND ADMIN BUILDING	7.0
② WAREHOUSE AND WORKSHOP	14.0
③ GAS TURBINE AIR INTAKE	26.0
④ GAS TURBINE ENCLOSURE	8.5
⑤ TRANSFORMER	5.0
⑥ COOLING FANS	13.0
⑦ EXHAUST STACK	30.0
⑧ SWITCHYARD	11.0
⑨ OTHER TANKS & PUMPS	7.0
⑩ FIRE SYSTEM	4.0
⑪ CAR PARK	-
⑫ SECURITY HOUSE	4.0
⑬ GAS SKID (IF REQUIRED)	6.0
⑭ FIRE TANK	9.0

- NOTES:**
- SITE LOCATION, SIZING AND LAYOUT INDICATIVE ONLY.
 - EXISTING DAM TO BE FILLED IN.
 - ARROWS INDICATE STORMWATER FLOW



A SECTION

SITE LAYOUT
SCALE 1:1000



B SECTION

PRELIMINARY

E	BUND MODIFIED	GHD		03/12/09
D	BUND & STORMWATER ADDED	GHD		24/11/09
C	EXTERNAL INFRASTRUCTURE INCLUDED	GHD		25/08/09
B	CLIENT COMMENTS INCORPORATED	GHD		17/07/09
A	ISSUED FOR CLIENT REVIEW	GHD		

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DO NOT SCALE		Drawn	Designed
Drafting Check		GHD	
Approved			
Date			
Scale	AS SHOWN		

Client	WESTLINK PTY. LTD.
Project	WESTLINK POWERSTATION DEVELOPMENT ASSISTANCE
Title	PLANT LAYOUT OPTION 1 PLANT VIEW
Original Size	A1
Drawing No.	41-21379-SK004
Rev.	E

Attachment B
Amended Photomontage Images

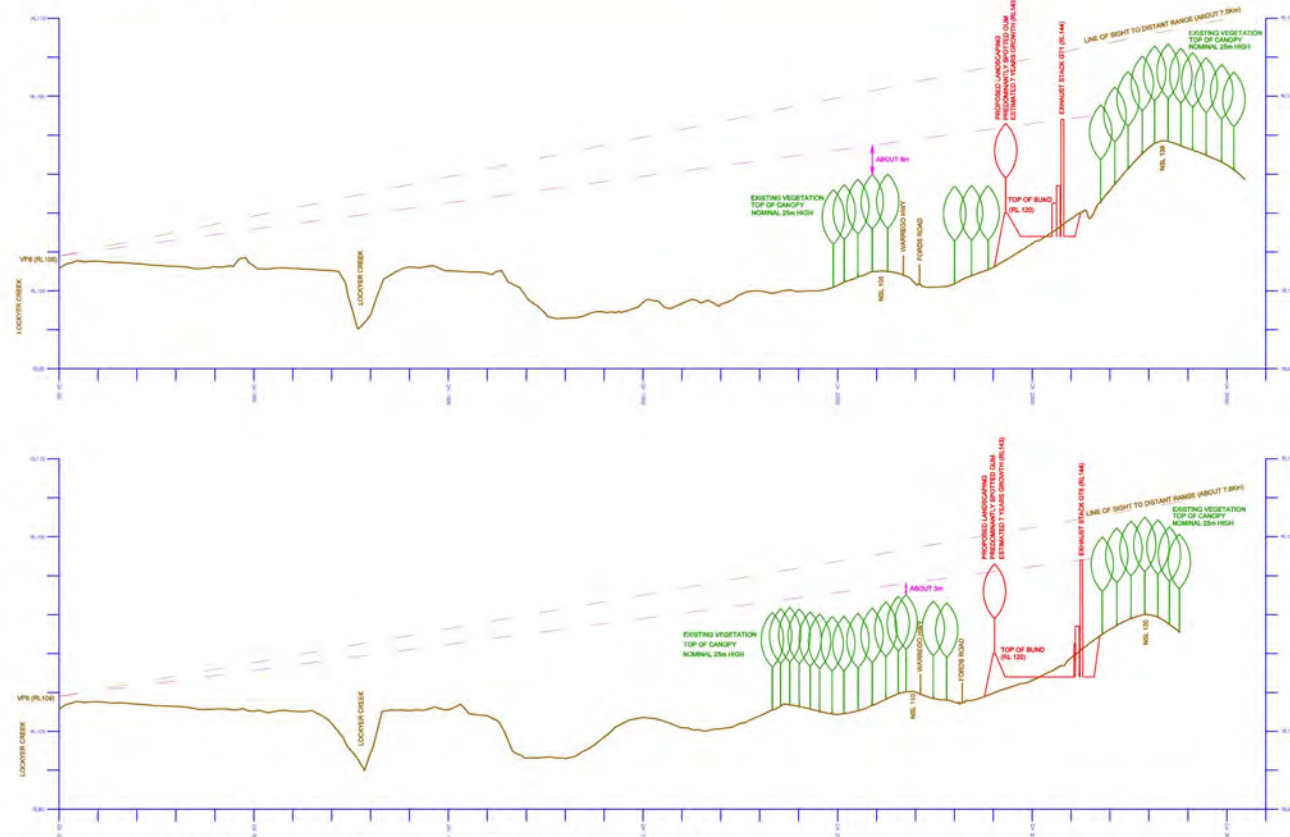
DRAFT ONLY*



Site Photo - May 2009



Location of Vantage Point 8



LEVEL DATUM AHD DERIVED SECTION OF VP8 TO GT1 AND GT6 DATE: 1/12/2009
 INFORMATION COMPILED FROM DERM DEM, DERM AERIAL PHOTOGRAPHY AND FIELD SURVEY BY SIMON BAKER REGISTERED SURVEYOR 2048 (CADASTRAL AND ENGINEERING)
Terrain profile demonstrating the proposed WPP will not be visible from Vantage Point 8



View from Vantage Point 8 expected to be unaltered by installation of the Proposed WPP after 7 years

Please Note: Photomontages are indicative only. Assumptions include:

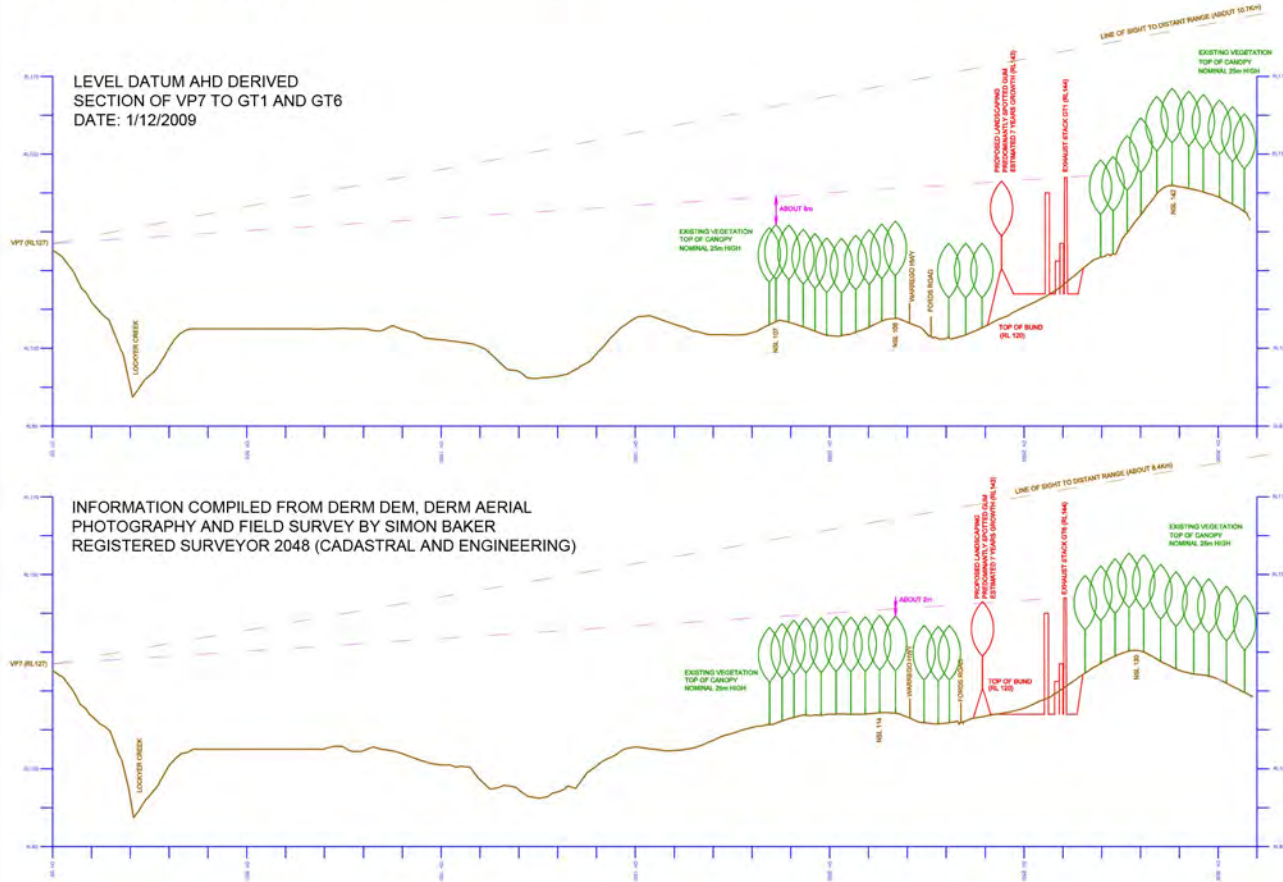
- Existing vegetation top of canopy nominal 25m high as identified by Simon Baker registered Surveyor 2048 (Cadastral and Engineering) during a field survey (refer longitudinal sections prepared by Simon Baker dated 01/12/2009 for further detail);
- Proposed landscape screening predominantly Spotted Gum estimated 7 years growth 23.1m;
- The mature height of planted vegetation on-site (approximately 23.1m) would be achieved over an approximate 7 year period or at an approximate rate of 3.3m of new growth per year (subject to rainfall and climatic conditions). Early age plantation growth rate data (for the Spotted Gum) has been supplied by DERM, DEM and DEEDI (Primary Industry and Fisheries) for the Gatton area that has been defined as a medium rainfall area; and
- The mature height of planted shrubs on-site (approximately 5m) would be achieved over an approximate 7 year period (subject to a range of variables such as soil type, rainfall, average temperatures and planting design layout) to establish the necessary vegetation screen.



Site Photo - May 2009



Location of Vantage Point 7



Terrain profile demonstrating the proposed WPP will not be visible from Vantage Point 7 after 7 years



View from Vantage Point 7 expected to be unaltered by installation of the Proposed WPP after 7 years

Please Note: Photomontages are indicative only. Assumptions include:

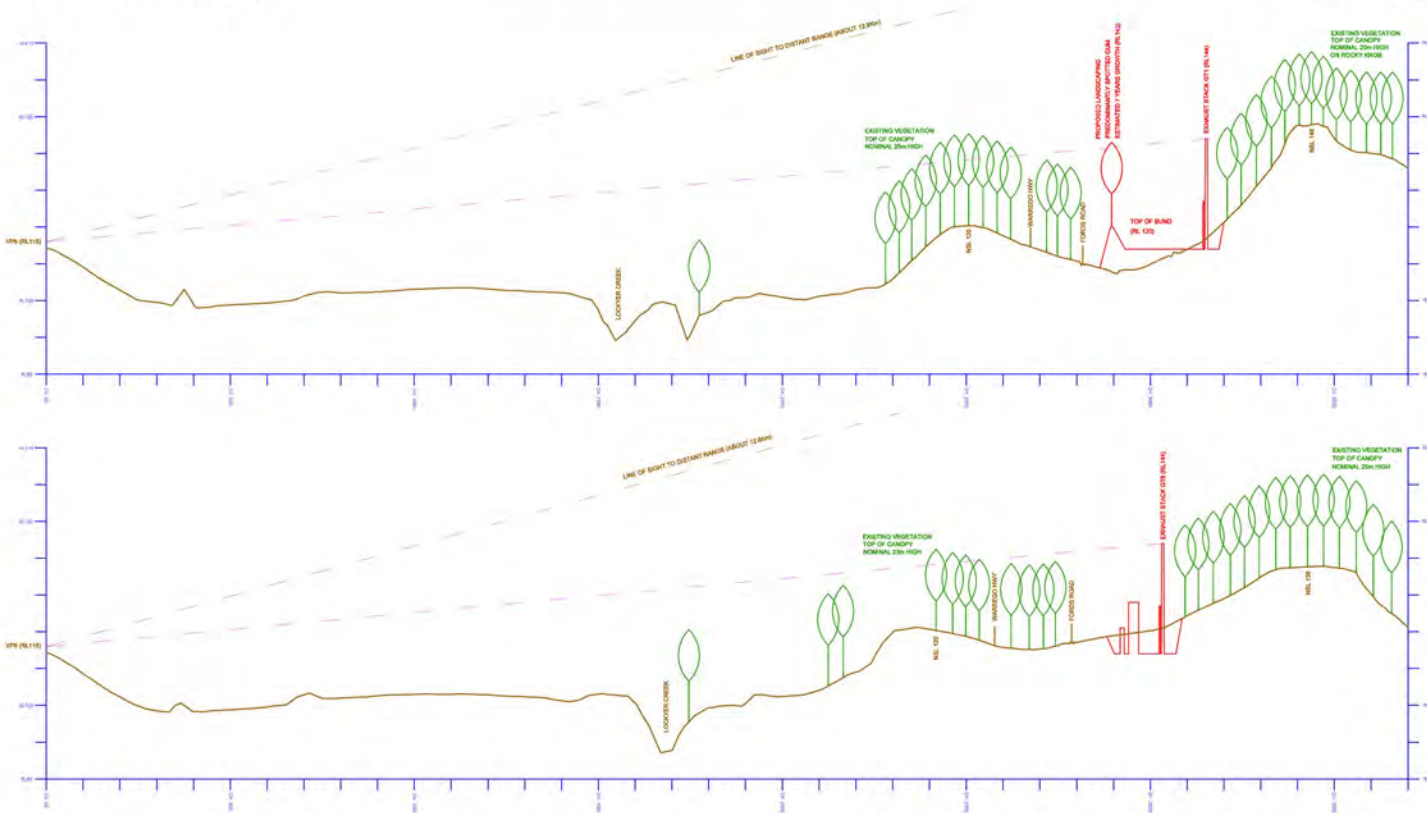
- Existing vegetation top of canopy nominal 25m high as identified by Simon Baker registered Surveyor 2048 (Cadastral and Engineering) during a field survey (refer longitudinal sections prepared by Simon Baker dated 01/12/2009 for further detail);
- Proposed landscape screening predominantly Spotted Gum estimated 7 years growth 23.1m;
- The mature height of planted vegetation on-site (approximately 23.1m) would be achieved over an approximate 7 year period or at an approximate rate of 3.3m of new growth per year (subject to rainfall and climatic conditions). Early age plantation growth rate data (for the Spotted Gum) has been supplied by DERM, DEM and DEEDI (Primary Industry and Fisheries) for the Gatton area that has been defined as a medium rainfall area; and
- The mature height of planted shrubs on-site (approximately 5m) would be achieved over an approximate 7 year period (subject to a range of variables such as soil type, rainfall, average temperatures and planting design layout) to establish the necessary vegetation screen.



Site Photo - May 2009



Location of Vantage Point 6



LEVEL DATUM AHD DERIVED
SECTION OF VP6 TO GT1 AND GT6
DATE: 1/12/2009

INFORMATION COMPILED FROM DERM DEM, DERM AERIAL
PHOTOGRAPHY AND FIELD SURVEY BY SIMON BAKER
REGISTERED SURVEYOR 2048 (CADASTRAL AND ENGINEERING)

Terrain profile demonstrating the proposed WPP will not be visible from Vantage Point 6

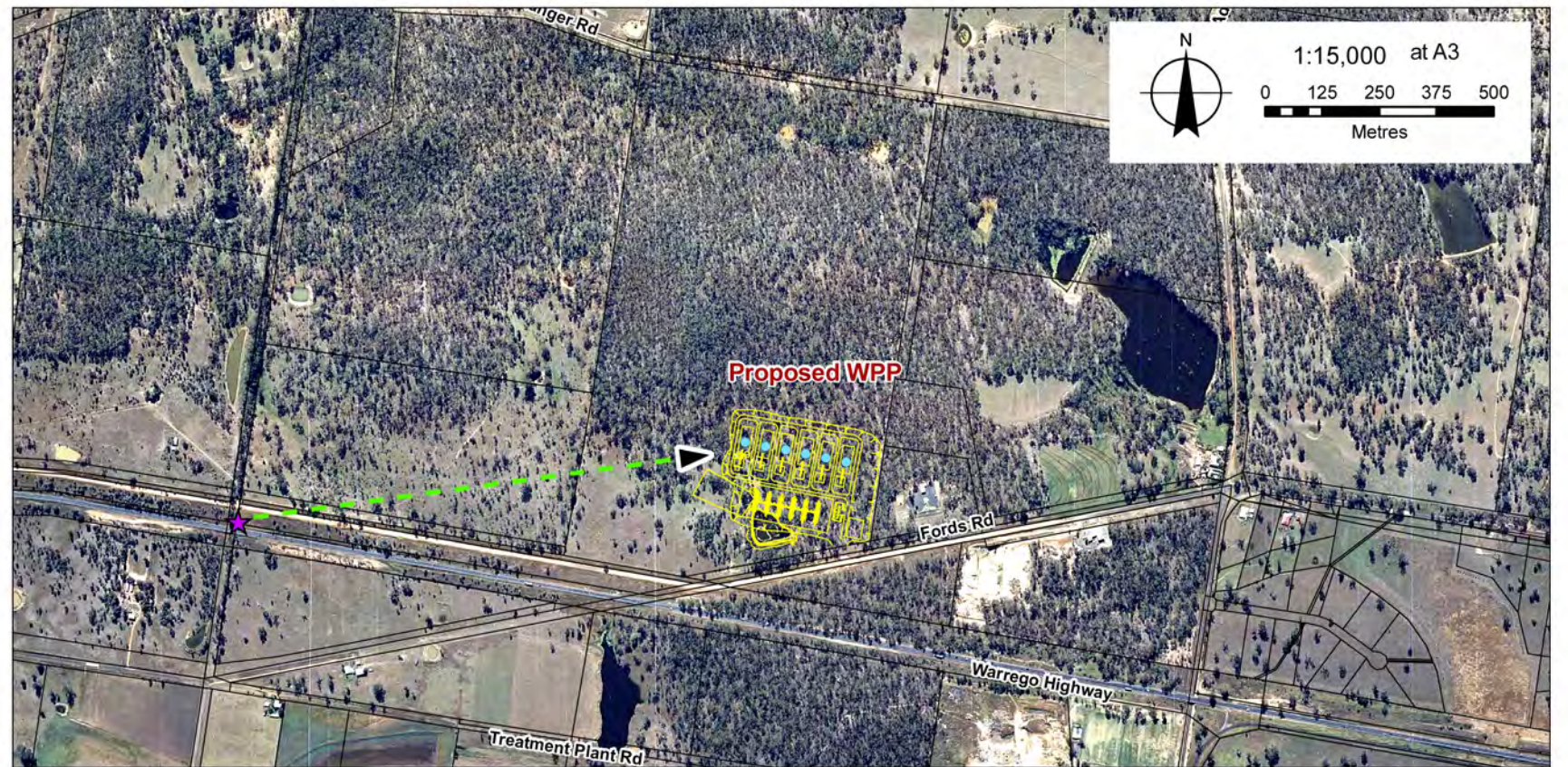


View from Vantage Point 6 expected to be unaltered by installation of the Proposed WPP after 7 years

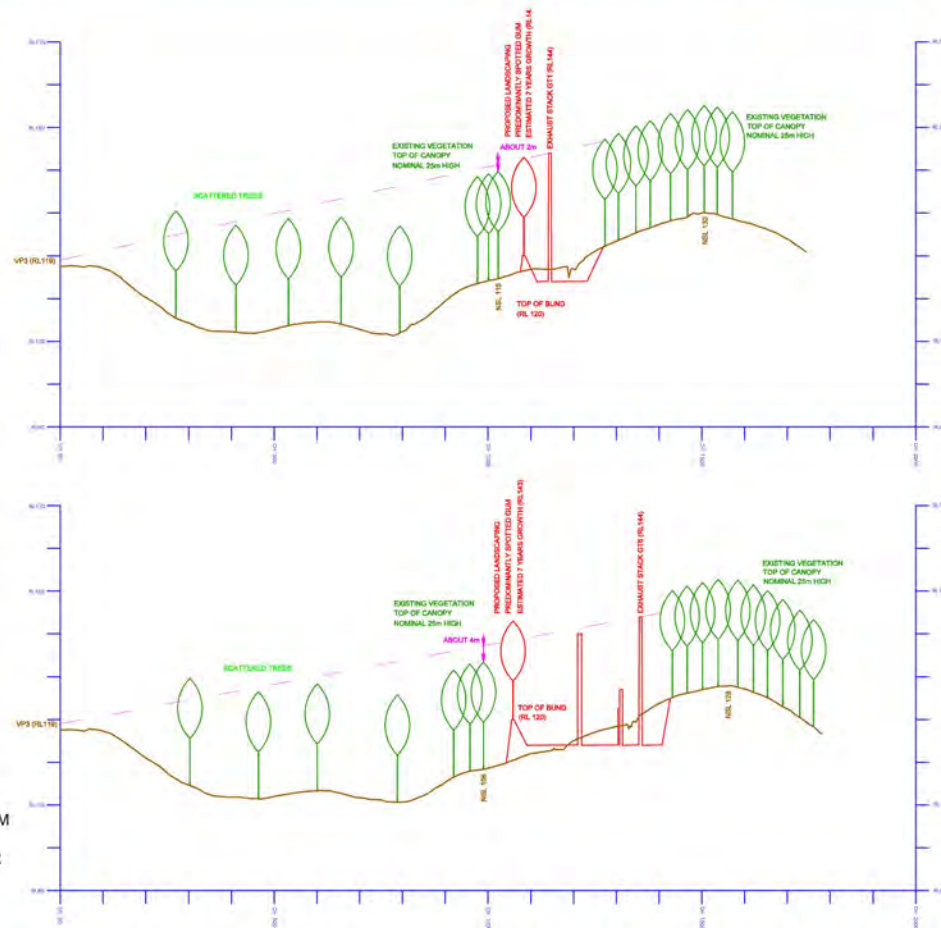
- Please Note: Photomontages are indicative only. Assumptions include:
- Existing vegetation top of canopy nominal 25m high as identified by Simon Baker registered Surveyor 2048 (Cadastral and Engineering) during a field survey (refer longitudinal sections prepared by Simon Baker dated 01/12/2009 for further detail);
 - Proposed landscape screening predominantly Spotted Gum estimated 7 years growth 23.1m;
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 - The mature height of planted shrubs on-site (approximately 5m) would be achieved over an approximate 7 year period (subject to a range of variables such as soil type, rainfall, average temperatures and planting design layout) to establish the necessary vegetation screen.



Site Photo - May 2009



Location of Vantage Point 3



LEVEL DATUM AHD DERIVED
SECTION OF VP3 TO GT1 AND GT6
DATE: 1/12/2009

INFORMATION COMPILED FROM DERM
DEM, DERM AERIAL PHOTOGRAPHY
AND FIELD SURVEY BY SIMON BAKER
REGISTERED SURVEYOR 2048
(CADASTRAL AND ENGINEERING)

Terrain profile demonstrating the proposed WPP will not be visible from Vantage Point 3 after 7 years



View from Vantage Point 3 expected to be unaltered by installation of the Proposed WPP after 7 years

Please Note: Photomontages are indicative only. Assumptions include:

- Existing vegetation top of canopy nominal 25m high as identified by Simon Baker registered Surveyor 2048 (Cadastral and Engineering) during a field survey (refer longitudinal sections prepared by Simon Baker dated 01/12/2009 for further detail);
- Proposed landscape screening predominantly Spotted Gum estimated 7 years growth 23.1m;
- The mature height of planted vegetation on-site (approximately 23.1m) would be achieved over an approximate 7 year period or at an approximate rate of 3.3m of new growth per year (subject to rainfall and climatic conditions). Early age plantation growth rate data (for the Spotted Gum) has been supplied by DERM, DEM and DEEDI (Primary Industry and Fisheries) for the Gatton area that has been defined as a medium rainfall area; and
- The mature height of planted shrubs on-site (approximately 5m) would be achieved over an approximate 7 year period (subject to a range of variables such as soil type, rainfall, average temperatures and planting design layout) to establish the necessary vegetation screen.



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Legend

- Stacks
- Vantage Point 3
- Proposed WPP Footprint

Job Number	41/21379
Westlink Power Project	Revision D
Visual Impact Assessment	Date 22 JANURAY 2010

Figure A3 Vantage Point 3
Warrego Highway (Heading East)

Map Projection: Geographic Coordinate System
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 56

G:\4121379\gis\map\rev2\figA3_vantage3.mxd

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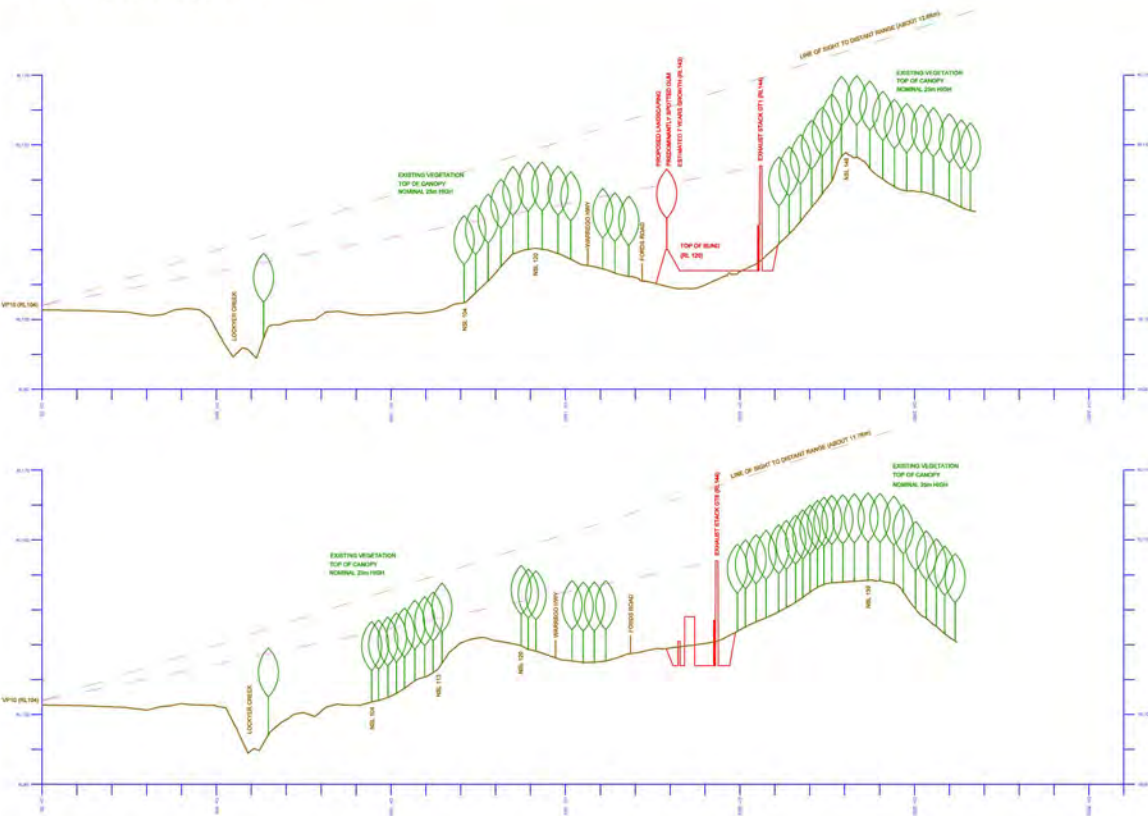
Data source: Cadastre Feb 2009 (DERM), Aerial photography 2001 (DERM), Detailed site survey (Westlink), and Proposed WPP Design (GHD).



Site Photo - May 2009



Location of Vantage Point 10



LEVEL DATUM AHD DERIVED SECTION OF VP10 TO GT1 AND GT6 DATE: 1/12/2009
 INFORMATION COMPILED FROM DERM DEM, DERM AERIAL PHOTOGRAPHY AND FIELD SURVEY BY SIMON BAKER REGISTERED SURVEYOR 2048 (CADASTRAL AND ENGINEERING)
Terrain profile demonstrating the proposed WPP will not be visible from Vantage Point 10



View from Vantage Point 10 expected to be unaltered by installation of the Proposed WPP after 7 years

- Please Note: Photomontages are indicative only. Assumptions include:
- Existing vegetation top of canopy nominal 25m high as identified by Simon Baker registered Surveyor 2048 (Cadastral and Engineering) during a field survey (refer longitudinal sections prepared by Simon Baker dated 01/12/2009 for further detail);
 - Proposed landscape screening predominantly Spotted Gum estimated 7 years growth 23.1m;
 - The mature height of planted vegetation on-site (approximately 23.1m) would be achieved over an approximate 7 year period or/ at an approximate rate of 3.3m of new growth per year (subject to rainfall and climatic conditions). Early age plantation growth rate data (for the Spotted Gum) has been supplied by DERM, DEM and DEEDI (Primary Industry and Fisheries) for the Gatton area that has been defined as a medium rainfall area; and
 - The mature height of planted shrubs on-site (approximately 5m) would be achieved over an approximate 7 year period (subject to a range of variables such as soil type, rainfall, average temperatures and planting design layout) to establish the necessary vegetation screen.

Legend

- Stacks
- ★ Vantage Point 10
- Proposed WPP Footprint



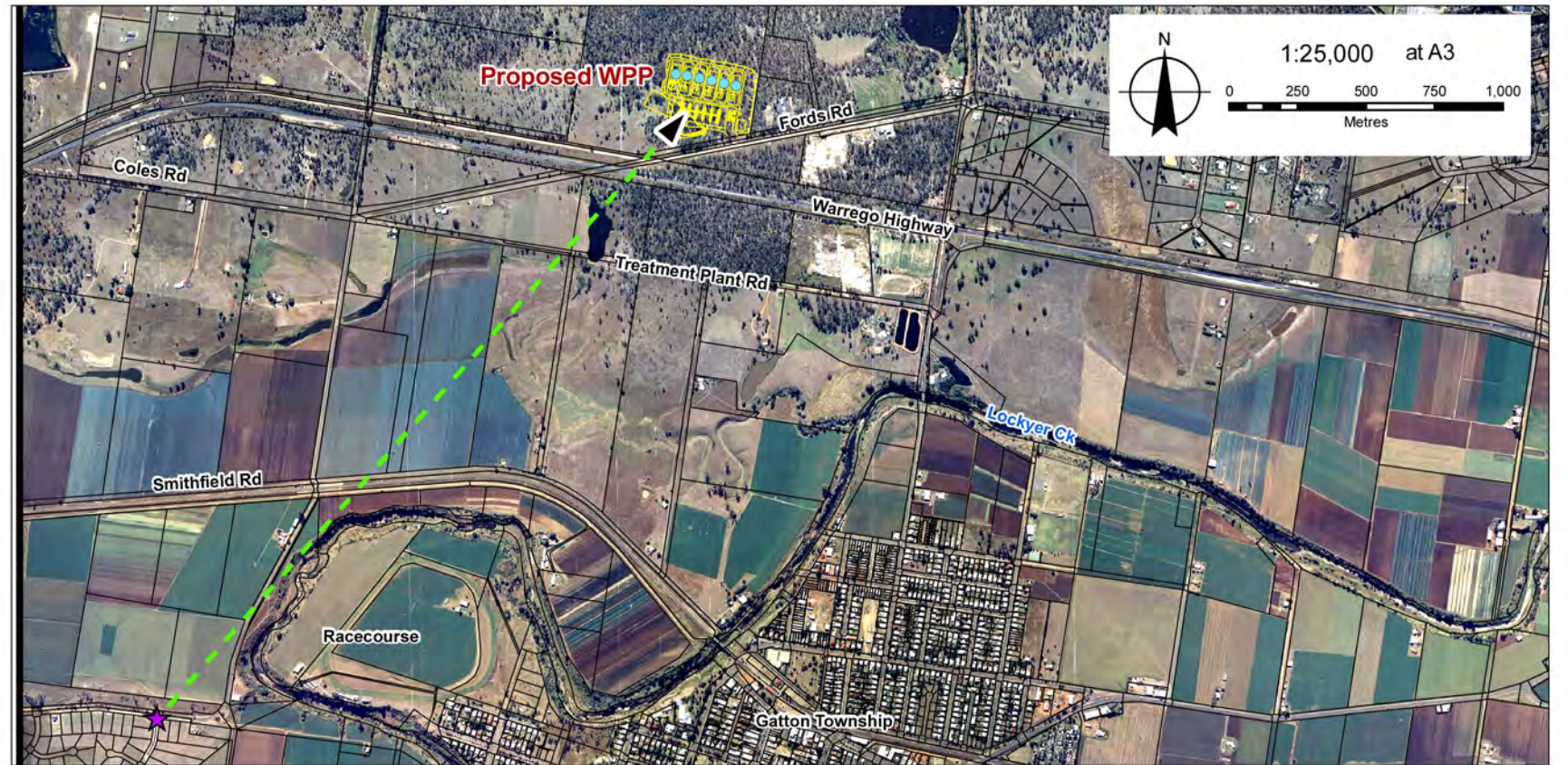
Map Projection: Geographic Coordinate System
 Horizontal Datum: Geocentric Datum of Australia
 Grid: Map Grid of Australia 1994, Zone 56

Job Number	41/21379
Westlink Power Project	Revision C
Visual Impact Assessment	Date 22 JANURAY 2010

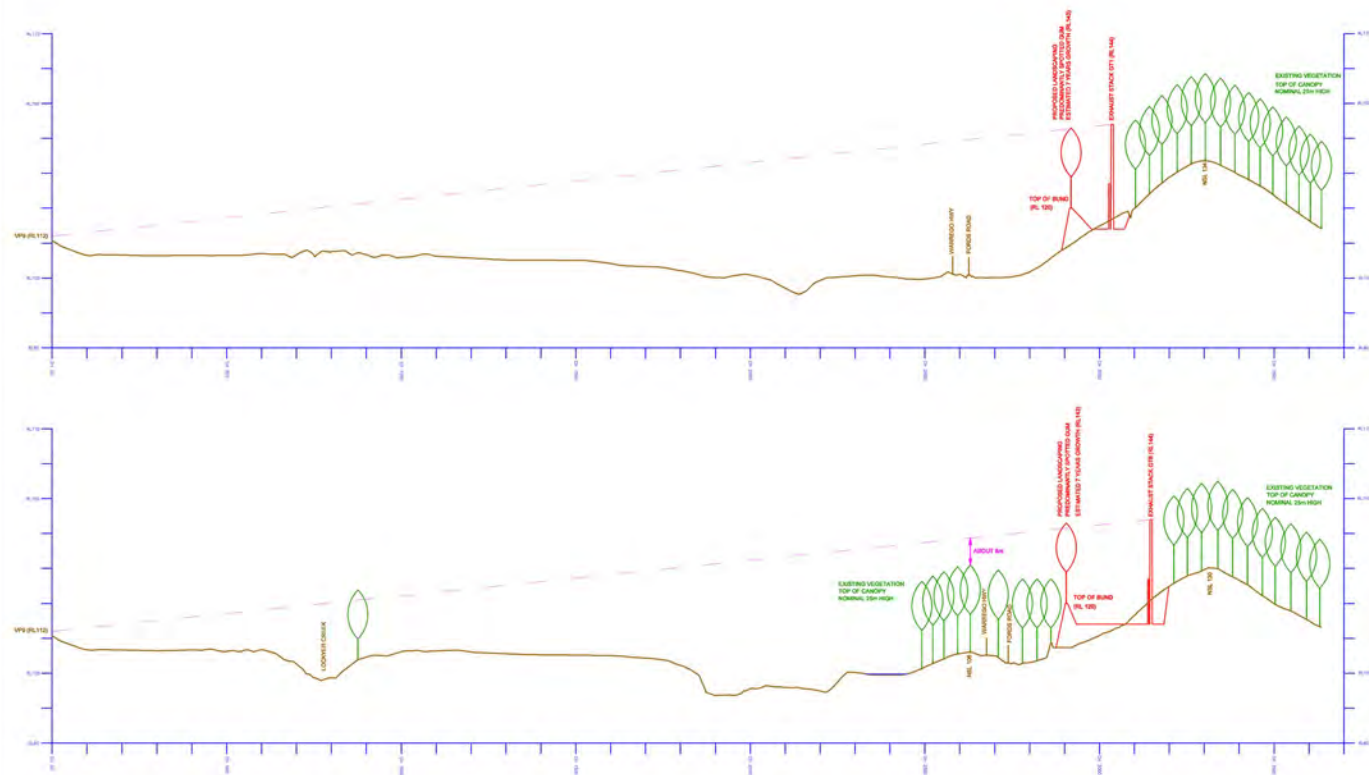
Figure A10 **Vantage Point 10**
Dwyer Street



Site Photo - May 2009



Location of Vantage Point 9



LEVEL DATUM AHD DERIVED FROM DERM DEM, DERM AERIAL PHOTOGRAPHY AND FIELD SURVEY BY SIMON BAKER REGISTERED SURVEYOR 2048 (CADASTRAL AND ENGINEERING)
 SECTION OF VP8 TO GT1 AND GT6
 DATE: 1/12/2009

Terrain profile demonstrating the proposed WPP will not be visible from Vantage Point 9 after 7 years



View from Vantage Point 9 expected to be unaltered by installation of the Proposed WPP after 7 years

- Please Note: Photomontages are indicative only. Assumptions include:
- Existing vegetation top of canopy nominal 25m high as identified by Simon Baker registered Surveyor 2048 (Cadastral and Engineering) during a field survey (refer longitudinal sections prepared by Simon Baker dated 01/12/2009 for further detail);
 - Proposed landscape screening predominantly Spotted Gum estimated 7 years growth 23.1m;
 - The mature height of planted vegetation on-site (approximately 23.1m) would be achieved over an approximate 7 year period or at an approximate rate of 3.3m of new growth per year (subject to rainfall and climatic conditions). Early age plantation growth rate data (for the Spotted Gum) has been supplied by DERM, DEM and DEEDI (Primary Industry and Fisheries) for the Gatton area that has been defined as a medium rainfall area; and
 - The mature height of planted shrubs on-site (approximately 5m) would be achieved over an approximate 7 year period (subject to a range of variables such as soil type, rainfall, average temperatures and planting design layout) to establish the necessary vegetation screen.

Map Projection: Geographic Coordinate System
 Horizontal Datum: Geocentric Datum of Australia
 Grid: Map Grid of Australia 1994, Zone 56

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Legend

- Stacks
- Vantage Point 9
- Proposed WPP Footprint

Job Number | 41/21379
 Westlink Power Project | Revision | D
 Visual Impact Assessment | Date | 22 JANURAY 2010

Figure A9 Vantage Point 9
 Old Toowoomba Rd and Parklea Dr

Attachment C
Landscape Revegetation and Management
Plan



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Westlink Pty Ltd

Report for Westlink Power
Station Development

Landscape Management and
Revegetation Plan

February 2010



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1. Introduction

1.1 Scope of Works

The Landscape Management and Revegetation Plan (LMRP) has been produced to manage and reinstate vegetation throughout the operation, construction and maintenance phases of specified areas of Westlink Power Project (WPP) site. Refer to Landscape Detail Design Planting Layout 1, Dwg 41-22282-L001, L002, L003 and L004, Rev A, located in Appendix A of this document. A Detailed Landscape Specification document has also been prepared which sets out the procedures to be followed for implementation of the soft landscape components of the project. Please Refer to Appendix D of the Visual Impact and Landscape Assessment Addendum Report for details. Additionally, a Detailed Ecological Assessment, dated 21st April 2009, has been prepared by Conics and relevant information on existing vegetation, fauna, weed species has been referred to in this LMRP.

1.2 Aims and Objectives of Revegetation

The LMRP aims to provide a clear, concise and practical framework for the management and revegetation of the areas outlined in 41-22282-L001 to L004 Planting Layout Plan for the WPP located in Appendix A of this document. The objectives of the LMRP are described in Table 1 below.

Table 1 Aims and Objectives of Rehabilitation Works

Components	Objective	Management Response
<i>Project Management</i>	To formulate and implement vegetation management actions; To clearly identify, methods and reporting lines; To inform all relevant players of their responsibilities; To promote and maintain stable vegetation cover.	Project management will incorporate LMRP as an integral part of the construction and operational phase. Nominate the person with responsibility for overseeing development works (e.g. the site supervisor or works supervisor) to be responsible for implementing vegetation management actions on site, and for point-of-contact for local Council or other agencies. Advise all contractors as to their role in vegetation management. Supply an action plan outlining timeframes for the implementation of each phase, and monitoring and reporting activities.



***Catchment
Management and
Action***

To protect catchments during construction and operational phases of development.

Implement catchment protection measures prior to construction works commencing.

Ensure that short (construction phase) impacts on water quality are minimized.

Ensure that hydrology quality of runoff is restored in the long-term.



Components	Objective	Management Responses
<p>Clearing and Disposal of Vegetation</p>	<p>To minimise the adverse impacts of vegetation clearance;</p> <p>To maximise recycling or reuse of cleared vegetation;</p> <p>To minimise the impacts of habitat loss due to the removal of vegetation or hollow bearing trees;</p> <p>To minimise impacts to native flora and fauna;</p> <p>To minimise soil erosion and sedimentation;</p> <p>To minimise the introduction and/or spread of weeds;</p> <p>To promptly identify and control weeds and to eliminate noxious weed species;</p> <p>To maintain existing floristic characteristics of the region throughout the proposed developed landscape;</p> <p>To minimise the negative impacts of pest plant and animal species within and adjoining the power station footprint, during construction of the project;</p> <p>To ensure the most appropriate measures are implemented to mitigate potential negative impacts of infestation by pest plant & animal species, caused before, prior to, during construction and throughout the maintenance period of the project;</p> <p>To ensure no negative impacts in water quality resulting from pathogens, bacteria, and nutrients; and</p> <p>To define the roles, responsibilities and the tasks to be performed, in regard to the control and monitoring of weed infestations.</p>	<p>Clearly identify areas of vegetation to be cleared or retained, and areas containing hollow bearing trees. Relocate wildlife including possums, sugar gliders, and native beehives prior to the removal of habitat trees.</p> <p>Ensure appropriate permits have been obtained prior to these actions.</p> <p>Use clearing methods that will not damage adjacent protected vegetation and will minimise soil profile disturbance.</p> <p>Recycle cleared vegetation for reuse on or off site such as mulch.</p> <p>Trees with identified hollows should have the hollow section preserved and this section should be suitably mounted on nearby or adjacent suitable trees, subject to Council approval.</p> <p>Establish an inventory of both native and exotic species on the site.</p> <p>Identify any species listed under the <i>Nature Conservation Act 1992 (Qld)</i>, and the <i>Environmental Protection and Biodiversity Conservation Act 2000 (Commonwealth)</i> which are to be protected under this legislation.</p> <p>Implement vegetation protection measures prior to construction works commencing. These commonly include designating vehicle access ways and work areas, signage, barrier fences, and tree guards, to minimize compaction of the remaining vegetation's root zone.</p> <p>Protect the root zones of individual trees or clumps of trees from compaction, filling, stockpiling or excavation, by excluding such activities to a location outside the vegetation canopy drip-line.</p>



Revegetation and Maintenance

To restore and enhance disturbed areas in the post construction phase;

To maximise survival opportunities for areas of retained vegetation and newly rehabilitated areas;

To protect vegetation and catchments during construction and operational phases of development;

To restore and enhance disturbed areas in the post construction phase;

To maximise survival opportunities for areas of retained vegetation and newly rehabilitated areas;

To improve the ecological values by providing a naturally vegetated weed-free area with habitat complexity, food resources and linkages to other areas; and

To prevent existing and new weeds from restabilising within the rehabilitated areas.

Determine the revegetation techniques suitable for the site taking into account the topography, soils, and ecological processes (i.e. natural regeneration, direct seeding, and soil seed-bank translocation techniques). Provide planting densities and techniques as required.

Provide recommended native species lists for revegetation, as well as priority weed species recommended for control. Ensure recommended native plant species will not aggressively compete or displace existing native species.

Specify a maintenance program in the LMRP to ensure the long-term health and vigour of retained vegetation and the healthy growth of new plantings and/or direct seeded areas.

Give details on mulching, watering and fertiliser regimes, regular inspection schedules for damage or disease, replacement planting criteria and weed eradication measures in this program.

Implement a monitoring program to measure the effectiveness of adopted measures. Provide for monitoring of any adjacent waterways for sedimentation and erosion with an action plan to remediate as necessary. Weed management and control methods should be applied in dry weather conditions only throughout the year.

Chemical control of weeds should have a minimum of 4 – 24 hrs of non-contact exposure to heavy rain.

All exposed soil surfaces are to be rehabilitated within 24 hrs of construction or landscaping completion and where necessary have temporary or permanent sediment control devices in place prior or during construction phase.





2. Existing Vegetation to be Retained

A field assessment was conducted to establish existing conditions on site in the vicinity of the proposed power station and screen/buffer mound areas. Trees at the southern bank of the existing dam and to the south west of the dam will be retained where possible. A variety of eucalypt species have been identified, refer to Landscape Detail Design Planting Layout 1, Dwg 41-22282-L001, L002, L003 and L004, Rev A, prepared by GHD and the Detailed Ecological Assessment, Lot 191 CSH2361, Ford's Road Gatton, dated 21st April 2009, prepared by Conics. Existing vegetation will provide an amount of instant screening of the proposed power station stacks. This has been documented on Landscape Detail Design Planting Layout 1, Dwg 41-22282-L001, L002, L003 and L004, Rev A, prepared by GHD

Mistletoe Infestation

There was a visible infestation of mistletoe (*Amyema miquelii*) on the forest red gums (*Eucalyptus tereticornis*) present on site around the largest dam. Mistletoe is a native epiphytic parasitic shrub that, if occurring in high enough densities may kill its host tree. Mistletoe also provides a potential food source for birds, particularly mistletoebird (*Dicaeum hirundinaceum*) and provides roosting opportunities for other species. Although mistletoe was present in quite a few trees located around the dam, it does not appear to be having a detrimental effect on the host trees. Retained trees should be routinely inspected by a suitably qualified arborist to make an assessment and perform any treatment required.



3. Roles and Responsibility for Revegetation Works

All personnel are responsible for the environmental performance of their activities and for complying with their General Environmental Duty as outlined in the *Environmental Protection Act 1994* (EP Act).

Section 36 (1) on the EP Act states that “a person must not carry out any activity that causes, or is likely to cause, environmental harm, unless the person takes all reasonable and practicable measures to minimise that harm”. The following roles and responsibilities relates to their obligations under the EP Act.

General Manager

The General Manager (GM) is responsible for the overall management of the project. This includes Environmental, Health and Safety management.

Project Manager

The Project Manager (PM), (Revegetation Contractor) is responsible for all project works and implementation of the work on location. This person reports to the GM.

The PM is also responsible for developing and maintaining a Compliance Register for the project. This includes managing compliance audits (environmental and safety) to ensure compliance.

Project Supervisor/s

The Supervisor is responsible for directing work in the field in compliance with the specifications documented in the specification for the Site Landscape and Revegetation Works. The Project Supervisors have the authority to ‘stop the work’ if, in their opinion, the work has the potential to harm people or damage the environment. This includes the incorporation of LMRP mitigation measures into work procedures, Job Hazard Analysis and Toolbox Meetings. The supervisor/s report to the PM.

The supervisor/s are also responsible for the implementation, monitoring and reporting in compliance with the LMRP. This includes the continuous improvement of environmental performance of people and equipment. The Project Supervisor is responsible for implementing all deliverables of the weed management plan outlined in the LMRP. This includes identification and control of all weeds species on site with a priority focus on declared weeds species using appropriate control techniques. The site supervisor is also required to prepare regular reports and records of all work activities. This person is responsible to the Project Manager.

Revegetation Contractor - Project Manager Role

- ▶ Supply of skilled and qualified Project Overseer to manage the project;
- ▶ Provision of providing site assessment of projects being undertaken;
- ▶ Overseeing staff/employees conducting labour intensive project and on site supervision/onsite training in general hand tools and small engine equipment;
- ▶ Setting daily tasks and meeting goals or work objectives;
- ▶ Community liaison;



- ▶ On site /council representation;
 - ▶ Preparing or daily work reports/feedback to project coordinator;
 - ▶ Project Design, planning and budgeting; and
- ▶ Meetings/presentations;
 - ▶ Recruitment of employees/training;
 - ▶ Provision of vehicle;
 - ▶ All work cover/insurance wages and administration costs incurred by Revegetation Contractor; and
 - ▶ Travelling expenses covered by Revegetation Contractor.

Revegetation Contractor - Project Supervisor Role

- ▶ Supply of skilled and qualified site supervisor to oversee project;
- ▶ Provision of providing site assessment of projects being undertaken;
- ▶ Overseeing staff/contractors intensive labour project;
- ▶ On site supervision/onsite training in general hand tools and small engine equipment;
- ▶ Setting daily tasks and meeting goals or work objectives;
- ▶ Community liaison / on site /council representation;
- ▶ Preparing or daily work reports/feedback to project coordinator; and
- ▶ Provision of vehicle and all work cover/insurance wages, travelling expenses and administration costs incurred by Rehabilitation contractor.

Weed Contractor

The Weed Contractor is responsible for implementing all deliverables in the weed management plan outlined in the LMRP. This includes identification and control of all weeds species on site with a priority focus on declared weed species using appropriate control techniques. The weed contractor is also required to prepare regular reports and records of all work activities. This person is responsible to the Environmental Site Manager.

Landscape Contractor

The landscape contractor is responsible for the implementation of all deliverables outlined in this LMRP. This includes identification and control of all weeds species on site, with a priority focus on declared weed species, using appropriate control techniques. The landscape contractor is also required to prepare regular reports and records of all work activities. This person is responsible to Environmental Site Manager.

Important: Roles of the weed and landscape contractor need to be determined as there is potential for one or the other to overlap in terms of their roles and responsibilities for project deliverables. For example, the weed contractor can maintain revegetation areas, which would relieve the landscape contractor of their maintenance duties. Preferably an organisation that can achieve and deliver all outcomes can alleviate this issue. Otherwise, clear and concise site specific work plans for the project will have to be produced for the contractors to delineate work activities.



4. Management of Risks for Flora and Fauna Revegetation Works

The revegetation works will be developed to effectively implement the following:

- ▶ Effective management of vegetation within the work area;
- ▶ Control and prevent re-establishment of weeds in the proposed restoration, revegetation areas and natural areas of the site;
- ▶ Maintain, enhance and promote the rejuvenation of native species on the site and surrounding areas; and
- ▶ Establish a monitoring program to effectively manage adverse weed infestation and its impact on the environmental values of the area.

Table 2 below outlines all management requirements for the operational and maintenance phase of the project and the responsibility for managing fauna, flora, monitoring and reporting requirements.

Table 2 Flora and Fauna Management – Operational & Maintenance of Rehabilitation Works

Flora and Fauna Management Operational & Maintenance Phase	
Objective	To minimise known and potential fauna and flora impacts in areas of high environmental sensitivity
Issues and Impacts	Minimisation of tree clearing (weed treatment) particularly in high value riparian habitat areas; Disturbance of ground cover vegetation; Destruction of fauna habitat Rehabilitation.



<p>Control Measures</p>	<p>Vegetation Treatment</p> <p>In the event vegetation is required to be cleared a spotter/catcher is to inspect for and appropriately remove any fauna immediately prior to works.</p> <p>A Vegetation Management Indicator Code should be adopted to mark all individual trees on site. This is to be marked on trees (degradable paint or tie) to inform all operators on site the status of the trees. The following codes should be used:</p> <ul style="list-style-type: none"> • Red tape to indicate removal; • Yellow and black tape to indicate significant tree; and • Blue tape to indicate vegetation to be pruned. <p>The extent or partial vegetation treatment within the site is to be clearly marked in each restoration zone (Monitoring Photographic Data Points are to be pegged and GPS for delineation).</p> <p>Tree protection devices or protection zones are to be used to minimise disturbance to existing vegetation on site that is to remain. These can vary from timber deflection braces attached to trees themselves in confined working spaces to wire strand star picket fences to protection tree root areas or groups of trees.</p> <p>In the event individual trees are to be removed from site they are to have mature seed collected (if in season) for direct seeding of disturbed areas and be mulched on site.</p> <p>Mechanical vegetation (hand) removal methods shall be favored over the use of herbicides where possible.</p>
<p>Control Measures</p>	<p>Where required by the landowner or relevant statutory authority, strips of vegetation or individual trees should remain to allow passage for animals between revegetation planting plots.</p> <p>Dead/injured wildlife during works or found on site shall be reported to the GM.</p> <p>Logs occurring in the proposed revegetation zones should be examined and their importance in terms of habitat value determined and assessed. Where they provide significant habitat values, logs should be left in their place of origin or relocated near or reinstated once weed removal treatment is completed.</p> <p>Rehabilitation</p> <p>Avoid the need for revegetation as much as possible by limiting vegetation clearing and/or site disturbance. Revegetation should only be considered where natural regeneration appears to have failed despite a period of suitable weather for colonisation and growth of vegetation.</p> <p>The site will be monitored during the works to ensure that the conservation and aesthetic value of the site are maintained. Areas proposed for rehabilitation will be supplemented with replacement plantings if any losses occur in the first 24-month period.</p>
<p>Monitoring</p>	<p>Maintenance personnel to monitor site during works and monthly through monthly maintenance inspections.</p>



Reporting	<p>Monthly monitoring operational works sheet are to be recorded and submitted to the general manager.</p> <p>Regular random on-site surveillance of tree and vegetation operational works to be conducted and onsite weed management surveillance report to recorded and submitted to site officer.</p> <p>Monthly progress rejuvenation monitoring records to be maintained on file by site officer.</p> <p>Monthly rejuvenation operational works sheet are to be recorded and submitted to site officer.</p> <p>Regular random on site surveillance of rejuvenation operational works to be conducted and onsite surveillance recorded and submitted to site officer.</p> <p>Annual rejuvenation management review including monitoring results of planting plots to be undertaken and submitted in an annual report.</p>
Corrective Action	<p>Areas undergoing rehabilitation shall be maintained as required.</p> <p>If soil erosion is still occurring in rejuvenation areas:</p> <ul style="list-style-type: none"> ▶ review rejuvenation techniques conducted by project manager; ▶ assess the potential for disturbance to occur; and ▶ implement erosion and sediment control actions. <p>If there is poor re-growth or regeneration of native plants occurring in rejuvenation, conservation and operational works zones:</p> <ul style="list-style-type: none"> ▶ review rejuvenation and direct seeding management techniques conducted by project manager; ▶ assess the appropriate use and amounts of herbicides are being used in rejuvenation areas; ▶ assess the potential for weeds to occur in rejuvenation areas; and ▶ assess other potential sources or causes of weeds or limited re-growth of native plants to occur .i.e. plant pests and disease monitoring.
Responsibility	Revegetation Contractor



5. Management of Risks for Weed Management

Poor weed control accounts for most tree-planting failures, due to competition for light, moisture and nutrients. Weeds can reduce a planted species' early growth rates by up to 70% compared to weed free sites, and can decrease survival from an expected 90% of trees planted to as little as 10% survival rate. It is therefore vital that weed control is undertaken prior to planting.

The area around the footprint of the stacks and bunds has been diminished in the past due to historic landuses such as farming. Initial site investigations found tree species around the proposed power station site are largely made up of immature trees. The vegetation on site is presently providing habitat to native fauna species. For a list of fauna species recorded on Lot 191 CSH2361, refer to Detailed Ecological Assessment report, Appendix 4 of the original REF, Fauna Species Recorded on Lot 191 CSH2361 dated 21st April by Conics. Weed control activities and revegetation of the site should be staged such that suitable habitat for fauna species is maintained throughout the revegetation process and are afforded a degree of protection for as long as practicable.

Native plant species should be used in all landscaping or revegetation to provide habitat for native fauna.

Weed management requirements for operational works and maintenance for the re-vegetation works has been identified and listed in Table 2 below.

Table 2 Weed Management – Operation and Maintenance Rehabilitation Works

Weed Management and Maintenance	
Objective	To ensure that no existing weeds are spread or introduced during Project and ongoing maintenance.
Issues and Impacts	Ground disturbance, transfer and spreading of weeds.
Operational and Maintenance	



<p>Control Measures</p>	<p>All weed technicians on site must be an accredited AC/DC Licensed operator.</p> <p>A pre-project weed audit and chemical treatment is to be undertaken before commencing works.</p> <p>All declared weeds (P1 -Priority 1 weeds) within the site are to be treated first before (P2 – Priority 2 weeds) before any revegetation works are to commence and are to continue throughout the duration of the 12 months maintenance project.</p> <p>All weed species located on site are to be identified and recorded. When applying weed management methods all due diligence will be used to maintain and preserve surrounding or existing native vegetation or communities.</p> <p>Woody weed species should have there stem cut close to ground level (50 mm) and be sprayed or swabbed with an approved herbicide e.g Roundup bioactive 20 ml/1 litre or concentrate, to prevent regrowth of unwanted weed species. The application of herbicidal dye should be used with the constituent herbicide to monitor the application kill rates of weed species.</p> <p>All broadleaf weeds in open space pasture areas are to be sprayed with Amicide 625 at a rate of 3 litres/400 litres of water.</p> <p>It is intended that any regrowth of weed seeds that may occur on site will be successfully controlled in the proposed maintenance program. Weekly, biweekly and monthly weed management practices will be applied to suppress and prevent re-growth of weeds species in all areas of the work site.</p> <p>Regularly monitoring and declared weed surveillance is to be conducted on a monthly basis of all areas. All weed removal techniques and chemicals used on site will be recorded and filed and made readily available to all relevant government agencies on request.</p> <p>Conduct follow up weed inspection during the growing season one year after hand over and arrange for the chemical eradication of any perceived weed occurrence. This will be outside existing contract conditions and will incur additional fees and services charges if required.</p>
<p>Monitoring</p>	<p>Weeds are to be visually monitored during routine monthly site inspections and maintenance visits.</p> <p>Technicians are to provide reports after maintenance patrols outlining the presence of weed infestations.</p> <p>Daily weed operational works sheet are to be recorded and submitted during operational works to Project Manager daily.</p> <p>Monthly site surveillance and maintenance report is to be submitted to the GM.</p>



<p>Corrective Action</p>	<p>Destroy localised infestations of weeds and conduct follow-up inspection to ensure that weed control has been effective.</p> <p>Train maintenance staff in weed identification and control measures.</p> <p>If weed infestations are still occurring in rejuvenation, conservation and operational works zones:</p> <ul style="list-style-type: none"> • review weed removal and weed management techniques conducted by technicians; • assess the appropriate use and amounts of herbicides are being used; • assess the potential for weeds to occur; • assess other potential sources or causes of weeds to occur. <p>Weeds to be sprayed by project manager using herbicides (approved low toxicity herbicides). Manual removal must be used adjacent to watercourses. Plant pathogens to be notified to DERM and QPI as appropriate and treated with approved chemicals in consultation with relevant statutory authority.</p>
<p>Reporting</p>	<p>Weeds and other pests shall be included in monthly maintenance reports.</p>



6. Revegetation Techniques

- ▶ All species to be sourced from local seed provenance where possible;
- ▶ All schedule species to be provided in standard native tube plant sizes;
- ▶ All planting stock shall be true to schedule nomenclature, well formed and hardened off to suit their final location, disease free nursery stock. The root system should be firmly established without large roots extruded from the container tube; and
- ▶ Tube stock shall not be root bound.

Appropriate species that are to be reinstated in the re-vegetation program are to be species already existing on site. Canopy trees, small trees and shrubs, sedges and rushes should be planted where possible. A list of re-vegetation species to be considered when regenerating disturbed areas is provided in Table 4. All tube stock is to be inspected prior to planting out with any unacceptable or diseased stock is to be returned by the contractor.

6.1 Revegetation Techniques

Depending on site conditions and availability of resources, it is recommended that a combination of revegetation techniques be used to restore functioning vegetation throughout the site.

Plant Propagation

Plant propagation shall be handled by an appropriate wholesale nursery facility with experience in the propagation of native plants from provenance seed. Plants purchased on 'spec' should also be of provenance material only.

Hand Installation

For hand installation the planting hole will be a minimum of 25% larger than the planting container and its edges will be suitably 'roughed' prior to plant installation. The hole shall be excavated using a 'hamilton planter' or petrol auger, if ground conditions allow, or 'potti putki' if planting occurs in rip lines. The planting hole will then be backfilled with soil and firmly tamped down by hand and foot.

Hand Broadcasting / Natural Recruitment

To supplement the establishment of tube stock native trees, shrubs and lower storey species in restoration zones, it is suggested that during on-going maintenance if any existing native species on site is producing seed these adjacent species should be encouraged to self seed into the surrounding area or the seed should be collected and broad casted across the site. This will add further diversity to the site, particularly ground covers.

Direct seeding is a very 'cost effective' method of revegetation for species that are suitable for this kind of application. This includes local provenance seed such as wattles collected prior to construction. Wattles and other legumes fix nitrogen in the soil while growing and can therefore greatly improve soil condition. Many of these plants also flower heavily and are therefore very attractive to birds and insects. The addition of these pollinators into the revegetation work adds diversity and brings opportunities for natural regeneration.

6.2 Timing of Revegetation

In general, autumn and early winter are the best seasons for planting as summer temperatures can be



too high for young plants to establish and impede survival rates. Planting in all seasons can be effective as long as a suitable watering regime is implemented.

6.3 Topsoil/ Mulching requirements

Imported top soil in accordance with AS4419 is recommended for the site as per landscape drawing package 41-22282-L001- RA, ; 41-22282-L002- RA, 41-22282-L003- RA, 41-22282-L004- RA, 41-22282-L005- RA, and Soft Landscape Specification reference 400159, mulched material should be applied particularly to degraded open areas to aid in soil stabilising, weed control, moisture retention and nutrient sources. Mulch depth is to be inspected prior to planting out can commence and should be consistently 100 mm across the site.

6.4 Fertiliser Requirements

Planting areas should be fertilised with Terracottem with approximately 5-10 grams per native tube stock. Terracottem should be placed directly in the hole as composition allows for minerals to transverse downward to the bottom of the hole to encourage root growth away from the planting hole. All sections should be mulched. Fertiliser is to be inspected during application and rates monitored.

6.5 Tree Guards

All plants installed manually will be suitably guarded with a protective sleeve 750 mm high with bamboo stakes.

6.6 Watering Requirements

To assist in the establishment of the rehabilitated areas, tube stock should receive a minimum of 5 litres of water per tree 3 times per week for 2 weeks during the initial planting period. Watering should occur once a week for the 12 week maintenance period. Ongoing watering should occur once a month at the same individual tree rate thereafter. Any tube stock replaced should be continually watered until it is established.

6.7 On-going Weed Management

An active weed control program should be maintained throughout all of the rehabilitated sections. The definition of a “weed” for the purposes of management is based on that of ‘environmental weed,’ namely a species that by virtue of fecundity and growth habit has the potential to establish large infestations without disturbances that dominate and eventually exclude the native vegetation.

- ▶ Control programs to be carried out by personnel qualified in the recognition of target weeds and potential weed species; and
- ▶ Where possible maintain weed control within one metre of each plant to reduce competition to new revegetation for approximately 24 months.

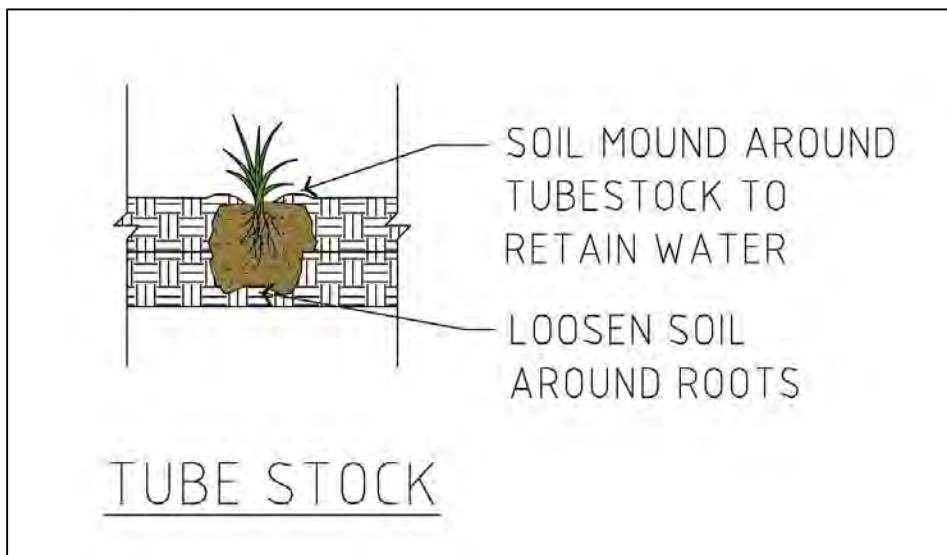


7. Planting Techniques

The following techniques should be employed for revegetation of the site:

- ▶ Figure 1 and Figure 2 illustrate the recommended planting out techniques of nursery tube stock and mature plants that should be utilised.
- ▶ Where possible planting of tube stock should commence immediately after weed management activities, preferably the two activities should be concurrent within a management section.
- ▶ Plants should be obtained from local nurseries that specialise in endemic or provincial species.
- ▶ If plants are not available seed can be collected from appropriate species of trees, shrubs and groundcover from local provenances such as other reaches of the site. These can then be established as tube stock for planting.
- ▶ Drainage lines that follow the natural contours of the site should be included within the rehabilitation works.

Figure 1 Planting diagram for tube stock



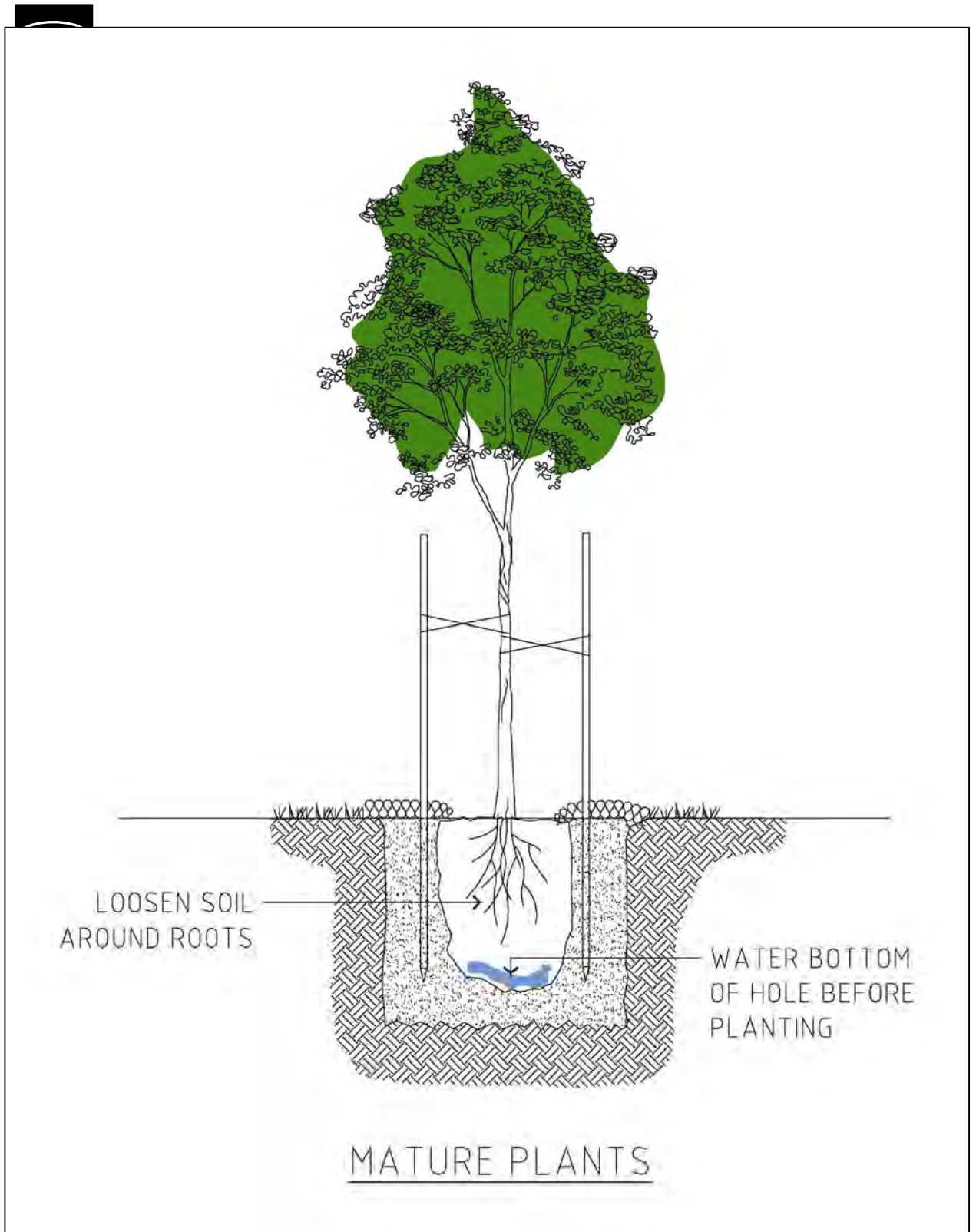


Figure 2 Planting diagrams for trees



7.1 Revegetation Areas

A cross-sectional view of a typical screen/buffer mound where the groups of trees are to be positioned within the site is provided in Figure 3. The planting structure includes a canopy layer; the local native species selected are estimated to reach a height of 25-30 m at maturity. The mid-story and understory will assist in screening the power station from various viewpoints. Plant species used in the revegetation areas will provide habitats for local fauna and avifauna species.



Figure 3 Cross sectional view of Typical Screen/Buffer Mound



7.2 Planting Densities

Planting densities for each tree size is provided in Table 3. A diversity of species in each habitat category should be planted out in accordance with the densities below.

Table 3 Planting Densities

Tree Form	Density
Large tree	1 tree every 10 m
Medium tree	1 tree every 7-8 m
Small tree	1 tree every 3-5m
Shrub	1 shrub every 2-3 m
Ground cover	Clumps every 1-2 m

7.3 Species list for rehabilitation

A list of species is to be used during the rehabilitation are those plants identified from onsite investigations of natural vegetation. Refer to 41-22282-L001 to L004 Landscape Planting Layout for placement of selected species.

Table 4 Species list for Revegetation Areas

Species	Type	Areas
<i>ALLOCASUARINA inophloia</i>	Tree	In both dam locations
<i>CORYMBIA maculata</i>	Tree	In both dam locations
<i>CORYMBIA tessellaris</i>	Tree	In both dam locations
<i>EUCALYPTUS tereticornis</i>	Tree	In both dam locations
<i>LOPHOSTEMON suaveolens</i>	Tree	In both dam locations
<i>ACACIA juncifolia</i>	Shrub	In both dam locations
<i>DODONAEA viscosa</i>	Shrub	In both dam locations
<i>HOVEA acutifolia</i>	Shrub	In both dam locations
<i>JACKSONIA scoparia</i>	Shrub	In both dam locations
<i>PULTENAEA villosa</i>	Shrub	In both dam locations
<i>CYMBOPOGON refractus</i>	Grass/Groundcover/ Native Grass Mix 1	In both dam locations
<i>DIANELLA revoluta</i>	Grass/Groundcover/ Native Grass Mix 1	In both dam locations
<i>HARDENBERGIA violacea</i>	Grass/Groundcover/ Native Grass Mix 1	In both dam locations



Species	Type	Areas
<i>LOMANDRA longifolia</i>	Grass/Groundcover/ Native Grass Mix 1	In both dam locations
<i>THEMEDA australis</i>	Grass/Groundcover/ Native Grass Mix 1	In both dam locations
<i>DIANELLA caerulea</i>	Grass/Groundcover/ Native Grass Mix 2	In both dam locations
<i>ISOLEPIS nodosa</i>	Grass/Groundcover/ Native Grass Mix 2	In both dam locations
<i>LOMANDRA longifolia</i>	Grass/Groundcover/ Native Grass Mix 2	In both dam locations
<i>THEMEDA australis</i>	Grass/Groundcover/ Native Grass Mix 2	In both dam locations
<i>HARDENBERGIA violacea</i>	Hydromulch Mix with Macmat Jute Matting	In both dam locations
<i>LOMANDRA longifolia</i>	Hydromulch Mix with Macmat Jute Matting	In both dam locations
<i>MYOPORUM ellipticum</i>	Hydromulch Mix with Macmat Jute Matting	In both dam locations
<i>CYNODON dactylon</i>	Hydromulch Grass Mix	In both dam locations



8. Maintenance Program for Revegetation Works

8.1 Revegetation Maintenance Actions

Table 5 Revegetation Maintenance Actions

	Time	Maintenance Action
Presence of Weeds	Fortnightly (12 weeks) Monthly (12 weeks) Quarterly (18 months)	Remove weed regrowth to ensure dominance of regenerating native plants. A weed exclusion zone of at least 2 m should be maintained around each revegetated area. Replenish mulch / weed matting where necessary. Problematic weeds listed in table 10 will be a specific focus for ongoing management.
Health of Plants	Fortnightly (12 weeks) Monthly (12 weeks) Quarterly (18 months)	Replace dead or dying plants. Sick plants may be an indication of stress or poor soil conditions. This may be a result of low nutrient levels or lack of water, it is imperative that a stringent watering regime is maintained.
Signs of Regeneration	Fortnightly (12 weeks) Monthly (12 weeks) Biennially (24 months)	Natural regeneration and new growth in previously weed infested areas is a good sign of recovery and indicates a healthy ecosystem.
Signs of Disturbance	Fortnightly (12 weeks) Monthly (12 weeks) Biennially (24 months)	If a disturbance (e.g. foraging by wildlife or insects, erosion, nutrient influx etc) is affecting >10% of a revegetation area it is considered a major threat and should be mitigated.
Habitat Values	12 months (annually for 2 years)	The site should be developing food sources, (e.g. nectar and seed) and habitat (e.g. leaf litter, nesting sites) for native fauna. Logs, rocks and nest boxes can be utilised to enhance fauna habitat.
Diversity & Structures	12 months (annually for 2 years)	The site should begin to represent a natural system. It should display a diversity of native species and a natural structure incorporating canopy, mid-layer and groundcover.
Density	24 months	A stem density of no greater than one (1) m centre between any two (2) plants to be achieved by end of maintenance period.





8.2 Proposed Maintenance Schedule

Table 6 Proposed Maintenance Schedule

MAINTENANCE SCHEDULE	
Responsibility	PM (Rehabilitation Contractor)
Maintenance Actions and Methodologies	<p>Initial Establishment</p> <p>Initial 12-week establishment period applies to all vegetation works. During this period weekly maintenance is to occur that involves the following:</p> <ul style="list-style-type: none"> • watering; • ongoing weeding; • fertilising; and • replacement of dead or damaged stock. <p>Ongoing Maintenance</p> <p>After this period, it is recommended that the site be maintained on a monthly basis over a 24 month period to ensure that the revegetation has been successful. The following is to occur:</p> <ul style="list-style-type: none"> ▶ Conduct weed spraying, tree watering, tree replacement of losses as necessary to maintain >90% survival rate. ▶ All proposed natural/conservation or landscape areas that are disturbed, will be revegetated at module planting rates. ▶ All revegetation species will be disease free and supplied from an accredited nursery supplier. <p>Long-term Maintenance</p> <p>Annual report is required to determine the success of rehabilitation against the floristic and structural criteria provided above and contain recommendations by the PM to the GM in regard to issues affecting the ongoing success of the restoration works, and the possible need for additional activities that may be required outside the normal maintenance program.</p>
Management Intervals	<p>Weekly for first 12 weeks;</p> <p>Monthly for after 24 months; and</p> <p>Review with Biannual report.</p>



<p>Monitoring Program</p>	<p>The monitoring should address the following issues:</p> <ul style="list-style-type: none">• Plant growth, percentage cover and survival rates;• Plant losses through herbivores, disease, vandalism, storm damage or other factors;• Weed re-growth and control measures;• Plant replacement;• Guard repair and weeding inside guards; and• Maintenance watering regime. <p>It is also essential to keep an accurate photo-record of the progress of the restoration works by setting up an appropriate number of representative fixed photo-points across the site. Photos should be taken by digital camera and recorded in the project file by date and discrete photo-point number. Photo-point locations should be clearly marked on site and mapped by a surveyor or by GPS.</p> <p>The site should be monitored on a monthly basis over 24 months</p>
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<p>Corrective Actions</p>	<p>If soil erosion is still occurring in planting zones the following is to occur:</p> <ul style="list-style-type: none">• review rehabilitation techniques conducted by project manager;• review erosion and sediment control;• assess the potential for disturbance to occur;• assess other potential sources or causes of disturbance to occur; and• maintain planting regimes to a minimum of >90% survival rate. <p>If weed infestations are still occurring in planting zones the following is to occur:</p> <ul style="list-style-type: none">• review weed removal and weed management techniques conducted by project manager;• assess the appropriate use and amounts of herbicides are being used;• assess the potential for weeds to occur; and• assess other potential sources or causes of weeds to occur. <p>If there is poor re-growth or regeneration of native plants occurring in rejuvenation areas zones, the following is to occur:</p> <ul style="list-style-type: none">• review re-vegetation and direct seeding management techniques conducted by project manager;• assess the appropriate use and amounts of herbicides are being used in rejuvenation areas;• assess the potential for weeds to occur in rehabilitated areas; and• assess other potential sources or causes of weeds or limited re-growth of native plants to occur.i.e. plant pests and disease monitoring.
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Reporting	<p>Report prepared after each maintenance and monitoring visit documenting the following:</p> <ul style="list-style-type: none">• plant growth rate;• plant survival rate in each monitoring zone;• photos from monitoring zones;• areas of weed establishment including species; and• weed spraying, tree watering or tree replacement of losses completed. <p>Annual report is required to determine success of rehabilitation against the floristic and structural criteria provided above and is to outline recommendations by the PM to the GM in regard to issues affecting the ongoing success of the restoration works, and the possible need for additional activities that may be required outside the normal maintenance program.</p>
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8.3 Photographic Monitoring Data Points

To aid in evaluating the success of the weed management and rehabilitation a number of photo points will be established along the restoration management area. Posts (timber) will be used to delineate the extent of the planting plot and each post will have a GPS coordinated for each post. Photographs will be taken at a post indicating a southern and northern aspect view of each planting plots. On a monthly basis, the same GPS posts will be used as a reference point to take photographs of the revegetation plots to monitor site establishment, tree growth and weed suppression. Periodic inspections are to be conducted every month for 24 months. Photographs are to be taken and included in the annual report to provide an indication of the survival and growth of vegetation and establishment of weeds over the maintenance period.

8.4 Preparation and submission follow up Monitoring Report

The objectives of the follow up report will be through site analysis and correlation of preliminary work activity reports will be to provide a maintenance report outlining:

- ▶ a comprehensive description of the existing environment after restoration works and mapping;
- ▶ establish plant identification of species located on site and a vegetation management plan;
- ▶ photographic record of site before and after of designated areas for revegetation/planting techniques to be applied;
- ▶ assessment of the potential impacts of weeds within the site and appropriate weed management practices to be implemented;
- ▶ review of vegetation management plan monitoring and maintenance program;
- ▶ review of description of project deliverables to meet guidelines;
- ▶ review of preparation of project schedule;
- ▶ description of safety measures used;



- ▶ review of methodologies; and
- ▶ conclusion and recommendation on long term maintenance of the revegetation works.



The Landscape Management and Revegetation Plan produced should establish a maintenance benchmark for the site. The revegetation areas would be required to be watered and weed free to maintain a planting threshold of 90% over a 24-month period. Any plant losses over this period of time should be replaced to maintain required planting regimes and to meet the 24-month maintenance conditions criteria outlined in Table 7 below.

Table 7 Site specific floristic and structural criteria – 24 month maintenance period

Criterion	24 Months	Comments
Plant survival (%)	90%	<p>Provided follow-up maintenance is provided (i.e. watering, weeding and replacement planting). If maintenance is not provided then survival rate will be lower which is not acceptable.</p> <p>Failures must be replaced during maintenance and prior to handover.</p> <p>Failed hydro seeding areas are to be reapplied.</p>
Diversity of species (% original planting ratio)	80%	<p>A diversity of native species for each plant type (edge, pioneer, shrub, tree) should be present and one or two species should not dominate (i.e. wattle species).</p> <p>80% must be achieved in the first 12 months.</p>
Plant growth (cm)	> 1.00m growth	Average Height of tree to be >1 m.
Mean cover (%) excluding weeds	80%	<p>Include trees, shrubs and ground covers must achieve 80%</p> <p>Hydro seeded areas must achieve 90%</p>
Mean weed foliage cover (%)	<5%	Must be no greater than 5% in the first 12 months.
Presence of invading environmental weeds (%)	5%	<p>In first 12 months 5% with evidence of dieback/ poisoning.</p> <p>0%.</p>
Evidence of self-generating	Evident	
Fauna habitat developing	Evident	

8.5 Mulching & Erosion Matting

All exposed soil surfaces are to be blanket mulched to a minimum depth of 100 mm mulched with a natural mix blend of organic matter (forest mulch) to aid in the retention of moisture and the reduction of weeds for the initial planting. In the event that mulch quantities are insufficient on site, mulch maybe required to be imported to site. All organic products delivered to site are required to be supplied by a quality supplier and be QPI certified red imported fire ant free.

In areas where embankment gradients are steep or the area shows signs of potential erosion, control devices such as coil logs or a bio degradable matting (Jute Matting Grade 3) should be used to line exposed areas batters/slopes.

Native seed can be hand sown under the matting if available or it can be planted into with tube stock.



The matting should be positioned parallel to the embankment gradient and be partially submerged into the soil at its highest and lowest point (both ends) and pinned at 1.5 m spacing over the matting coverage. Where matting is required to join another piece the matting should be slightly rolled so the joining mats are overlaid and then pinned through the centre at 1 m spacings. This will prevent slippage from water runoff and mats being dislodged from strong winds.

Once matting is in place, planting into the Jute matting is to be at 1 plant per 1 m², the matting is to be cut using Jute matting scissors. The cut is to be made as an upside v pattern with the cut portion turned into and under the mat. This allows access to plant into the soil and acts as a device to catch and hold water to the new plant.

Re-vegetated areas are to be designated as lawn free maintenance zones. The combination of natural re-growth and leaf litter from plants will eventually allow the natural vegetation to maintain itself.

8.5.1 Stockpiling Areas for Mulch

It is recommended to establish any mulch stock piles at a distance of 40 m from a major watercourse and preferably on flat land. The stock pile is to have a sediment fence installed around its entire perimeter. It is best practice to ensure that any exposed surfaces should be covered within a 48 hour period after being cleared. Where blanket mulch meets embankments with steep slopes. Sediment fencing should be installed along the top of the embankment at 1.5 m from the edge of the slope to prevent mulch being potentially washed down embankments during heavy rainfall periods.

If embankments are mulched, sediment fences should be installed to run parallel along the embankment slope at top and toe of batter to prevent mulch slipping in heavy rainfall periods until plantings have stabilised the slope.



9. Erosion and Sediment Control

Erosion and sediment requirements have been identified and listed in Table 8 below:

Table 8 Erosion and Sediment Control Plan

Erosion and Sediment Control	
Objective	To rehabilitate the site using all reasonable and practicable measures to minimise erosion and sedimentation.
Issues and Impacts	Locating structures, existing erosion problems, extensions/upgrade of access tracks Traffic movement on access tracks, vegetation clearing
Planning and design	
Control Measures	<p>Locate structures in areas of low erosion potential, where possible.</p> <p>Where any widening of existing tracks or structures are to be located in areas of high erosion risk, design erosion control measures in accordance with Institute of <i>Engineers Australia Queensland Division (1996) Soil Erosion and Sediment Control – Guidelines for Queensland Construction Sites</i>. Utilise existing access tracks where possible.</p> <p>Design/schedule ameliorative measures for existing erosion areas including:</p> <ul style="list-style-type: none"> ▶ Installation of whoa boys on access tracks if required; ▶ Backfill, resurface and install contour banks for existing rill and gully erosion, to provide erosion resistance and reduce overland flow velocity. ▶ Planning and design are to consider erosion and sediment control impacts and include into budgets
Monitoring	Not applicable to this stage of project
Reporting	Not applicable to this stage of project
Corrective Action	Review design of erosion and sediment control measures
Responsibility	Westlink
Construction	



<p>Control Measures</p>	<p>Access Tracks</p> <p>Limit construction of new access tracks by utilising existing tracks where possible.</p> <p>Limit construction of new access tracks where existing surface remains suitable for construction traffic and longer term 4WD maintenance vehicles.</p> <p>All access tracks to be located by GPS and shown on site route plans to avoid misunderstandings prior to detailed construction commencing.</p>
<p>Control Measures</p>	<p>No clearing of riparian vegetation or in any areas vulnerable to erosion unless at structure sites.</p> <p>Access tracks through easily erodable ground shall have endemic grass (or with a mixture of sterile annuals) seeds hand spread across the majority of the track on a regular basis to facilitate native grass germination and soil retention, even though the track may remain under irregular traffic use.</p> <p>Where access tracks become heavily disturbed, restrict movement by cordoning off with survey tape. Install additional drainage control measures (such as table drains, rock check dams and whoa boys) if required.</p> <p>Access tracks not required: to be cordoned off, re-profiled and rehabilitated, as such areas become available. Erosion controls shall remain in place and maintained until such time as a stable landform (>70% groundcover) has been achieved.</p>



<p>Control Measures</p>	<p>Any new access tracks or extensions to existing access tracks shall be constructed to control drainage and minimise erosion. Erosion and sediment control shall be undertaken in accordance with <i>Institute of Engineers Australia Queensland Division (1996) Soil Erosion and Sediment Control – Guidelines for Queensland Construction Sites</i>, a copy of which is with each Construction Manager and Project Environmental Officer.</p> <p>Where new or extended access tracks are required across creeks and gullies, earthworks should be minimised as far as practicable to minimise soil disturbance. Crossings should be constructed at right angles to the stream flow, if possible. Approaches to creeks may need stone lining to provide stable access and access clearings should be minimised to retain riparian vegetation. Whoa-boys should be constructed immediately upslope to prevent up-gradient runoff from causing rill erosion. The surface of the crossing should be finished at the original creek bed level. Streambeds may require stone lining for protection.</p> <p>New or extended access tracks shall be constructed at grades of less than 20%, as far as possible. Where previously constructed tracks traverse directly up steep ridge lines that are causing significant erosion, alternative flatter alignments should be investigated and the existing track rehabilitated.</p> <p>Erosion protection of access track lead off drains from whoa boys, dams or other drains shall be extended until a non-scourable 2% grade or less is achieved.</p> <p>Rehabilitate temporary access roads by deep ripping, replacing displaced topsoil and revegetating with endemic vegetation.</p> <p>Traffic Movement</p> <p>In the event of saturated soil conditions, works may be postponed until further notice to prevent disturbance and damage to access roads.</p>
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<p>Control Measures</p>	<p>Structure footings and infrastructure within site.</p> <p>Disturbances associated with constructing structure footings require strategies to minimise the release of sediment to waters. These strategies shall include but not be limited to the construction of diversion banks/drains, where necessary, along the elevated perimeter of the works to prevent uncontaminated stormwater from contacting areas of disturbance and installation of temporary sediment fences below areas of earthworks.</p> <p>Erosion and sediment control measures at disturbed areas and on the approach corridors shall be implemented as per (Institute of Engineers Australia Queensland Division (1996) Soil Erosion and Sediment Control – Guidelines for Queensland Construction Sites).</p>
<p>Control Measures</p>	<p>Cleared vegetation should be windrowed on the low side of the clearing.</p> <p>Broad-scale clearing shall be undertaken with blades at least 100mm above ground level to minimise topsoil disturbance, unless earthworks are required.</p> <p>Deep rip and revegetate disturbed areas once construction has been completed and lay down areas or access tracks no longer required.</p>
<p>Monitoring</p>	<p>Regular inspections of all stormwater drains and erosion control measures for discharges of suspended solids to waters daily in response to significant rainfall events (>50 mm in 24 hours). The Contractors Site Foreperson or delegate shall immediately undertake any necessary maintenance works to prevent or minimise the release of contaminated runoff to any waterways. Such actions are to be audited by the Project Environmental Officer for compliance.</p>
<p>Reporting</p>	<p>Erosion and sediment control shall be included in monthly reports prepared by the Project Environmental Officer. The reports are to recommend appropriate controls to minimise erosion on site.</p>



Corrective Action	<p>The Construction Manager and the Project Environmental Officer are to be notified in the event of non-compliance.</p> <p>Corrective actions in the event of non-compliance include inspection of maintenance and erosion control measures and identification of sediment control deficiencies. Sediment fences and additional whoa boys (or rock check dams on drainage lines) may be installed to prevent transport of sediment to any waterway.</p> <p>Undertake revegetation works in areas of likely erosion.</p> <p>Some tracks may have to be temporarily closed to repair erosion damage and to prevent further sediment transport off site.</p>
Responsibility	Construction Manager and Project Environmental Officer
Operation and Maintenance	
Control Measures	<p>Access roads and structure sites will be regularly monitored (minimum annually) for evidence of erosion and sedimentation of gullies and creeks.</p> <p>Grading of tracks should be limited to those sections where erosion damage has occurred. Where ground cover exists and no erosion is occurring, access should be maintained by slashing with grading limited to clean-up of drainage control structures to allow dry weather 4WD vehicle drive access.</p> <p>► The success of rehabilitation should determine the need for additional erosion control works.</p>
Monitoring	Regular monitoring for erosion along the corridor during routine inspections.
Reporting	Corridor Maintenance to include erosion in reporting requirements.
Corrective Action	Where erosion has occurred, stabilise the area and implement appropriate controls (drainage, bunds, sediment devices etc) to prevent erosion from occurring again.
Responsibility	Environmental Officer and Maintenance Contractor



10. Weed Control and Management

Identification of Weeds on Site

During the field visit to the area proposed for the power station and buffer mound, one declared weed, listed under the *Land Protection (Pest and Stock Route Management) Act 2002* (LPA), was identified.

This was:

- ▶ *Opuntia stricta* (prickly pear) – Class 2 Declared Plant.

For general site information on declared weeds, refer to section 3.4.1 of the Detailed Ecological Assessment, Lot 191 CHS2361, Ford's Road, Gatton, dated 21st April 2009 prepared by Conics.

Environmental Weeds

Table 10 contains species that are considered environmental weeds in South East Queensland. These species were identified during the site visit on 14/12/09 and located in the southeast corner of the site, in open grassland areas.

Table 9

Species Name	Common Name
<i>Cirsium vulgare</i>	spear thistle
<i>Gomphocarpus physocarpus</i>	Balloon cotton bush

Environmental weeds identified generally on the site by ecologist are listed in Table 10. Refer to section 3.4.1 Environmental Weeds of the Detailed Ecological Assessment, Lot 191 CHS2361, Ford's Road, Gatton, dated 21st April 2009 prepared by Conics.

Table 10

Species Name	Common Name
<i>Paspalum dilatatum</i>	paspalumgrass
<i>Plantago lanceolata</i>	lamb's tongue
<i>Conyza bonariensis</i>	flaxleaf fleabane
<i>Melinis repens</i>	red natal grass
<i>Gomphrena celosioides</i>	gomphrena weed
<i>Bidens pilosa</i>	cobbler's pegs
<i>Lantana montevidensis</i>	creeping lantana (Class 3 weed)
<i>Verbena bonariensis</i>	purple topped verbana



10.1 Control Methods and Species List

Weed Removal Methods

The following methods are the most common and user-friendly methods of applying appropriate weed management techniques to contain weeds on the property. The following types of weed management techniques are recommended to eradicate different types of weed species, and promote the regeneration of native species in the area.

Although weeds will be removed via machinery as part of the engineering works for the construction of the access track, certain responsibilities in maintaining this zone are required. Weeds reproduce in great numbers by effective methods of vegetative propagation or by setting great numbers of seeds. Seeds and other propagules are spread around by localised environmental elements and machinery. Most soils contain large numbers of dormant weed seeds that readily germinate when exposed to light and moisture. Bare and disturbed soil will be readily colonised by weeds and regular maintenance will be required.

The following methods are to be applied in managing weeds on site:

- ▶ direct contact spray; and
- ▶ cut stump method.

Direct Contact Spray

This method involves direct spraying of herbicide to the leaf surface of classified weed species. This method is particularly user friendly and time efficient if it is implemented on targeting weed species, which are of a herbaceous/succulent or young nature. The plant usually dies on site and will not require removal using this method. This will minimise the impact on the environment.

This method is excellent for targeting more invasive low growth species such as grasses and herbaceous weeds species, which may occur. Invasive weeds of this kind have a short rapid growth cycle producing regular flowers and seeds, and short reproduction cycles.

Timely direct spraying of these weeds can effectively minimise the reoccurrence of these weeds, disturbing the lifecycle by preventing the plant from producing seed.

Cut stump method

The cut stump method is applied to semi-hardwood species. This involves mechanically cutting the plants stem and then directly applying the herbicide to the cut stem. It recommended that a dye be added to the herbicide to assist in the application as a visual aid to monitor the use and success of the herbicide. For optimum results herbicide should be applied to the stem immediately to prevent plant cells from sealing and preventing herbicide from entering the plant. Mechanical treatment of woody weeds, such as lantana by reducing plant to 50 mm above ground is the most appropriate method. The cut stump method involves applying undiluted Glyphosate directly to the cut stem.

Type of herbicide

When applying weed control methods near waterways that require the use of chemical herbicides it is a requirement to use herbicide of a low residual composition. This will minimise the build up of herbicide levels in the surface soil and ecosystem. Roundup biactive is the preferred use herbicide as it has a low residual nature and is also effective in the control of weed species. The type of herbicide is preferred when in close proximity of waterways. Coloured dye should be added to chemical control of weeds to provide visual identification of herbicide application and the monitoring of success rates. In areas of intense weed infestation, particularly near creeks), removal of vegetation encourages erosion and further



opportunistic weed species. Revegetation of these areas is a priority.

Timing

The weed management techniques are to be applied in the early morning and/or late afternoon. If the herbicide is mixed with water and used in the direct contact spray, the herbicide may evaporate before it is absorbed into the plant tissue. It is a legal requirement that any department or contractor must be an approved licensed herbicide operator (AC/DC Applicators License) when using herbicide on state, commercial or public lands. It is a requirement to record and file a materials/herbicide spray checklist nominating Time/Date/weather conditions/ litres used (application rates) on every application and be made available to any government official if requested. Chemical control of weeds should have a minimum of 4 – 24 hrs of non-contact exposure to heavy rain.

All exposed soil surfaces are to be rehabilitated within 24 hrs of construction or landscaping completion and where necessary have temporary or permanent sediment control devices in place prior or during construction phase

Declared Plant Surveillance

When monitoring declared weeds it is a requirement to undertake monthly and annual site surveillance inspections to monitor weed and re-vegetation areas. This allows consultation between landowners and council to maintain awareness and education in relation to weed management on the site for the potential re-growth and occurrence of new invasive weeds. This surveillance is required to be undertaken by a suitably qualified person. Under the *Queensland Land Protection (Pest and Stock Route Management) Act 2002*, it is a required that the property owner, manage any declared plants on the property.

Table 11 Guide for weed species list and recommended control methods

Species Name	Common Name	Form	Control methods
<i>Lantana camara</i> Class 3	Lantana	Shrub	Refer to P1 General Control Methods
<i>Opuntia stricta</i> Class 2 Declared Pest P1	Prickly Pear	Cactus	Refer to P1 General Control Methods 1
<i>Lantana montevidensis</i> Class 3 Declared Pest P1	Creeping Lantana	Shrub	Refer to P1 General Control Methods
<i>Bidens pilosa</i> P2	Cobbler's Pegs	Annual Herb	P2 Control Method
<i>Melinis repens</i> P2	Red Natal Grass	Perennial grass	P1 Control Method 1



<i>Verbena bonariensis</i>	Purpletop	Perennial herb	P2 Control Method
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11. Potential Impacts and Mitigation Measures for Revegetation Works

To ensure the most appropriate measures are implemented to mitigate potential negative impacts from the infestation by pest plants, the management of native vegetation and the stabilisation of a riparian zone, prior to, during construction and throughout the maintenance period of the project needs to be implemented. Site-specific mitigation measures have been developed and are to be applied on site as additional requirements to the standard guidelines of the LMRP.

Potential impacts from the proposed rehabilitation works on the surrounding vegetation communities include but not limited to the following:

- ▶ Vegetation loss and habitat fragmentation
- ▶ Gully erosion and sediment run-off; and
- ▶ Weed invasion.

These impacts are discussed in more detail below.

11.1 Vegetation loss and habitat fragmentation Mitigation Measures

- ▶ Vegetation to be retained is to clearly visible by barricade fencing or clearly marked or flagged;
- ▶ All appropriate permits and approvals to be gained;
- ▶ Prior to clearing vegetation or weeds on site, clearing zones need to be identified to all operational and construction personnel;
- ▶ Temporary fencing incorporating safety measures and sediment control devices should be installed to delineate limit of clearing permitted under the development application;
- ▶ Utilise existing tracks, disturbed areas and cleared lands for access only;
- ▶ Rehabilitate cleared area with appropriate local native species;
- ▶ Retain habitat features such as large fallen logs for reinstatement following construction and during rehabilitation;
- ▶ Vegetation required to be cleared should be mulched on site. The mulch should be used to assist in stabilising soil batters/disturbed areas or stockpiled to reinstate future proposed re vegetation areas after completion of works;
- ▶ Vegetation removed on embankments should be cut no less than 50 mm above ground level to maintain soil/riparian surface stability where possible. This will assist to maintain and improve the potential regeneration of the site from re-growth when construction is completed;
- ▶ Logs occurring in the proposed rehabilitation area should be examined and their importance in terms of habitat value determined and assessed. Where they provide significant habitat values, logs should be left in their place of origin or relocated near or reinstated once works are completed.
- ▶ A list of species is to be used during the revegetation are those plants identified from on site investigations of natural vegetation Table 4. Species have been grouped into the different categories based location of planting.
- ▶ Planting densities for each tree size is provided (refer to Table 3). A diversity of species in each habitat category should be planted out in accordance with the densities in Table 3. Re-vegetation is



required to mitigate against potential adverse impacts on vegetated and or exposed lands of the operation works.

Gully Erosion and Sediment Run-off

The embankments also show evidence of spoil and landfill waste used to stabilise the embankments. Further clearing and disturbance to the soil structure and vegetation cover through this area would increase any erosion already present on the gully slopes through exposed soil surfaces, increased water run-off and disturbance to the banks.

Mitigation Measures

- ▶ Site is to be assessed prior to works to determine locations of stockpiles, diversion banks and requirements for other sediment retention devices. Appropriate devices to be installed to prevent turbid water from leaving site and entering surrounding surface waters. Water should be ponded until sediment has settled or water has receded.
- ▶ Sediment Control Devices to be used:
 - coil logs on formed swales, dry creek beds and slopes;
 - sediment fencing on boundaries and open surface run off areas;
 - silt curtains in water bodies; and
 - jute matting (grade 3) on all exposed slopes/batters greater than 1: 2.
- ▶ Revegetation should occur as by applying a direct seed mix of native ground covers, sedges and grasses or tubestock species to achieve a ground cover density of 1 plant 1 m ration. Utilise existing tracks, disturbed and cleared areas for pipeline easement;
- ▶ Install sediment fencing to protect surrounding creek lines, gullies and reduce run-off;
- ▶ Backfilling and rehabilitation of the alignment within 24 - 48 hrs is to occur immediately after pipe-laying is complete;
- ▶ Exposed soil surfaces are to be jute matted (grade 3) on slopes/batters and rehabilitated at 1 native plant per m² or direct seeded under matting or exposed surfaces at 7 kg per hectare; and;
- ▶ By reducing the need to clear vegetation, it will reduce the area required to regenerate.

11.2 Weed Invasion and Edge Effect

Increased disturbance within the site in time would allow weed species to penetrate further into this area if not managed accordingly. In time this may affect the integrity, biodiversity and habitat value of the native vegetation. Also, weeds may not provide good protection against erosion. Often the removal of one weed species allows another weed species type to takeover. The following mitigation measures are suggested.

Mitigation Measures

In addition to implementing the rehabilitation and revegetation in accordance with the overall VMRP the following site-specific requirements are to be implemented:

- ▶ All weeds throughout the site are to be sprayed and managed a minimum 1-month prior to any clearing or earthworks can commence;
- ▶ Direct contact spraying and cut stump method are the preferred weed control methods to be used throughout the proposed rehabilitation site;
- ▶ Herbaceous weeds are to be direct contact sprayed and woody weeds are to be cut 50 mm above to



ground level and have stumps sprayed or swabbed with an approved herbicide - e.g. Roundup Biactive 20 ml/1 litre with wetting agent, to prevent re-growth of unwanted weed species. The application of an herbicidal application dye should be used and applied with the constituent herbicide to monitor the application kill rates of weed species.

- ▶ Clean equipment prior to exiting and arriving on site. A leaf blower is sufficient to prevent the introduction of new weeds on site.
- ▶ Roundup bioactive is the preferred herbicide (applied with dye to monitor application) to be used on site;
- ▶ Landscape/weed contractor is to be a licensed and accredited commercial operator with approval from QPI;
- ▶ Initial 12-week establishment period applies to all vegetation works. During this period weekly weed maintenance is to occur that involves ongoing weeding and spot spraying; and
- ▶ Regular monthly ongoing maintenance of the rehabilitation works is to occur for a period of 24 months for weed suppression and re-vegetation areas.



12. Conclusions

As a result of the proposed landscape management and revegetation works the following has been determined:

- ▶ Selective removal of weeds will occur as a result of the project;
- ▶ All environmental weeds throughout the site are to be sprayed and managed in accordance of the LMRP;
- ▶ Trees, shrubs and ground covers must be planted in accordance with the planting specification as outlined in the 41-22282-L001-L004, Landscape Planting Layout and associated Landscape Specification;
- ▶ Mean ground cover of weeds must be no greater than 5% in re-vegetation planting plots in the first 24 months;
- ▶ Regular monitoring and reporting is required for clearing, rehabilitation, weed management and re-vegetation of all areas;
- ▶ Regular ongoing maintenance of re-vegetation establishment, weed suppression areas, re-vegetation of areas is required to maintain and enhance the visual and dominant landscape in the region;
- ▶ Replacement of dead plants is required during the maintenance period.
- ▶ Successful survival of all re-vegetated species planted to a minimum of 90% survival rate after 24-month period;
- ▶ A follow-up quarterly maintenance program after the initial 12 months is highly recommended;
- ▶ The PM is responsible for implementing and achieving the deliverables outlined in Section 11 of this LMP (Weed Control and Management);
- ▶ PM is to be a licensed and accredited commercial operator with approval of from QPI;
- ▶ All declared weeds (P1 zone) are required to be controlled as a priority over all other weed species;
- ▶ Direct contact spraying and cut stump method are the preferred weed control method techniques to be used throughout the site;
- ▶ Initial 12-week establishment period applies to all vegetation works. During this period; weekly weed maintenance is to occur that involves ongoing weeding and spot spraying;
- ▶ Ongoing maintenance is to continue monthly for the 24 months;
- ▶ Roundup bioactive is the preferred herbicide to be used on site;
- ▶ PM and the EO are to visually monitor for the presence of weeds during routine patrols PM personnel are to provide reports after maintenance patrols outlining the presence of weed infestations.
- ▶ Monthly operational works sheet are to be recorded and submitted to GM monthly.
- ▶ An accurate photo-record of the progress of the weed control works and re-vegetation is required by setting up an appropriate number of representative fixed photo-points in the area. Photos should be taken by digital camera and recorded with a GPS coordinate. Photo-point locations should be clearly marked on site and mapped by a surveyor or by GPS.
- ▶ An annual report should be prepared documenting the monthly activities and reporting over the 24



months.

- ▶ The report completed by the PM to the GM should contain recommendations in regard to issues affecting the ongoing success of the LMRP works, and the possible need for additional activities that may be required outside the normal maintenance program.



Appendix A
Detailed Landscape Plan



- LEGEND**
- EXISTING TREE TO BE RETAINED (INDICATIVE LOCATION ONLY)
 - PROPOSED TREE
 - PROPOSED SHRUB MIX
 - PROPOSED GROUNDCOVER/NATIVE GRASS MIX 1
 - PROPOSED GROUNDCOVER/NATIVE GRASS MIX 2
 - PROPOSED HYDROMULCH MIX WITH MACMAT JUTE MATTING (REFER TO SPECIFICATION)
 - PROPOSED HYDROMULCH GRASS MIX (TO BE APPLIED TO ALL DISTURBED AREAS. REFER SPECIFICATION)

- NOTES:**
- REFER TO LMRP FOR WEED REMOVAL INFORMATION, STREAM ORDERS AND RIPARIAN / WILDLIFE CORRIDORS, STOCKPILE LOCATIONS AND DISPOSAL SITES, EROSION CONTROL AND LOCATION OF MACHINE ACCESS WAYS



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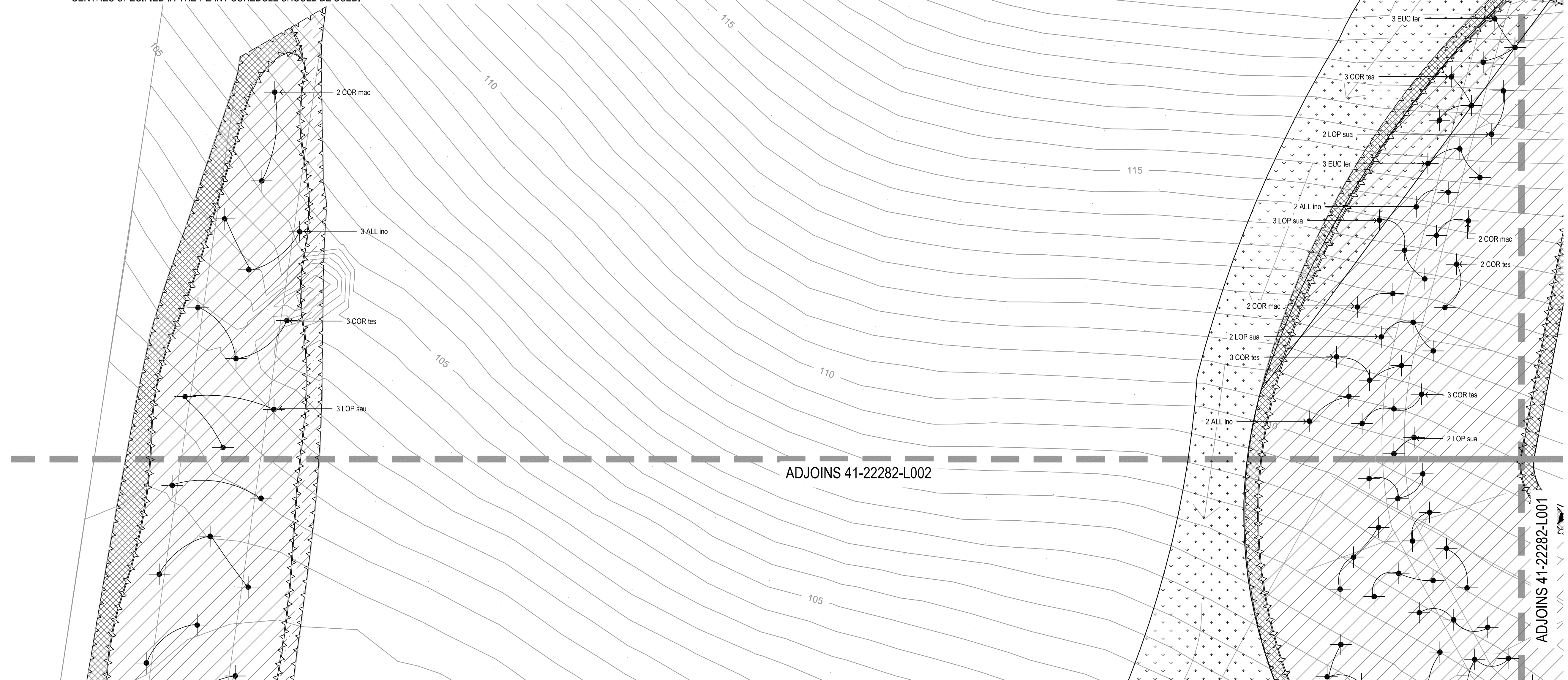
Client **WESTLINK PTY LTD.**
 Project **WESTLINK POWERSTATION**
 Title **LANDSCAPE DETAILED DESIGN**
LANDSCAPE PLANTING LAYOUT 4

Original Size **A1** Drawing No: **41-22282-L004** Rev: **A**

MASTER PLANT SCHEDULE									REV A
QUANTITY	CODE	BOTANICAL NAME	COMMON NAME	CENTRES (mm)	POT SIZE	HEIGHT (MATURITY)	SUPPLY HEIGHT	STAKING	
TREES									
42	ALL ino	ALLOCASUARINA inophloia	Stringybark She Oak	10000	25L	10m	1200mm	Y	
52	COR mac	CORYMBIA maculata	Spotted Gum	10000	25L	25-30m	1200mm	Y	
46	COR tes	CORYMBIA tessellaris	Moreton Bay Ash	10000	25L	35m	1200mm	Y	
37	EUC ter	EUCALYPTUS tereticornis	Forest Red Gum	10000	25L	30m	1200mm	Y	
48	LOP sau	LOPHOSTEMON suaveolens	Swamp Box	10000	25L	10-25m	1200mm	Y	
SHRUB MIX									
13950	ACA jun	ACACIA juncea	Rush Leaf Wattle	MIXTURE OF SPECIES AT 2000mm CENTRES	TUBE	1-2.5m	NA	N	
13950	DOD vis	DODONAEA viscosa	Sticky Hop Bush		TUBE	5-8m	NA	N	
13950	HOV vis	HOVEA acutifolia	Pointed Leaf Hovea	TUBE	2-4m	NA	N		
13950	JAC sco	JACKSONIA scoparia	Dogwood	TUBE	4m	NA	N		
13950	PUL vil	PULTENAEA villosa	Hairy Bush Pea	TUBE	2m	NA	N		
GROUNDCOVERS/NATIVE GRASS MIX 1									
2255	CYM ref	CYMBOPOGON refractus	Barbed Wire Grass	MIXTURE OF SPECIES AT 750mm CENTRES	TUBE	NA	NA	N	
2255	DIA rev	DIANELLA revoluta	Blueberry Lily		TUBE	NA	NA	N	
2255	HAR vio	HARDENBERGIA violacea	Native Sarsaparilla	TUBE	NA	NA	N		
2255	LOM lon	LOMANDRA longifolia	Mat Rush	TUBE	NA	NA	N		
2255	THE aus	THEMEDA australis	Kangaroo Grass	TUBE	NA	NA	N		
GROUNDCOVERS/NATIVE GRASS MIX 2									
1060	DIA cae	DIANELLA caerulea	Blue Flax Lily	MIXTURE OF SPECIES AT 750mm CENTRES	TUBE	NA	NA	N	
1060	ISO nod	ISOLEPIS nodosa	Knobby Club Rush		TUBE	NA	NA	N	
1060	LOM lon	LOMANDRA longifolia	Mat Rush	TUBE	NA	NA	N		
1060	THE aus	THEMEDA australis	Kangaroo Grass	TUBE	NA	NA	N		
HYDROMULCH MIX WITH MACMAT JUTE MATTING									
NA	1/3	HARDENBERGIA violacea	Native Sarsaparilla	NA	NA	NA	NA	N	
NA	1/3	LOMANDRA longifolia	Mat Rush	NA	NA	NA	NA	N	
NA	1/3	MYOPORUM ellipticum	Booblia	NA	NA	NA	NA	N	
HYDROMULCH GRASS MIX									
		CYNODON dactylon		NA	NA	NA	NA	N	

NOTES:

- WHERE DISCREPANCIES OCCUR BETWEEN PLANT QUANTITIES SHOWN ON DRAWING AND PLANT SCHEDULE, A QUANTITY DERIVED FROM PLANT CENTRES SPECIFIED IN THE PLANT SCHEDULE SHOULD BE USED.
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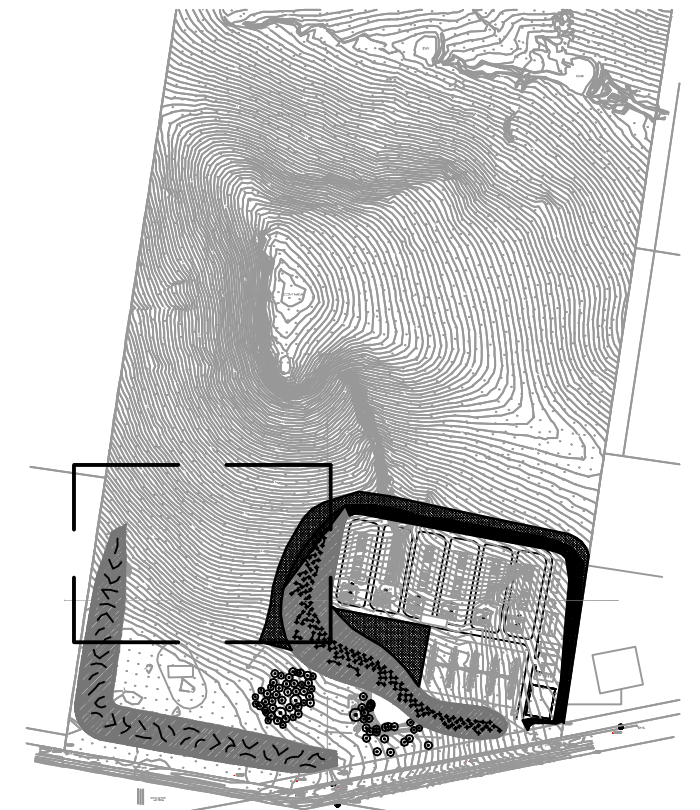


LEGEND

- EXISTING TREE TO BE RETAINED (INDICATIVE LOCATION ONLY)
- PROPOSED TREE
- PROPOSED SHRUB MIX
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NOTES:

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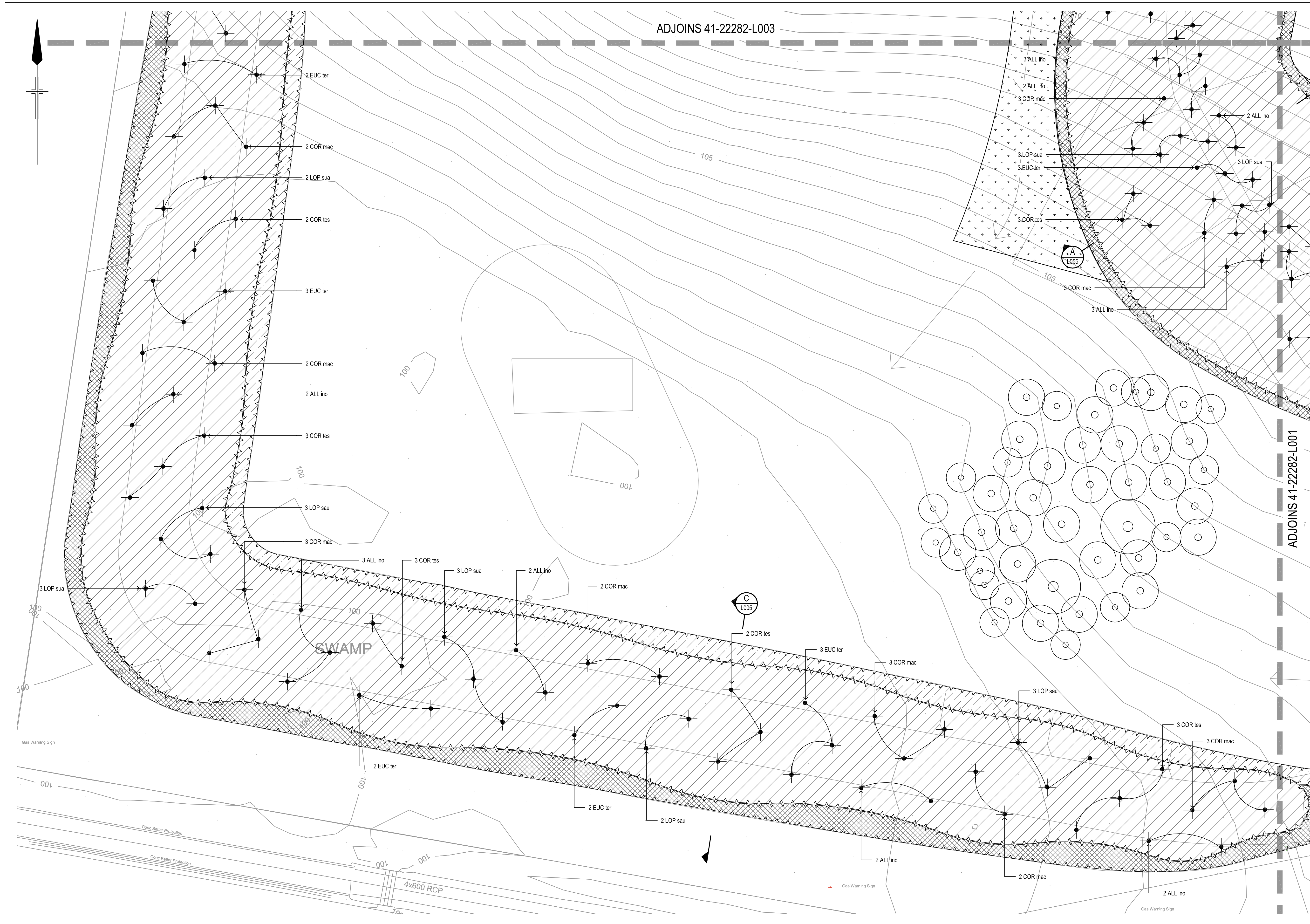
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Client **WESTLINK PTY LTD.**
Project **WESTLINK POWERSTATION**
Title **LANDSCAPE DETAILED DESIGN**
LANDSCAPE PLANTING LAYOUT 3

Original Size **A1** Drawing No: **41-22282-L003** Rev: **A**



- LEGEND**
- EXISTING TREE TO BE RETAINED (INDICATIVE LOCATION ONLY)
 - PROPOSED TREE
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Client	WESTLINK PTY LTD.	Original Size	A1
Project	WESTLINK POWERSTATION	Drawing No:	41-22282-L002
Title	LANDSCAPE DETAILED DESIGN	Rev:	A
	LANDSCAPE PLANTING LAYOUT 2		

ADJOINS 41-22282-L004

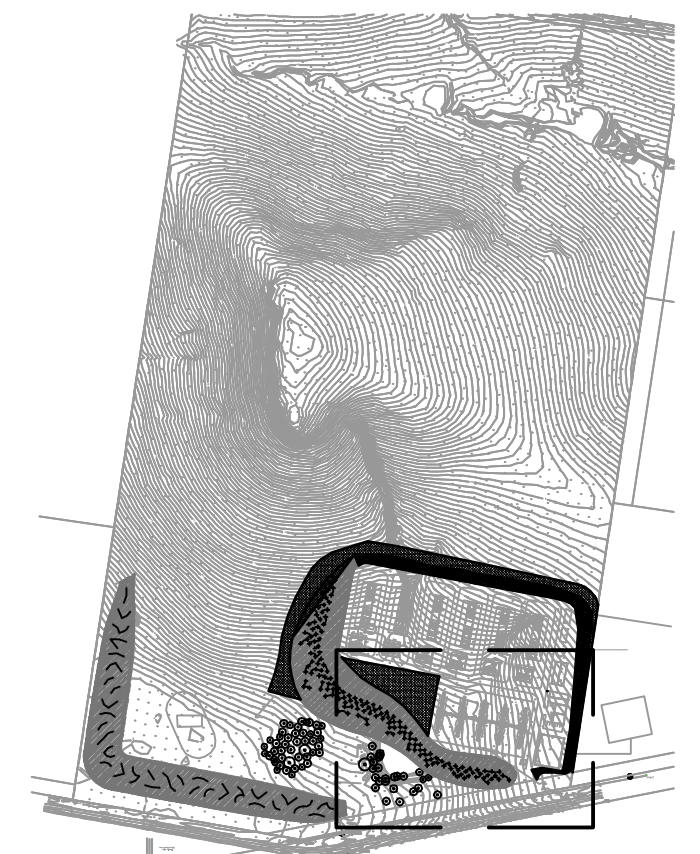


LEGEND

- EXISTING TREE TO BE RETAINED (INDICATIVE LOCATION ONLY)
- PROPOSED TREE
- PROPOSED SHRUB MIX
- PROPOSED GROUNDCOVER/NATIVE GRASS MIX 1
- PROPOSED GROUNDCOVER/NATIVE GRASS MIX 2
- PROPOSED HYDROMULCH MIX WITH MACMAT JUTE MATTING (REFER TO SPECIFICATION)
- PROPOSED HYDROMULCH GRASS MIX (TO BE APPLIED TO ALL DISTURBED AREAS. REFER SPECIFICATION)

NOTES:

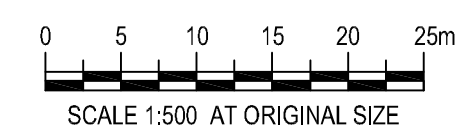
1. REFER TO LMRP FOR WEED REMOVAL INFORMATION, STREAM ORDERS AND RIPARIAN / WILDLIFE CORRIDORS, STOCKPILE LOCATIONS AND DISPOSAL SITES, EROSION CONTROL AND LOCATION OF MACHINE ACCESS WAYS



KEY PLAN
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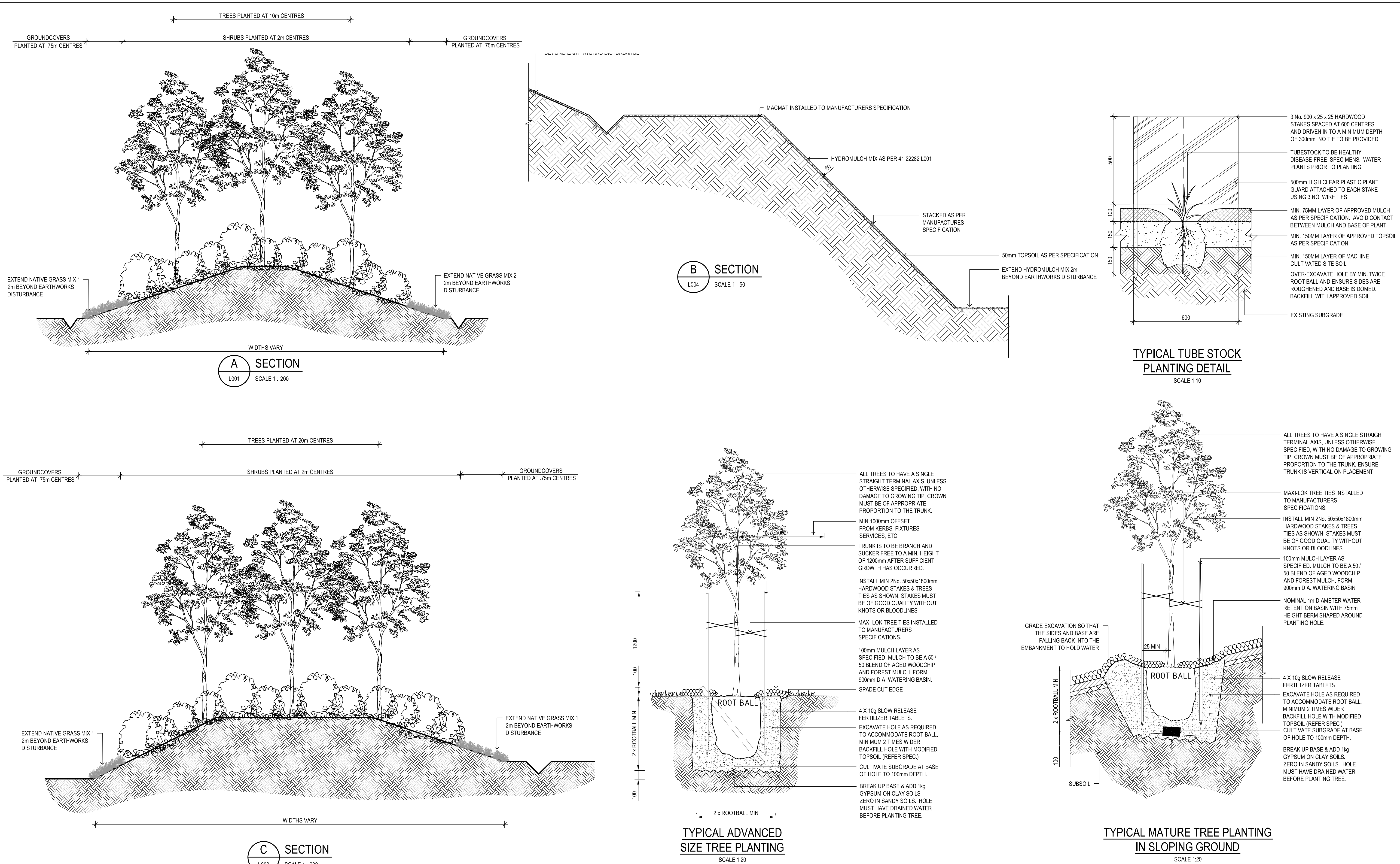
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 Project **WESTLINK POWERSTATION**
 Title **LANDSCAPE DETAILED DESIGN**
LANDSCAPE PLANTING LAYOUT 1

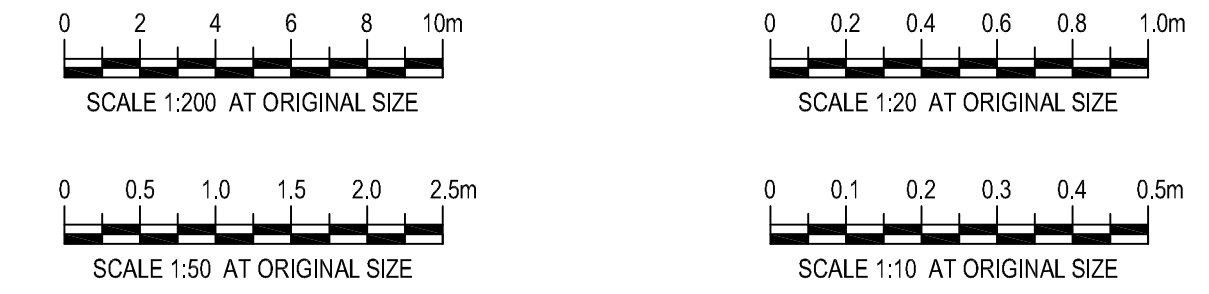
Original Size **A1** Drawing No: **41-22282-L001**

Rev: A



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Project	WESTLINK POWERSTATION
Title	LANDSCAPE DETAILED DESIGN
	TYPICAL SECTIONS AND PLANTING DETAILS
Original Size	A1
Drawing No:	41-22282-L005
Rev:	A



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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	C.O'Neill	A. Franks		P. Wootton		17/12/09
B	C.O'Neill	C.Humphreys*		P. Wootton		01/02/09



Attachment D
Detailed Landscape Specification

DRAFT ONLY*



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WESTLINK Pty Ltd
Specification for Westlink Power Station
Development
Landscape Specification

February 2010



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- A Master Plant Schedule
- B Macmat Jute Matting - Manufacturers Specification



1. General Requirements

1.1.1 Precedence

Requirements of subsequent worksections of the specification override conflicting requirements in this worksection.

1.1.2 Contractual relationships

Responsibilities and duties of the principal, contractor and contract administrator are not altered by requirements in the documents referenced in this specification.

1.1.3 Abbreviations

For the purposes of this worksection the abbreviations given below apply.

- ▶ AS: Australian Standard.
- ▶ BCA: Building Code of Australia.
- ▶ NATA: National Association of Testing Authorities.
- ▶ SSL: Scientific Services Laboratory.

1.2 Definitions

For the purposes of this worksection the definitions given below apply.

- ▶ Attendance: 'Attendance', 'provide attendance' and similar expressions mean 'give assistance for examination and testing'.
- ▶ Contract administrator: 'Contract administrator' has the same meaning as 'landscape architect' or 'superintendent' and is the person appointed by the 'owner' or 'principal' under the contract.
- ▶ Documented: 'Documented', 'as documented' and similar terms mean contained in the contract documents.
- ▶ Geotechnical site investigation: The process of evaluating the geotechnical characteristics of the site in the context of existing or proposed construction.
- ▶ Give notice: 'Give notice', 'submit', 'advise', 'inform' and similar expressions mean 'give notice (submit, advise, inform) in writing to the contract administrator'.
- ▶ Maintenance period: Synonymous with 'Defects Liability Period'.
- ▶ Obtain: 'Obtain', 'seek' and similar expressions mean 'obtain (seek) in writing from the contract administrator'.
- ▶ Principal: 'Principal' has the same meaning as 'owner', 'client' and 'proprietor' and is the party to whom the Contractor is legally bound to construct the works.



- ▶ Proprietary: 'Proprietary' means identifiable by naming manufacturer, supplier, installer, trade name, brand name, catalogue or reference number.
- ▶ Provide: 'Provide' and similar expressions mean 'supply and install'. Installation shall include development of the design beyond that documented.
- ▶ Registered testing authority:
 - An organisation registered by the National Association of Testing Authorities (NATA) to test in the relevant field; or
 - An organisation outside Australia registered by an authority recognised by NATA through a mutual recognition agreement; or
 - An organisation recognised as being a Registered Testing Authority under legislation at the time the test was undertaken.
- ▶ Required: Means required by the contract documents, the local council or statutory authorities.
- ▶ If required: A conditional specification term for work which may be shown on the drawings or be a legislative requirement.
- ▶ Samples: Includes samples, prototypes and sample panels.
- ▶ Supply: 'Supply', 'furnish' and similar expressions mean 'supply only'.
- ▶ Tests:
 - Pre-completion tests: Tests carried out before completion tests.
 - * Type tests: Tests carried out on an item identical with a production item, before delivery to the site.
 - * Production tests: Tests carried out on a purchased item, before delivery to the site.
 - * Site tests: Tests carried out on site.
 - Completion tests: Tests carried out on completed installations or systems before the date for practical completion, to demonstrate that the installation or system, including components, controls and equipment, operates correctly, safely and efficiently, and meets performance and other requirements. The superintendent may direct that completion tests be carried out after the date for practical completion.
- ▶ Tolerance: The permitted difference between the upper limit and the lower limit of dimension, value or quantity.
- ▶ Verification: Provision of evidence or proof that a performance requirement has been met or a default exists.

1.3 Setting out

Ensure levels and dimensions of the site align with information shown on the landscape drawings, and record the results on a copy of the drawings.

Any discrepancies shall be reported to the Superintendent in writing, and instructions must be



obtained from the Superintendent before proceeding with the Landscape works.

1.3.1 Levels

Spot levels take precedence over contour lines and ground profile lines.

1.3.2 Services diagrammatic layouts

Layouts of service lines, plant and equipment shown on the drawings are diagrammatic only, except where figured dimensions are provided or calculable.

Before commencing work:

- ▶ Obtain measurements and other necessary information.
- ▶ Coordinate the design and installation in conjunction with all trades.



2. Quality Control

2.1 General

2.1.1 Australian Standards

The Landscape Subcontractor shall familiarise themselves with the relevant Australian Standards pertaining to this Landscape Specification, and any subsequent revisions of such Standards.

2.1.2 Supervision

Landscape works are to be supervised.

A competent general foreman authorised to receive and carry out instructions from the Superintendent is to be provided.

2.1.3 Inspection

If notice of inspection is required in respect of any parts of the works, the part requiring inspection shall not have further work carried out, or be concealed without prior approval of the Superintendent.

A minimum of three (3) working days notice shall be given to the Superintendent prior to the inspection of Landscape works.

2.1.4 Authorities

If required, submit documents showing approval by the authorities whose requirements apply to the work.

Submit copies of correspondence and notes of meetings with authorities.

2.1.5 Compliance

Ensure all products, materials, goods and the like comply with the requirements set out in the project documents.

Where any supplied products are different from the requirements set out in the project documents, the Superintendent shall be notified. Approval of any alternative products is at the reasonable discretion of the Superintendent.

2.2 Tests

The Superintendent may require testing of materials, goods, or samples to ensure they meet the relevant Australian Standards.

Site tests: Use instruments calibrated by authorities accredited by a Registered testing



authority.

2.2.1 Testing authorities

Except for site tests, have tests carried out by a Registered testing authority and submit test reports.

- ▶ An organisation registered by the National Association of Testing Authorities (NATA) to test in the relevant field; or
- ▶ An organisation outside Australia registered by an authority recognised by NATA through a mutual recognition agreement; or
- ▶ An organisation recognised as being a Registered Testing Authority under legislation at the time the test was undertaken.
- ▶ Reports: Submit copies of test reports, including certificates for type tests, showing the observations and results of tests and conformance or non-conformance with requirements.

Where testing indicates relevant Australian Standards have not been met, the cost of testing, and any re-testing shall be borne by the Landscape Subcontractor.

2.2.2 Attendance

Provide attendance on tests where nominated in worksections.

2.3 Products

Ensure all products, materials, goods and the like are an overall consistent quality, size, and, overall appearance.

Check to ensure correct species, cultivars, pot sizes, heights, spreads, callipers, and the like have been supplied.

Where any supplied products are different from the requirements set out in the project documents, the Superintendent shall be notified. Approval of any alternative products is at the reasonable discretion of the Superintendent.

2.3.1 Samples

Submission: Submit nominated samples.

Incorporation of samples: If it is intended to incorporate samples into the works, submit proposals. Incorporate samples in the works that have been endorsed for incorporation. Do not incorporate other samples.

Allow adequate time for approval of samples.



2.3.2 Substitution

Performance: Equal or greater to that specified.

Alternatives: If alternatives to the documented products, methods or systems are proposed, submit sufficient information to permit evaluation of the proposed alternatives including the following:

- ▶ Samples.
- ▶ Reasons for the proposed substitutions.
- ▶ Statement of the extent of revisions to the contract documents.
- ▶ Statement of the extent of revisions to the construction program.
- ▶ Statement of cost implications including costs outside the contract.
- ▶ Statement of consequent alterations to other parts of the works.

Evidence: If the documented products are unavailable within the time constraints of the construction programme submit evidence, from the supplier.

Criteria: If the substitution covers unavailability or is for any other reason, submit evidence that the substitution:

- ▶ Is of nett enhanced value to the Proprietor.
- ▶ Is consistent with the contract documents and is as effectual as the identified proprietary item.

2.4 Materials and components

2.4.1 Consistency

General: For the whole quantity of each material or product use the same manufacturer or source and provide consistent type, size, quality and appearance.

2.4.2 Galvanizing

Severe conditions: Galvanize mild steel components (including fasteners) to AS 1214 or AS 4680 as appropriate, if:

- ▶ Exposed to weather.
- ▶ Embedded in masonry.
- ▶ Exposed to or in air spaces behind external leaf of masonry walls.
- ▶ In contact with chemically treated timber, other than CCA.



2.5 Proprietary items

2.5.1 Manufacturers' or suppliers' recommendations

Proprietary items: Provide, including select, if no selection is given, and transport, deliver, store, handle, protect, finish, adjust, prepare for use, and provide manufactured items in accordance with the current written recommendations and instructions of the manufacturer or supplier.

Proprietary systems/assemblies: Assemble, install or fix to substrate in accordance with the current written recommendations and instructions of the manufacturer or supplier.

Project modifications: Advise of activities that supplement, or are contrary to, manufacturers or suppliers' written recommendations and instructions.

Product certification: If products must comply with product certification schemes, provide them in accordance with the certification requirements.

2.5.2 Identified proprietary items

Identification of a proprietary item does not necessarily imply exclusive preference for the item so identified, but indicates the necessary properties of the item.

2.6 Warranties

Name the Principal as warrantee in conformance with the Warranty schedule. Register with manufacturers as necessary. Retain copies delivered with components and equipment.

Commencement: Commence warranty periods at practical completion or at acceptance of installation, if acceptance is not concurrent with practical completion.

Approval of installer: If installation is not by manufacturer, and product warranty is conditional on the manufacturer's approval of the installer, submit the manufacturer's written approval of the installing firm.

2.7 Completion

On completion of the Landscape works, restore all existing areas that have been disturbed or damaged through undertaking of the landscape works to its condition at the commencement of the Contract.

This excludes areas forming part of, or modified by the landscape works.



3. Landscape – Soils

3.1 General

3.1.1 Aims

Responsibilities

Selections: Conform to the Selections.

3.1.2 Cross References

General

General: Conform to the *General requirements* worksection.

3.1.3 Standards

Soils

General: To AS 4419.

3.1.4 Interpretation

Definitions

General: For the purposes of this worksection the definitions given below apply.

Bad ground: Ground unsuitable for the purposes of the works, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground which is or becomes soft, wet or unstable.

Site rock: Rocks selected for salvage.

Site topsoil: Soil excavated from the site which has the following characteristics:

- ▶ Contains organic matter.
- ▶ Supports plant life.
- ▶ Free from unwanted matter.

Unwanted matter (in topsoil):

- ▶ Stones over 25 mm diameter.
- ▶ Clay lumps.
- ▶ Weeds and tree roots.
- ▶ Sticks and rubbish.



- ▶ Material toxic to plants.

Imported topsoil:

- ▶ Fine: Clay loam, fine sandy loam, sandy clay loam, silty loam, loam.
- ▶ Medium: Sandy loam, fine sandy loam.
- ▶ Coarse: Sand, loamy sand.

Topsoil mixture: Topsoil and compost or other additives, thoroughly mixed before placing.

Top dressing: A soil which is suitable for surface application to lawn.

3.1.5 Geotechnical site investigation

Report

The geotechnical site investigation report provided is for information only. The geotechnical information and information on contaminants given is information on the nature of the ground at each tested part. It is not a complete description of conditions existing at or below ground level.

Notice

If the following are encountered, give notice immediately and obtain instructions before carrying out any further work in the affected area:

- ▶ Bad ground.
- ▶ Discrepancies.
- ▶ Rock.
- ▶ Springs, seepages.
- ▶ Topsoil > 100 mm deep.

3.1.6 Inspection

Notice

Inspection: Give notice so inspection may be made of the following:

- ▶ Setting out completed.
- ▶ Subgrades cultivated or prepared for placing topsoil.
- ▶ Topsoil spread before planting.
- ▶ Grassing bed prepared before turfing, seeding, or temporary grassing.



3.1.7 Tests

Soil tests

Sampling: As recommended in AS 4419 Appendix A.

Phosphorous content testing:

Any soil described as being suitable for phosphorus-sensitive plants shall have an extractable phosphorus content as follows:

- ▶ Organic soils and low density soils: Less than 3 mg/L total phosphorus in a 1:1.5 v/v extract.
- ▶ Soil blends and natural soils: Less than 5 mg/kg phosphorus for very sensitive plants and less than 20 mg/kg for moderately sensitive plants when extracted by the Olsen sodium bicarbonate procedure as described in the Australian laboratory handbook of soil and water chemical methods.

3.1.8 Submissions

Samples

General: Submit representative samples of each material, packed to prevent contamination and labelled to indicate source and content.

Bulk materials: Submit a 5 kg sample of each type specified. Submit bulk material samples, with required test results, at least 5 working days before bulk deliveries.

Suppliers

Statements: Submit statements from suppliers of soils and other materials, giving the following, where applicable:

- ▶ Particulars of the supplier's experience in the required type of work.
- ▶ Production capacity for material of the required type, sizes and quantity.
- ▶ Lead times for delivery of the material to the site.

Materials

Supplier's data: Submit supplier's data including the following:

- ▶ Material source of supply for topsoil, filling, stone and filter fabrics.

Compost: Submit a certificate of proof of compost pH value.

Execution

Program: Submit a work program in the form of a bar chart, for the landscape works.



3.2 Products

3.2.1 Topsoil

Source

General: Import topsoil to the Selections unless the topsoil type can be provided from material recovered from the site.

Additives

Compliance: If using additives to raise topsoil to the required standard, ensure compliance with the relevant test criteria.

3.2.2 Fertiliser

Provide proprietary fertilisers, delivered to the site in sealed bags marked to show manufacturer or vendor, weight, fertiliser type, N:P:K ratio, recommended uses and application rates.

Fertiliser schedule

Fertiliser key	Location	N:P:K ratio	Application rate
GBF	Garden Beds	Ratio as per manufacturer's recommendations	Slow release to manufacturer's recommendations
TPF	Tree Planting	Ratio as per manufacturer's recommendations	Slow release to manufacturer's recommendations
GRF	Grassed Areas	120:0:0	100kg/Ha

3.3 Execution

3.3.1 Preparation

Vegetative spoil

Remove vegetative spoil from site. Do not burn.

Earth mounds

Place clean filling in layers approximately 150 mm thick compacted to 85% of the dry density ratio of the surrounding soil as determined by AS 1289.5.4.1. Minimise slumping and further internal packing down. Construct changes in grade over a minimum width of 500 mm to smooth, gradual and rounded profiles.



Embankment stabilisation

General: Where necessary to prevent erosion or soil movement, stabilise embankments.

Method: Either matting overlay or hydromulching.

Matting generally: Biodegradable fibre reinforced with lightweight polymer mesh. Provide lightweight material for seeding, medium or heavy weight material for planting.

Matting in high erosion zones: Flexible carbon black UV stabilised interwoven nylon mesh.

Matting installation: Sow before matting is installed, where sowing is required. Plant after matting is installed, where planting is required. Peg the matting into 300 x 300 mm anchor trenches at top and bottom, backfill the trenches with soil and compact.

Matting pegs: U-shape galvanized steel, at 1000 x 1000 mm intervals generally, 250 mm at overlaps.

3.3.2 Rockwork

Rock work

General: Place rocks while ground formation work is being carried out. Provide site rock, otherwise provide imported rock. Bury rock two thirds by volume, with weathered faces exposed. Protect the weathered faces from damage.

Site rock: Stockpile for future placement and accessibility for lifting. Dispose of other rock off site.

Imported rock: Provide rock which has been selected before delivery.

Rock outcrops

General: Protect existing rock, rock shelves and rock outcrops from mechanical damage and surface defacement.

3.3.3 Subsoil

Ripping

General: Rip parallel to the final contours wherever possible. Do not rip when the subsoil is wet or plastic. Do not rip within the dripline of trees and shrubs to be retained.

Ripping depths: Rip the subsoil to the following typical depths:

- ▶ Compacted subsoil: 300 mm.
- ▶ Heavily compacted clay subsoil: 450 mm.
- ▶ Ripeline planting areas: 300mm.

Planting beds

Excavated: Excavate to bring the subsoil to at least 300 mm below finished design levels.



Shape the subsoil to fall to subsoil drains where applicable. Break up the subsoil to a further depth of 100 mm.

Unexcavated: Remove weeds, roots, builder's rubbish and other debris. Bring the planting bed to 75 mm below finished design levels.

Cultivation

Minimum depth: 100 mm.

Cultivation depths (mm):

- ▶ Grassed areas (seeded, turf, strip turf): 100mm.
- ▶ Hydroseeded or hydromulched areas: 100mm.
- ▶ Planting areas: 150mm.

Services and roots: Do not disturb services or tree roots; if necessary cultivate these areas by hand.

Cultivation: Thoroughly mix in materials required to be incorporated into the subsoil. Cultivate manually within 300 mm of paths or structures. Remove stones exceeding 25 mm, clods of earth exceeding 50 mm, and weeds, rubbish or other deleterious material brought to the surface during cultivation. Trim the surface to design levels after cultivation.

Additives

General: Apply additives after ripping or cultivation and incorporate into the upper 100 mm layer of the subsoil.

Gypsum: Incorporate at the rate of 0.25 kg/m².

3.3.4 Topsoil

Placing topsoil

General: Spread the topsoil on the prepared subsoil and grade evenly, making the necessary allowances to permit the following:

- ▶ Required finished levels and contours may be achieved after light compaction.
- ▶ Grassed areas may be finished flush with adjacent hard surfaces such as kerbs, paths and mowing strips.

Contamination: Where diesel oil, cement or other phytotoxic material has been spilt on the subsoil or topsoil, excavate the contaminated soil, dispose of it off the site, and replace it with site soil or imported topsoil to restore design levels.

Spreading: On steep batters, if using a chain drag, ensure there is no danger of batter disturbance.

Finishing: Feather edges into adjoining undisturbed ground.



Consolidation

General: Compact lightly and uniformly in 150 mm layers. Avoid differential subsidence and excess compaction and produce a finished topsoil surface which has the following characteristics:

- ▶ Finished to design levels.
- ▶ Smooth and free from stones or lumps of soil.
- ▶ Graded to drain freely, without ponding, to catchment points.
- ▶ Graded evenly into adjoining ground surfaces.
- ▶ Ready for planting.

Topsoil depths

Spread topsoil to the following typical depths:

- ▶ Excavated planting areas: 300 mm below finished mulch level.
- ▶ Irrigated grassed areas generally: 150 mm.
- ▶ Non-irrigated grass areas: 100 mm.

Surplus topsoil

General: Spread surplus topsoil on designated areas on site, if any; otherwise, dispose off site.

3.4 Selections

3.4.1 Topsoil

Table 1 Topsoil Particle Size Table (% passing by mass)

AS sieve aperture	Soil textures		
	Fine	Medium	Coarse
2.36	100	100	100
1.18	90 – 100	95 – 100	95 – 100
0.60	75 – 100	75 – 100	70 – 90
0.30	57 – 90	55 – 85	30 – 46
0.15	45 – 70	38 – 55	10 – 22
0.075	35 – 55	25 – 35	5 – 10
0.002		2 – 15	2 – 8



Topsoil properties schedule

Property	Type	Amount
Nutrient levels	Phosphorus (P) (mg/L)	0.7 – 4
	Potassium (K) (mg/L)	35 – 250
	Sulfur (S) (mg/L)	> 40
	Calcium (Ca) (mg/L)	50 – 350
	Nitrogen (N) (mg/L)	≤ 100
	Manganese (Mn) (mg/L)	1 – 15
	Nitrogen drawdown	If NDI ₁₅₀ is less than 0.9 soluble nitrogen is to be added as per manufacturer's specified rate
Additives	Gypsum (% by volume)	Min 80% by volume
	Compost	Min 10% by volume
Other properties	Organic matter (% by mass)	20% maximum
	Wettability	>5mm/min
	Soil reaction (pH)	6 – 7
	Electrical conductivity (dS/m)	<1.2 dS/m
	Dispersibility	Emerson class number Class 3 or greater
	Soluble salts (% by mass)	<500mg/L
	Toxicity index	to AS 3743
	Permeability	2 – 100 cm/hr



4. Landscape – Soft Surfaces

4.1 General

4.1.1 Cross References

General

General: Conform to the *General requirements* worksection.

Associated worksections

Associated worksections: Conform to the following:

- ▶ *Landscape - soils.*

4.1.2 Interpretation

Definitions

General: For the purposes of this worksection the definitions given below apply.

Site topsoil: Soil excavated from the site which has the following characteristics:

- ▶ Contains organic matter.
- ▶ Supports plant life.
- ▶ Free from unwanted matter.

Unwanted matter (in topsoil):

- ▶ Stones over 25 mm diameter.
- ▶ Clay lumps.
- ▶ Weeds and tree roots.
- ▶ Sticks and rubbish.
- ▶ Material toxic to plants.

Imported topsoil:

- ▶ Fine: Clay loam, fine sandy loam, sandy clay loam, silty loam, loam.
- ▶ Medium: Sandy loam, fine sandy loam.
- ▶ Coarse: Sand, loamy sand.

Topsoil mixture: Topsoil and compost or other additives, thoroughly mixed before placing.

Top dressing: A soil that is suitable for surface application to lawn.



4.1.3 Inspection

Notice

Inspection: Give notice so inspection may be made of the following

- ▶ Clearing completed.
- ▶ Setting out completed.
- ▶ Grassing bed prepared before turfing, seeding, or temporary grassing.
- ▶ Grassing or turfing completed.

4.1.4 Submissions

Samples

General: Submit representative samples of each material, packed to prevent contamination and labelled to indicate source and content.

Samples schedule

Item	Quantity
1. Imported topsoil with test results to AS4419	1 x 5 kg bag
2. Site soil intended for Horticultural uses	1 x 5 kg bag
3. Blended site soil intended for Horticultural uses	1 x 5 kg bag

Suppliers

Statements: Submit statements from suppliers, giving the following, where applicable:

- ▶ Particulars of the supplier's experience in the required type of work.
- ▶ Production capacity for material of the required type and quantity.
- ▶ Lead times for delivery of the material to the site.

Materials

Supplier's data: Submit supplier's data including the following:

- ▶ Material source of supply.

Execution

Program: Submit a work program in the form of a bar chart, for the landscape works.



Maintenance program: Submit a proposed planting maintenance program.

Material storage on site: Submit proposal.

4.2 Products

4.2.1 Grass Seed

Seed

Mixtures: Provide seed mixtures which are thoroughly pre-mixed with a bulking material such as safflower meal. Deliver to the site in bags marked to show weight, seed species and supplier's name. Provide fresh, clean, uncoated new seed. Do not provide wet, mouldy, or otherwise impaired seed.

Purity (minimum): 98%.

Germination viability (minimum): 86%.

Age (maximum) from date of harvest: 2 years.

4.2.2 Fertiliser

Fertiliser

General: Provide proprietary fertilisers, delivered to the site in sealed bags marked to show manufacturer or vendor, weight, fertiliser type, N:P:K ratio, recommended uses and application rates.

Before seeding: To improve organic content of existing subgrade apply either approved chicken manure additive such as Dynamic Lifter, or other approved complete fertiliser.

After seeding during the Establishment Period: Apply Nitrogen fertiliser in the last week of the Establishment Period, and after mowing. Lightly water after application.

Fertiliser schedule

Fertiliser key	Location	N:P:K ratio	Application rate
Before Seeding	All turf areas	14:15:10 as per manufacturer's recommendations or approved chicken manure additive such as Dynamic Lifter as per manufacturer's recommendations.	100 kg/ha or as per manufacturer's recommendations



Fertiliser key	Location	N:P:K ratio	Application rate
After Seeding (Establishment Period)	All turf areas	20:0:0 (Ammonium Sulphate only) or other approved Nitrogen fertiliser as per manufacturer's recommendations	120 kg/ha or as per manufacturer's recommendations

4.3 Execution

4.3.1 Preparation

Weed eradication

Herbicide: Eradicate weeds using environmentally acceptable methods, such as a non-residual Glyphosate herbicide in any of its registered formulae, at the recommended maximum rate.

Manual weeding: Regularly remove, by hand, rubbish and weed growth throughout grassed, planted and mulched areas. Remove weed growth from an area 750 mm diameter around the base of the trees in grassed areas. Continue eradication throughout the course of the works and during the planting establishment period.

Weed eradication schedule

Weed type	Eradication method or treatment	
	Acceptable	Unacceptable
Refer to Weed Management Plan		

Vegetative spoil

Disposal: Remove vegetative spoil from site. Do not burn.

4.3.2 Grass Seeding

Preparation

General: Prepare the areas to be sown. Spread the fertiliser evenly over the cultivated bed within 48 hours before sowing, and rake lightly into the surface. If a prepared area becomes compacted from any cause before sowing can begin, rework the ground surface before sowing.

Sowing

Conditions: Do not sow if frost is likely before the plant has reached an established state, or in periods of extreme heat, cold or wet, or when wind velocities exceed 8 km/h. Provide even



distribution. Lightly rake the surface to cover the seed.

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Sowing schedule

Mix designation	Seed species	Location	Sowing Season	Sowing Method	Application rate (kg/ha)	Mowing height (mm)
35%	STERILE Japanese Millet (<i>Echinochloa esculenta</i>)	All	October to March	Hydroseeding or other approved method	20 kg/ha	No lower than 30 mm
35%	STERILE Wimmera Rye (<i>Lolium rigidum</i>)	All	April to September	Hydroseeding or other approved method	20 kg/ha	No lower than 30 mm
65%	Green Couch (<i>Cynodon dactylon</i>)	All	Winter and Summer	Hydroseeding or other approved method	40 kg/ha	No lower than 30 mm

Rolling

General: Roll the seed bed immediately after sowing.

Roller weight (maximum):

- ▶ Clay and packing (heavy) soils: 90 kg/m width.
- ▶ Sandy and light soils: 300 kg/m width.

Watering

Before germination: Water the seeded area with a fine spray until the topsoil is moistened to its full depth. Continue watering until germination to keep the surface damp and the topsoil moist but not waterlogged.

After germination: Water to maintain a healthy condition, progressively hardened off to the natural climatic conditions.

Germination

General: Maintain sown areas until the attainment of a dense continuous sward of healthy grass over the whole of the seeded area, evenly green and of a consistent height.

Reseeding: If germination has not been attained within one month, reseed the sown areas.

Weeding

Removal: Remove weeds that occur in sown areas.

Spraying: Where necessary spray with a selective herbicide for broad leafed weeds. Do not spray grass seeded areas within 3 months of germination.



Protection

General: Protect the newly sown areas against traffic until well established.

Fertilising after germination

Six weeks after germination: Spread fertiliser evenly over the sown area and then water in. Do not apply the fertiliser to wet grass.

Ten weeks after grass germination: If the planting establishment period carries through the summer months, spread pelleted sulphate of ammonia at the rate of 250 kg/ha.

Mowing

Height: Mow to maintain the grass height within the required range. Do not remove more than one third of the grass height at any one time. Carry out the last mowing within 7 days before the end of the planting establishment period. Remove grass clippings from the site after each mowing.

4.3.3 Hydroseeding and hydromulching

Seed pretreatment

General: Place in a calico bag those species of seed to be pretreated, and immerse for 10 minutes in water kept at a temperature between 80°C and 95°C. Do not boil. Allow to cool, soak for 24 hours, then apply immediately.

Seed species to be pretreated as per approved application method.

Hydroseeding mixture

General: A slurry of seed mixture, fertiliser, and water.

Hydromulching mixture

General: A slurry of seed mixture, fertiliser, mulch and water.

Hydroseeding and hydromulching schedule

Location	Seed mix and type	Mulch type	Slurry type	Water application rate (L/ha)	Binder type and rate
As per drawing	As per drawing	Approved contractor submittal	Approved contractor submittal	Suitable for the site conditions, sufficient to assist in seed, fertiliser, mulch distribution	250L/ha

Fertiliser

Type and application rate: Approved contractor submittal, application rate as per manufacturer's



instructions.

Mixing

Mixer: Thoroughly mix the slurry in a purpose-made mechanical mixer.

Application rates

Seed mixture: The rate applicable to the mix type.

Mulch: At least 2.5 t/ha with seed, or 5 t/ha without seed.

Bitumen emulsion binder: 2000 L/ha of residual bitumen.

Polymer binder: 250 L/ha.

Water: Suitable for the site conditions, and sufficient to assist in the distribution of the seed, fertiliser and mulch.

Preparation

Bed: For cultivation purposes machine scarify the area to be seeded to provide a firm friable seed bed. For slopes greater than 1:3 50mm of imported topsoil to be added prior to scarifying. For slopes less than 1:3 75mm of imported topsoil is to be added prior to scarifying.

Application

General: Moisten the topsoil to its full depth before applying the slurry. Apply the slurry using high pressure pumping equipment operated by trained personnel. Spray the mixed slurry under pressure, maintaining a thoroughly mixed supply, operating on a front so that the mixture is evenly distributed over the area. Complete each front before commencing the next.

Watering

Before germination: Water the seeded area with a fine spray until the topsoil is moistened to its full depth. Continue watering until germination to keep the surface damp and the topsoil moist but not waterlogged.

After germination: Water to maintain a healthy condition, progressively hardened off to the natural climatic conditions.

Turfing

Turf

Supplier: Obtain turf from a specialist grower of cultivated turf. Provide turf of even thickness, free from weeds and other foreign matter.

Supply

Elapsed time: Deliver the turf within 24 hours of cutting, and lay it within 36 hours of cutting. Prevent it from drying out between cutting and laying.



Fertilising

General: Mix the fertiliser thoroughly into the topsoil before placing the turf. Apply lawn fertiliser at the completion of the first and last mowings, and at other times as required to maintain healthy grass cover.

Laying

General: Lay the turf in the following manner:

- ▶ In stretcher pattern with the joints staggered and close butted.
- ▶ Parallel with the long sides of level areas, and with contours on slopes.
- ▶ To finish flush, after tamping, with adjacent finished surfaces of ground, paving edging, or grass seeded areas.

Strip turf laying: Close butt the end joints and space the strips 300 mm apart. Apply a layer of top dressing between the strips of turf. Finish with an even surface.

Tamping

General: Lightly tamp to an even surface immediately after laying. Do not use a roller.

Pegging

Stabilising: On steep slopes peg the turf to prevent downslope movement. Remove the pegs when the turf is established.

Watering

General: Water immediately after laying until the topsoil is moistened to its full depth. Continue watering to maintain moisture to this depth. Keep the grass in a healthy condition.

Mowing

Height: Mow to maintain the grass height within the required range. Do not remove more than one third of the grass height at any one time. Carry out the last mowing within 7 days before the end of the planting establishment period. Remove grass clippings from the site after each mowing.

Turfing schedule

Turf key	Species or variety	Minimum thickness (mm)	Turf roll size	Location	Mowing height (mm)
TURF (Standard treatment)	<i>Cynodon dactylon</i> "Green Couch"	25 mm (10 mm soil; 1.5 or greater of grass mat)	A Grade - Half a square metre or to approved manufacturer's specifications	All turf areas as per drawing	No lower than 30 mm



Maintenance

General: Maintain turfed areas until the attainment of a dense continuous sward of healthy grass over the whole turfed area, evenly green and of a consistent height.

Failed turf: Lift failed turf and relay with new turf.

Levels: Where levels have deviated from the design levels after placing and watering, lift turf and regrade topsoil to achieve design levels.

Top dressing

General: When the turf is established, mow, remove cuttings and lightly top dress to a depth of 10 mm. Rub the dressing well into the joints and correct any unevenness in the turf surface.

4.3.4 Temporary grassing

Location

Refer to Section 4.2.1

Seed mix type

Refer to Section 4.2.1

Preparation

General: Prepare the areas to be sown. Spread fertiliser evenly over the cultivated bed within 48 hours before sowing, and rake lightly into the surface. If a prepared area becomes compacted before sowing begins, rework the ground surface before sowing.

Sowing

General: Provide even distribution. Lightly rake the surface to cover the seed.

Watering

General: Immediately after sowing, water to a depth of 100 mm. Thereafter water to obtain germination and establish grasses. After establishment water only as necessary.

Maintenance

General: Maintain temporary grassing areas until no longer required.

Existing grass

General: Where existing grass or planting is within the landscape contract area, maintain it as for the corresponding classifications of new grass or planting.

Grassed areas

Maintenance: Commence grass maintenance works at the completion of sowing, hydroseeding and turfing. Maintain healthy weed-free growth.



Log book

Records: Keep a log book recording when and what maintenance work has been done and what materials, including toxic materials, have been used. Make the log book available for inspection on request.

4.3.5 Geotextiles

Select geotextile to suit application and submit to Landscape Architect for approval. Selection shall be appropriate biodegradable solution using manufacturer's specifications and recommended application only.

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5. Landscape – Plants

5.1 General

5.1.1 Cross References

General

General: Conform to the *General requirements* worksection.

Associated worksections

Associated worksections: Conform to the following:

- ▶ *Landscape – soils.*
- ▶ *Trees supply.*

5.1.2 Interpretation

Definitions

General: For the purposes of this worksection the definitions given below apply.

Site topsoil: Soil excavated from the site that has the following characteristics:

- ▶ Contains organic matter.
- ▶ Supports plant life.
- ▶ Free from unwanted matter.

Unwanted matter (in topsoil):

- ▶ Stones over 25 mm diameter.
- ▶ Clay lumps.
- ▶ Weeds and tree roots.
- ▶ Sticks and rubbish.
- ▶ Material toxic to plants.

Imported topsoil:

- ▶ Fine: Clay loam, fine sandy loam, sandy clay loam, silty loam, loam.
- ▶ Medium: Sandy loam, fine sandy loam.
- ▶ Coarse: Sand, loamy sand.

Topsoil mixture: Topsoil and compost or other additives, thoroughly mixed before placing.



5.1.3 Inspection

Notice

Inspection: Give notice so inspection may be made of the following:

1. Setting out completed.
2. Plant holes excavated and prepared for planting.
3. Plant material set out before planting.
4. Planting, staking and tying completed.
5. Completion of planting establishment work.

5.1.4 Submissions

Suppliers

Statements: Submit statements from suppliers of plants and other materials, giving the following, where applicable:

- ▶ Particulars of the supplier's experience in the required type of work.
- ▶ Production capacity for material of the required type, sizes and quantity.
- ▶ Lead times for delivery of the material to the site.

Materials

Supplier's data: Submit supplier's data including the following:

- ▶ Material source of supply.

Compost: Submit a certificate of proof of compost pH value.

Execution

Program: Submit a work program in the form of a bar chart, for the landscape works.

Maintenance program: Submit a proposed planting maintenance program.

Planting machine: If a planting machine is to be used as an alternative to hand planting, submit proposal.

Spraying: Submit proposal.

Plants – open rooted stock: If open rooted stock is to be used, submit proposal.

Material site storage: Submit proposal.

Samples

General: Submit representative samples of each material, packed to prevent contamination and labelled to indicate source and content.

Plant materials - quantity: Submit one plant sample for each 100 of each species or variety, in



the condition in which it is proposed to supply that plant to the site.

Samples schedule

Item	Quantity
As per Master Plant Schedule on drawing	1 sample for each 100 of each species

Soil – type tests

Evidence: Submit test results as follows:

- ▶ Sampling: As recommended in AS 4419 Appendix A.
- ▶ Phosphorous content testing: Refer to Section 3.1.7

5.2 Products

5.2.1 Plants

Plants

Characteristics: Provide plants with the following characteristics:

- ▶ Large healthy root systems, with no evidence of root curl, restriction or damage.
- ▶ Vigorous, well established, free from disease and pests, of good form consistent with the species or variety.
- ▶ Hardened off, not soft or forced, and suitable for planting in the natural climatic conditions prevailing at the site.

Trees: Provide trees that, unless required to be multi-stemmed, have a single leading shoot.

Replacement: Replace damaged or failed plants with plants of the same type and size.

Plant containers

General: Supply plants in weed-free containers of the required size.

Open rooted stock: If trees are to be supplied as open rooted stock, ensure this is appropriate to the species, variety, size, and time of year for planting.

Potting-on: Do not carry out potting-on.



Plant schedule

Plant key	Plant species	Roots	Number required	Plant size (mm)		
				Container size	Minimum trunk caliper	Plant height
As per Master Plant Schedule on drawing.						

Labelling

Tag: Label at least one plant of each species or variety in a batch with a durable, readable tag.

Storage

Timing: Deliver plant material to the site on a day to day basis, and plant immediately after delivery.

5.2.2 Mulch

Mulch

General: Provide mulch that is free of deleterious and extraneous matter such as soil, weeds and sticks.

Standard: To AS 4454.

Organic mulches: Free of stones.

Mulch material: Brush chippings and leaf litter recovered from site clearing, if available; otherwise, pine bark.

Organic mulch types

Brush chippings and leaf litter: Vegetative material processed through a chipper to pieces not larger than 75 x 50 x 15 mm.

- ▶ Material permitted: Leaf matter and tree loppings from Eucalyptus, Tristania and Pinus species.
- ▶ Material not permitted: Leaf matter and tree loppings from privet, camphor laurel, coral tree, poplar, willow, and noxious weeds.

Pine bark: From mature trees, graded in size from 50 x 50 x 25 mm to 25 x 15 x 15 mm, free from wood slivers.

Pine flake: Pinus species sapwood slivers of size range 250 x 25 mm to 30 x 3 mm, including fragments of pine bark.

Straw: Cereal straw, wood fibre, or other suitable vegetative material (but not meadow hay) free from weeds and seeds, applied in conjunction with a bitumen emulsion or polymer binder.



Inorganic mulch types

Washed river pebble: Uniform size or graded material in the size range 6 – 10 mm.

Decomposed granite gravel: Uniform size or graded material in the size range 5 – 20 mm, of uniform colour and low plasticity. Keep clear of plant stems.

Crushed quartz: Uniform size or graded material in the size range 5 – 20 mm, of uniform colour.

Marble chip gravel: Uniform size or graded material in the size range 5 – 20 mm, of uniform colour.

Slate: Plum slate slivers in the size range 5 – 25 mm.

Shale: Uniform size or graded material, no particles smaller than 0.1 mm diameter.

Scoria: Uniform size or graded material.

5.3 Execution

5.3.1 Preparation

Weed eradication

Herbicide: Eradicate weeds using environmentally acceptable methods, such as a non-residual Glyphosate herbicide in any of its registered formulae, at the recommended maximum rate.

Removal: Regularly remove, by hand, rubbish and weed growth throughout grassed, planted and mulched areas. Remove weed growth from an area 750 mm diameter around the base of the trees in grassed areas. Continue eradication throughout the course of the works and during the planting establishment period.

Weed eradication schedule

Weed type	Eradication method or treatment	
	Acceptable	Unacceptable
As per Weed Management Plan		

Vegetative spoil

Disposal: Remove vegetative spoil from site. Do not burn.

5.3.2 Planting

Individual plantings in grassed areas

Method: Excavate a hole to twice the diameter of the root ball and at least 100 mm deeper than the root ball. Break up the base of the hole to a further depth of 100 mm, and loosen compacted sides of the hole to prevent confinement of root growth.



Ripline planting

Method: Rip the row and excavate a plant hole for each plant large enough to accept the root ball plus 0.1 m³ of backfilling with topsoil. Clear weeds and other vegetative material within 300 mm radius of the plants. If planting holes are excavated by mechanical means increase the hole size by 100 mm and loosen compacted sides to prevent confinement of root growth.

Locations

General: If it appears necessary to vary plant locations and spacings to avoid service lines, or to cover the area uniformly, or for other reasons, give notice.

Planting conditions

Weather: Do not plant in unsuitable weather conditions such as extreme heat, cold, wind or rain. In other than sandy soils, suspend excavation when the soil is wet, or during frost periods.

Watering

Timing: Thoroughly water the plants before planting, immediately after planting, and as required to maintain growth rates free of stress.

Placing

Method: Remove the plant from the container with minimum disturbance to the root ball, ensure that the root ball is moist and place it in its final position, in the centre of the hole and plumb, and with the topsoil level of the plant root ball level with the finished surface of the surrounding soil.

Fertilising

Pellets: In planting beds and individual plantings, place fertiliser pellets around the plants at the time of planting.

Application rate (kg/ha): Slow release fertiliser such as Osmocote to manufacturer's specification.

Backfilling

General: Backfill with topsoil mixture. Lightly tamp and water to eliminate air pockets. Ensure that topsoil is not placed over the top of the root ball, so that the plant stem remains the same height above ground as it was in the container.

Watering basins for plants in grass

Method: Except in irrigated grassed areas and normally moist areas, construct a watering basin around the base of each individual plant, consisting of a raised ring of soil capable of holding at least 10 L.



5.3.3 Transplanting

Notice

General: Give notice before transplanting.

Conditions

Timing: Select a time for transplanting having regard to the appropriate season, time of actual operation, root ball diameter and depth, lifting methods, weather conditions and the like.

Lifting

Method: Two days before transplanting of each specimen, thoroughly irrigate it to the full depth of the root ball. Minimise the cutting of roots. Cut roots with sharp tools. Do not fracture the ball of soil around the root system, but maintain it in firm condition during transplanting by wrapping in appropriate open weave material (e.g. hessian), securely tied.

Planting

Disturbance: Avoid disturbance to the root ball and plant. Remove the root ball wrapping and ties by cutting.

Pruning

General: Prune as directed where selective pruning of branches or canopy is necessary.

Standard: To AS 4373.

Watering

General: At the completion of transplanting, water the root ball thoroughly and continue to water until established.

5.3.4 Mulching

Placing mulch

General: Place mulch to the required depth, clear of plant stems, and rake to an even surface flush with the surrounding finished levels. Spread and roll mulch so that after settling, or after rolling, it is smooth and evenly graded between design surface levels sloped towards the base of plant stems in plantation beds, and not closer to the stem than 50 mm in the case of gravel mulches.

In mass planted areas: Place after the preparation of the planting bed but before planting and other work.

In smaller areas (e.g. planter boxes): Place after the preparation of the planting bed, planting and other work.

Extent: To surrounds of plants planted in riplines and grass areas, provide mulch to 750 mm diameter.



Depths: Spread organic mulch to a depth of 75 mm, and gravel mulch to a depth of 50 mm.

5.3.5 Spraying

Notice

General: Immediately give notice of evidence of insect attack or disease amongst plant material.

Spraying

Product: Where required, spray with insecticide, fungicide or both.

5.3.6 Stakes and Ties

Stakes

Material: Hardwood, straight, free from knots or twists, pointed at one end.

- ▶ Installation: Drive stakes into the ground at least one third of their length, avoiding damage to the root system, **ties are to be positioned at half the height of the main stem**, to stabilise the plant.

Stake sizes:

- ▶ For plants ≥ 2.5 m high: Three 50 x 50 x 2400 mm stakes per plant.
- ▶ For plants 1 – 2.5 m high: Two 50 x 50 x 1800 mm stakes per plant.
- ▶ For plants < 1 m high: One 38 x 38 x 1200 mm stake per plant.

Ties

General: Provide ties fixed securely to the stakes, **ties are to be positioned at half the height of the main stem**, to stabilise the plant.

Tie types:

Maxi-Lok or approved long lasting UV stabilised re-joinable polyethylene chain lock. Use soft sleeve around tree trunks

- ▶ For plants ≥ 2.5 m high: Two strands of approved tie neatly twisted together, passed through reinforced rubber or plastic hose, and installed around stake and stem in a figure of eight pattern. **Ties are to be positioned at half the height of the main stem**, to stabilise the plant.
- ▶ For plants < 2.5 m high: 50 mm hessian webbing stapled to the stake. **Ties are to be positioned at half the height of the main stem**, to stabilise the plant.

Marker stakes

Material: Timber offcuts 25 x 25 x 1200 mm. Dip the top 200 mm in white paint.

Installation: Drive firmly into the ground at least 300 mm from the plant. Do not tie to the plant.



Location of marker stakes:

- ▶ Trees in grass: Mark each tree.
- ▶ Ripline planting areas: Mark each ripline at every fifth plant along the line.

5.3.7 Earth anchors

Requirement

Support: Provide temporary support where necessary to trees, root balls or stakes using galvanized steel cables attached to proprietary aluminium anchors or drive rods, which have been hand or power driven at an angle into the ground.

5.3.8 Tree Surgery

Notice

General: Give notice before commencing tree surgery.

Qualifications

General: Employ suitably qualified persons to carry out tree surgery work in a safe and progressive manner.

Pruning

Standard: To AS 4373.

The following are deemed to be unacceptable pruning practices. See AS4373 for further information.

- ▶ Lopping and topping: No lopping or topping is to occur.
- ▶ Wound painting: No wound painting is to occur.
- ▶ Flush cutting: No flush cutting is to occur.

Operations

General: Remove dead and decayed wood or limbs that have been broken. Make cuts into live wood. If the trees show signs of deterioration after the work has been done, carry out a program of feeding or soil amelioration such as soil aeration, irrigation or incorporation of organic material. Continue this program until the end of the planting establishment period.

Precautions

Damage: Avoid damage to trees being treated or to nearby trees and surroundings. Do not use trees as anchors for winching operations or bracing. Provide bracing as necessary before cutting to prevent uncontrolled breakages and damage to surroundings.



Dressing

Treatment: Prevent incursion of rot or disease after cutting.

Root pruning

Disturbance: Do not unduly disturb the remaining root system.

5.3.9 Planting Establishment

Period

Commencement: The planting establishment period commences at the date of practical completion.

Required period: 12 Weeks.

Existing planting and grass

Maintenance: Where existing grass or planting is within the landscape contract area, maintain it as for the corresponding classifications of new grass or planting.

Recurrent works

General: Throughout the planting establishment period, carry out maintenance work including, watering, mowing, weeding, rubbish removal, fertilising, pest and disease control, reseeding, returfing, staking and tying, replanting, cultivating, pruning, hedge clipping, aerating, reinstatement of mulch, renovating, top dressing, and keeping the site neat and tidy.

Replacements

Plants: Continue to replace failed, damaged or stolen plants.

Grassed areas

Maintenance: Commence grass maintenance works at the completion of sowing, hydroseeding and turfing. Maintain healthy weed-free growth.

Log book

Records: Keep a log book recording when and what maintenance work has been done and what materials, including toxic materials, have been used. Make the log book available for inspection on request.

5.3.10 Completion

Product warranty

Certification: Submit the supplier's written statement certifying that plants are true to the required species and type, and are free from diseases, pests and weeds.



Maintenance manual

General: Submit recommendations for maintenance of plants.

Cleaning

Stakes and ties: Remove those no longer required at the end of the planting establishment period.

Temporary fences: Remove temporary protective fences at the end of the planting establishment period.

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6. Trees Supply

6.1 General

6.1.1 Aims

Responsibilities

General: Provide trees that have been grown to a standard that allows them to establish rapidly and grow to maturity.

Selections: Conform to the Selections.

6.1.2 Cross References

General

General: Conform to the *General requirements* worksection.

6.1.3 Standard

General

Guidance: Follow the guidance given in *NATSPEC Guide: Specifying Trees – a guide to assessment of tree quality* (Clark R. 2003).

6.1.4 Interpretation

Definitions

General: For the purposes of this worksection the definitions given below apply.

Calliper: The stem or trunk diameter at a nominated point. Generally measured at 300 mm above ground.

Size Index: Product of height (m) x calliper (mm).

Tubes or plant cells: Trees grown in small containers or cells in trays with a height:diameter ratio > 3:2, typically < 0.75 L.

Small trees: Trees grown in containers < 20 L (other than tubes or plant cells), and ex-ground trees of Size Index < 35.

Large trees: Trees grown in containers \geq 20 L, and ex-ground trees of Size Index \geq 35.

External inspection: Tree inspection without washing away of soil from the rootball, and assesses the following:

- ▶ The tree's ability to be self-supporting.



- ▶ Its balance.
- ▶ Its root development.

Investigative inspection: Any method of root inspection that involves the washing away of all or portions of the soil from the rootball to expose a section or all the roots.

- ▶ Destructive inspection: The washing away of all soil from a rootball to allow inspection of rootball development.
- ▶ Partial inspection: A method of exposing a section of a root system to enable inspection of root development by washing the soil away in a wedge-shaped section from the stem to the extremity of the rootball. This soil can be gently replaced so the tree is not damaged.

6.1.5 Precompletion Tests

Production tests

External inspection:

- ▶ Frequency: Inspect trees before shipment.
- ▶ Inspector: Supplier.
- ▶ Sampling: To the External inspection sampling table for each batch of trees. Select sample trees at evenly distributed intervals within each batch.

Table 2 External Inspection Sampling Table

Number of trees per batch	Number of trees to sample
0 – 20	4
21 – 50	8
51 – 100	15
101 – 500	15 for the first 100 + 5% of the balance of the order
501 – 2000	35 for the first 500 + 2% of the balance of the order
2001+	65 for the first 2000 + 1% of the balance of the order

Investigative inspection:

- ▶ Frequency: Inspect trees before shipment.
- ▶ Inspector: Qualified person authorised by contract administrator.
- ▶ Destructive inspection: Use for trees with rootballs/containers \leq 200 mm.



- ▶ Allowance: Allow for sample trees in addition to quantity ordered.
- ▶ Partial inspection: Use for trees with rootballs/containers > 200 mm.
- ▶ Sampling: To the Investigative inspection sampling table for each batch of trees. Select sample trees at evenly distributed intervals throughout each batch.

Table 3 Investigative Inspection Sampling Table

Number of trees per batch	Number of trees to sample
0 – 20	1
21 – 50	2
51 – 100	4
101 – 500	4 for the first 100 + 2% of balance of order
501 – 2000	12 for first 500 + 1% of balance of order
2001+	27 for the first 2000 + 0.5% of balance of order

6.1.6 Submissions

Test results

General: Complete and return the Tree inspection form for each batch inspected.

Rejection: Non-compliance may lead to rejection of the entire batch.

Corrective action: Comply with corrective action procedures for each order as instructed.

Substitution: If non-complying trees are proposed, submit a proposal in writing.

Authentication: Supply a copy of the written approval of substitution with any non-complying trees.

Forward order contracts

Reports: Complete regular reports using the pro forma Tree inspection form. Include checks against specification requirements.

- ▶ Photographs: Provide current colour copies with date verification.
- ▶ Submissions: To the contract administrator.
- ▶ Inspection: Complete and return the attached pro-forma Tree inspection form before despatch of every batch, and at the following frequencies:
 - Inspections: At 3 monthly intervals.



- Reports: At time of inspections.

6.2 Products

6.2.1 Balance

Small trees

Conformance at inspection: To Balance (small trees) assessment requirements.

Balance (small trees) assessment requirements:

- ▶ Tubes or plant cells: height above soil level must be between 1.5 and 2.5 times the height of the tube or plant cell.
- ▶ Trees in containers < 20 L (other than tubes or plant cells) or ex-ground trees of Size Index < 35 (e.g. 1.4 m high x 25 mm calliper); height must fall within the range indicated for the container size in the Small container-grown trees table.
- ▶ Containers/rootballs (other than tubes or plant cells) must remain flat on the ground when the stem, held at 80% of height above ground, is deflected 30° from the vertical, side to side.

Exempt: Species that naturally produce hard inflexible wood in the early stages of their development.

Table 4 Small Container-Grown Trees Table

Tubes or plant cells Container size or minimum rootball diameter	Tree height between 1.5 and 2.5 x the height of the container	
	Height range (m)	
	Thin-stemmed species	Thick-stemmed species
150 mm (1.8 L)	0.4 – 0.6	0.3 – 0.5
170 mm (2.6 L)	0.5 – 0.7	0.4 – 0.6
200 mm pot (4 L)	0.7 – 0.9	0.6 – 0.8
200 mm bag (5 L)	0.8 – 1.0	0.7 – 0.9
250 mm (8 L)	1.0 – 1.2	0.8 – 1.0
300 mm (15 L)	1.2 – 1.5	1.0 – 1.2

Large trees

Conformance at inspection: To Balance (large trees) assessment requirements.



Balance (large trees) assessment requirements:

- ▶ For trees grown in containers ≥ 20 L, the Size Index must lie within the range for the nominal container size shown in the Common container volumes table.
- ▶ Ex-ground trees with a Size Index ≥ 35 (e.g. 1.4 m high x 25 mm calliper) must have rootball diameters \geq the minimum rootball diameters shown in the Ex-ground trees table.

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Table 5 Common Container Volumes Table

Size Index	Nominal container volume (L)	Size Index	Nominal container volume (L)
26-33	20	371-480	450
32-41	25	412-518	500
45-58	35	453-587	550
57-74	45	495-640	600
77-99	60	533-716	700
83-107	75	632-818	800
111-143	100	711-921	900
154-200	150	791-1023	1000
194-251	200	842-1089	1100
227-314	250	918-1188	1200
273-353	300	1148-1485	1500
289-373	350	1530-1980	2000
330-427	400	1913-2475	2500

Table 6 Ex-ground Trees Table

Size Index	Minimum rootball diameter (mm)	Size Index	Minimum rootball diameter (mm)
36-55	350	341-383	850
56-72	400	384-429	900
73-106	450	430-530	1000
107-131	500	531-642	1100
132-156	550	643-732	1200
157-173	600	733-859	1300
174-228	650	860-1144	1500
229-249	700	1145-1507	1750



250–299	750	1508–1968	2000
300–340	800	1969–3075	2500

For trees outside the ranges shown in the Common container volumes table and the Ex-ground trees table, refer to the master planting schedule for details.

Photographs: Provide current colour copies with date verification.

6.2.2 Above-ground

Labelling

General: Clearly label individual trees and batches.

- ▶ Label type: To withstand transit without erasure or misplacement.

Health and vigour

Health: Supply trees with foliage size, texture and colour at time of delivery consistent with the size, texture and colour shown in healthy specimens of the nominated species.

Vigour: Supply trees with extension growth consistent with that exhibited in vigorous specimens of the species nominated.

Freedom from pests and disease

Pests and disease: Supply trees with foliage free from attack by pests or disease.

Native species with a history of attack by native pests: Restrict evidence of previous attack to < 15% of the foliage and ensure absence of actively feeding insects.

Supply

Supply only trees that:

- ▶ Are free from injury.
- ▶ Are self-supporting.
- ▶ Have the calliper at any given point on the stem greater than the calliper at any higher point on the stem.

Pruning

In accordance with AS 4373.

Specific form: N/A

Clean stem height: < 40% of total tree height.



Pruning wounds

Extent: Restrict fresh (i.e. recent, non-calloused pruning wounds) to < 20% of total tree height.

Type: Ensure a clean-cut at the branch collar.

Diameter of wound: < 50% of the calliper immediately above the point of pruning.

Apical dominance

Species with an excurrent form: Supply trees with a defined central leader and the apical bud intact.

Crown symmetry

Crown distribution: Difference on opposite sides of the stem axis < 20%.

Stem structure

Species with excurrent form: Supply trees with a single stem roughly in the centre of the tree with any deviation from vertical < 15°.

Species with decurrent form: Supply trees where the central stem is not divided at any point lower than the clean stem height nominated, and that the stem junction at the point of division is sound.

All species: Ensure that branch diameter is less than or equal to one-half of the calliper immediately above the branch junction.

Included bark

General: Supply trees where the branch/stem bark ridges at junctions between stems and branches and between co-dominant stems are convex, except for species prone to include bark that are known to remain strong.

Trunk position

General: Supply trees with the distance from the centre of the trunk to the extremity of the rootball not varying by > 10%.

Compatibility of graft unions

General: Supply trees where the union between the scion and rootstock is sound for the entire perimeter of the graft, and the diameter of the scion immediately above the graft is equal to the diameter of the rootstock immediately below the graft ($\pm 20\%$).

Indication of north

Trees in containers > 100 L or of Size Index > 140: Indicate the northerly aspect during growth in the nursery to withstand transit without erasure or misplacement.



6.2.3 Below-ground

Root division

Trees in containers ≤ 45 L or ex-ground trees with a Size Index ≤ 70 : Primary division of roots at < 100 mm intervals.

Trees in containers > 45 L or ex-ground trees with a Size Index > 70 : Primary division of roots within the outer 50% of the rootball at < 100 mm intervals.

Root direction

General: Ensure that roots, from the point of initiation, generally grow in an outwards (radial) or downwards direction, and that any deviation from the established direction $< 45^\circ$.

Trees with a calliper at ground level < 40 mm: Ensure that the diameter of any nonconforming roots at the extremity of the rootball $< 25\%$ of the calliper.

Trees with a calliper at ground level ≥ 40 mm: Ensure that the diameter of any nonconforming roots at the extremity of the rootball < 10 mm.

Rootball occupancy

Soil retention: On shaking or handling the unsupported rootball at least 90% of the soil volume to remain intact.

Rootball depth

Rootball depth assessment for containers/rootballs ≥ 45 L or larger:

- ▶ Depth: \leq maximum depth specified and no rootball (regardless of size) > 550 mm in depth.
- ▶ Diameter: \geq depth.

Height of root crown

General: Ensure that root crown is at the surface of the rootball.

Non-suckering rootstock

Grafted cultivars/varieties: Supply trees grafted onto non-suckering rootstock.

6.3 Selections

6.3.1 Schedules

Plant schedule – as per the Master Planting Schedule

Plant species	Number	Rootball or container volume (L)	Height (m)	Calliper (mm)
As per the Master Planting Schedule				



Plant species	Number	Rootball or container volume (L)	Height (m)	Calliper (mm)

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6.3.2 Tree Inspection Form (Typical Example Only)

General

Date		Reference	
Purchaser			
Supplier		Inspected by (supplier/purchaser/agent)	
Species		Batch identification	
Number of trees in batch		Container/rootball size	
Height range		Calliper range	
Special requirements			

Above ground

Labelling	<input type="checkbox"/>	
Health and vigour	<input type="checkbox"/>	
Freedom from pests/disease	<input type="checkbox"/>	
Freedom from injury	<input type="checkbox"/>	
Self-supporting	<input type="checkbox"/>	
Stem taper	<input type="checkbox"/>	
Pruning	<input type="checkbox"/>	
Apical dominance	<input type="checkbox"/>	
Crown symmetry	<input type="checkbox"/>	
Stem structure	<input type="checkbox"/>	
Included bark	<input type="checkbox"/>	
Trunk position	<input type="checkbox"/>	



Compatibility of graft unions	<input type="checkbox"/>	
Indication of north	<input type="checkbox"/>	

Below ground

Inspection method used	<input type="checkbox"/>	External only
	<input type="checkbox"/>	External plus investigative
	<input type="checkbox"/>	destructive <input type="checkbox"/> partial
Number of trees in sample	<input type="checkbox"/>	
Root division	<input type="checkbox"/>	
Root direction	<input type="checkbox"/>	
Diameter nonconforming roots at rootball extremity	<input type="checkbox"/>	
Rootball occupancy	<input type="checkbox"/>	
Rootball depth	<input type="checkbox"/>	
Height of root crown	<input type="checkbox"/>	
Non-suckering rootstock	<input type="checkbox"/>	

Balance

Balance	<input type="checkbox"/>	

Conformance with specification

Conforming	<input type="checkbox"/> Yes <input type="checkbox"/> No
------------	--



Comments	
Name and signature (inspector)	

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7. Landscape – Swales

7.1 General

7.1.1 Cross References

General

General: Conform to the *General requirements* worksection.

Associated worksections

Associated worksections: Conform to the following:

- ▶ *Landscape - soils.*

7.2 Products

7.2.1 Grass Seed

Seed

Mixtures: Provide seed mixtures which are thoroughly pre-mixed with a bulking material such as safflower meal. Deliver to the site in bags marked to show weight, seed species and supplier's name. Provide fresh, clean, uncoated new seed. Do not provide wet, mouldy, or otherwise impaired seed.

Purity (minimum): 98%.

Germination viability (minimum): 86%.

Age (maximum) from date of harvest: 2 years.

7.2.2 Erosion Control Matting (MacMat)

Refer to **Appendix B** for Manufacturer's Specification

7.3 Hydroseeding and hydromulching

Seed pretreatment

General: Place in a calico bag those species of seed to be pretreated, and immerse for 10 minutes in water kept at a temperature between 80°C and 95°C. Do not boil. Allow to cool, soak for 24 hours, then apply immediately.

Seed species to be pretreated as per approved application method.



Hydroseeding mixture

General: A slurry of seed mixture, fertiliser, and water.

Hydromulching mixture

General: A slurry of seed mixture, fertiliser, mulch and water.

Hydroseeding and hydromulching schedule

Location	Seed mix and type	Mulch type	Slurry type	Water application rate (L/ha)	Binder type and rate	Sowing Season
As per drawing	STERILE Japanese Millet (<i>Echinochloa esculenta</i>) 35%	Approved contractor submittal	Approved contractor submittal	Suitable for the site conditions, sufficient to assist in seed, fertiliser, mulch distribution	250L/ha	October to March
As per drawing	STERILE Wimmera Rye (<i>Lolium rigidum</i>) 35%	Approved contractor submittal	Approved contractor submittal	Suitable for the site conditions, sufficient to assist in seed, fertiliser, mulch distribution	250L/ha	April to September
As per drawing	Green Couch (<i>Cynodon dactylon</i>) 65%	Approved contractor submittal	Approved contractor submittal	Suitable for the site conditions, sufficient to assist in seed, fertiliser, mulch distribution	250L/ha	Winter and Summer

Fertiliser

Type and application rate: Approved contractor submittal, application rate as per manufacturer’s instructions.

Mixing

Mixer: Thoroughly mix the slurry in a purpose-made mechanical mixer.

Application rates

Seed mixture: The rate applicable to the mix type.

Mulch: At least 2.5 t/ha with seed, or 5 t/ha without seed.

Bitumen emulsion binder: 2000 L/ha of residual bitumen.

Polymer binder: 250 L/ha.



Water: Suitable for the site conditions, and sufficient to assist in the distribution of the seed, fertiliser and mulch.

Preparation

Bed: Scarify the area to be seeded to provide a firm friable seed bed. If the area is to have added topsoil, place it before scarifying.

Application

General: Moisten the topsoil to its full depth before applying the slurry. Apply the slurry using high pressure pumping equipment operated by trained personnel. Spray the mixed slurry under pressure, maintaining a thoroughly mixed supply, operating on a front so that the mixture is evenly distributed over the area. Complete each front before commencing the next.

Watering

Before germination: Water the seeded area with a fine spray until the topsoil is moistened to its full depth. Continue watering until germination to keep the surface damp and the topsoil moist but not waterlogged.

After germination: Water to maintain a healthy condition, progressively hardened off to the natural climatic conditions.

7.4 Weed Management

Weed eradication

Herbicide: Eradicate weeds using environmentally acceptable methods, such as a non-residual Glyphosate herbicide in any of its registered formulae, at the recommended maximum rate.

Manual weeding: Regularly remove, by hand, rubbish and weed growth throughout grassed, planted and mulched areas. Remove weed growth from an area 750 mm diameter around the base of the trees in grassed areas. Continue eradication throughout the course of the works and during the planting establishment period.

Spraying: Where necessary spray with a selective herbicide for broad leafed weeds. Do not spray grass seeded areas within 3 months of germination.

Vegetative spoil

Disposal: Remove vegetative spoil from site. Do not burn.



8. Landscape – Establishment and Maintenance

8.1 General

8.1.1 Cross References

General

General: Conform to the NATSPEC *General requirements* worksection.

8.2 Establishment and Maintenance Periods

The establishment and maintenance periods commence at the date of practical completion, or other identified fixed period, as set out by the Superintendent in a written certification to the Landscape Subcontractor.

8.2.1 Planting establishment period

The establishment period for soft landscape works is: **12 Weeks**

8.2.2 Planting maintenance period

The maintenance period for soft landscape works is: **52 Weeks**

8.3 Establishment and Maintenance Requirements

The Landscape Subcontractor is required to maintain all landscaped areas in accordance with all clauses within the Landscape Specification in order to ensure optimum plant growth is achieved. Plant establishment works include, but are not limited to:

- ▶ Pest and disease control;
- ▶ Weeding and spraying;
- ▶ Watering and fertilising;
- ▶ Mowing and edging;
- ▶ Top dressing of turf; and
- ▶ Replanting and remulching.

The Landscape Subcontractor is expected to undertake regular site visits throughout the maintenance period in order to ensure optimum plant growth is achieved.

8.3.1 Use of Watertube to Trees and Shrubs in Bags of 25L and Greater

Trees and shrubs in bags of 25L and greater shall be installed on site within a Watertube. The Watertube is installed in a similar fashion to that of a traditional tree guard however provides a



trickle fed source of water, and protection for young saplings from the elements. This ensures healthy growth is achieved at a significantly faster rate during the establishment period than through a traditional watering regime, as well as minimising the loss of plants due to drought intolerance.

8.4 Defects Liability Period

The Defects Liability period for soft and hard landscape works is 52 weeks from Practical Completion or other identified fixed period, as set out by the Superintendent in a written certification to the Landscape Subcontractor. The Defects Liability Period will run concurrently with the Establishment and Maintenance Period specified timeframes.

The Landscape Subcontractor is responsible for the replacement of all hardscape elements of the landscape works, due to defective materials or workmanship, however excluding acts of vandalism.

The Principal is responsible for the supply costs of replacement landscape materials where such materials are deemed to have failed, or have been damaged due to circumstances beyond the control of the Landscape Subcontractor, such as through vandalism, and include but are not limited to:

- ▶ Irrigation;
- ▶ Mulch; and
- ▶ Plant stock.

The Defects Liability period for hard landscape works is: **52 weeks**

Where the duration of the plant maintenance period differs from the defects liability period, the defects liability period for soft landscape works shall be: **52 weeks**

8.5 Establishment and Maintenance Log Book

A logbook detailing the landscape establishment and maintenance tasks, hours required to perform each task, materials used, and outcomes shall be submitted to the Superintendent, from commencement through to final inspection.

8.6 Inspection

Give sufficient notice so that inspection may be made at the following stages unless required otherwise by the Superintendent:

- ▶ Sub grades cultivated or prepared for placing topsoil;
- ▶ Grassing bed prepared before turfing, seeding, or temporary grassing;
- ▶ Plant holes excavated and prepared for planting;
- ▶ Plant material set out before planting;



- ▶ Clearing Completed;
- ▶ Plant materials delivered to the site;
- ▶ Planting, staking and tying completed;
- ▶ Grassing or turfing completed;
- ▶ Paving trim, fixtures and furniture completed;
- ▶ Tree holes excavated and prepared for planting;
- ▶ Trees before arboriculture works.

8.7 Completion

Product warranty

Certification: Submit the supplier's written statement certifying that plants are true to required species and type, and are free from diseases, pests, and weeds.

Maintenance manual

General: Submit recommendations for maintenance of plants.

Cleaning

Clean substrate and signage, removing excess adhesive, burrs and temporarily identification marks and labels from any items supplied as part of the Landscape scope of works.

Stakes and ties: Remove those no longer required at the end of the planting establishment period.

Temporary fences

Remove temporary protective fences at the end of the planting establishment period.



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Appendix A
Master Plant Schedule



MASTER PLANT SCHEDULE								REV A
QUANTITY	CODE	BOTANICAL NAME	COMMON NAME	CENTRES (mm)	POT SIZE	HEIGHT (MATURITY)	SUPPLY HEIGHT	STAKING
TREES								
42	ALL ino	<i>ALLOCASUARINA inophloia</i>	Stringybark She Oak	10000	25L	10m	1200mm	Y
52	COR mac	<i>CORYMBIA maculata</i>	Spotted Gum	10000	25L	25-30m	1200mm	Y
46	COR tes	<i>CORYMBIA tessellaris</i>	Moreton Bay Ash	10000	25L	35m	1200mm	Y
37	EUC ter	<i>EUCALYPTUS tereticornis</i>	Forest Red Gum	10000	25L	30m	1200mm	Y
48	LOP sau	<i>LOPHOSTEMON suaveolens</i>	Swamp Box	10000	25L	10-25m	1200mm	Y
SHRUB MIX								
13950	ACA jun	<i>ACACIA juncifolia</i>	Rush Leaf Wattle	MIXTURE OF SPECIES AT 2000mm CENTRES	TUBE	1-2.5m	NA	N
13950	DOD vis	<i>DODONAEA viscosa</i>	Sticky Hop Bush		TUBE	5-8m	NA	N
13950	HOV vis	<i>HOVEA acutifolia</i>	Pointed Leaf Hovea		TUBE	2-4m	NA	N
13950	JAC sco	<i>JACKSONIA scoparia</i>	Dogwood		TUBE	4m	NA	N
13950	PUL vil	<i>PULTENAEA villosa</i>	Hairy Bush Pea		TUBE	2m	NA	N
GROUNDCOVERS/NATIVE GRASS MIX 1								
2255	CYM ref	<i>CYMOPOGON refractus</i>	Barbed Wire Grass	MIXTURE OF SPECIES AT 750mm CENTRES	TUBE	NA	NA	N
2255	DIA rev	<i>DIANELLA revoluta</i>	Blueberry Lily		TUBE	NA	NA	N
2255	HAR vio	<i>HARDENBERGIA violacea</i>	Native Sarsaparilla		TUBE	NA	NA	N
2255	LOM lon	<i>LOMANDRA longifolia</i>	Mat Rush		TUBE	NA	NA	N
2255	THE aus	<i>THEMEDA australis</i>	Kangaroo Grass		TUBE	NA	NA	N
GROUNDCOVERS/NATIVE GRASS MIX 2								
1060	DIA cae	<i>DIANELLA caerulea</i>	Blue Flax Lily	MIXTURE OF SPECIES AT 750mm CENTRES	TUBE	NA	NA	N
1060	ISO nod	<i>SOLEPIS nodosa</i>	Knobby Club Rush		TUBE	NA	NA	N
1060	LOM lon	<i>LOMANDRA longifolia</i>	Mat Rush		TUBE	NA	NA	N
1060	THE aus	<i>THEMEDA australis</i>	Kangaroo Grass		TUBE	NA	NA	N
HDROMULCH MIX WITH MACMAT JUTE MATTING								
NA	1/3	<i>HARDENBERGIA violacea</i>	Native Sarsaparilla	NA	NA	NA	NA	N
NA	1/3	<i>LOMANDRA longifolia</i>	Mat Rush	NA	NA	NA	NA	N
NA	1/3	<i>MYOPORUM ellipticum</i>	Booblia	NA	NA	NA	NA	N
HYDRMULCH GRASS MIX								
		<i>CYNODON dactylon</i>		NA	NA	NA	NA	N



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Appendix B

Macmat Jute Matting - Manufacturers Specification

Jute Mesh

Geomat – Erosion Control Netting



Technical characteristics:

Jute Mesh Soil Saver is made from unbleached, undyed, and loosely-twisted yarn 100% woven jute fiber to form an open weave mesh.

Physical properties

Yarn Thickness	mm		5
Mass per unit area	g/m ²	2387 : 1969	545
Aperture Size	mm		13 x 20
Width	Warpings/m		60-75
Length	Warpings/m		40-45
Color			* Light Brown/ Grey
Fiber			100% Jute
Contaminants	%		≤5
Living organisms			Nil
Fumigation Certificate			Yes
Longevity	years		≤ 1

Mechanical properties

Longitudinal tensile strength	kN/m	IS 1969 : 1980	10.4
Elongation at break	%	Warpway	11
Transversal tensile strength	kN/m	IS 1969 : 1980	7.9
Elongation of break	%	Weftway	15
Water Retention		5x	3kg/m ²

Bale presentation

Width	m		1.22
Length	m		549
Area (nominal)	m ²		670
Dimensions	mm		1300 x 550 x 800
Weight	kg		345



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B	Claire Humphreys	C. O'Neill*		P. Wootton		01/02/10

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Attachment E

Queensland DPI Hardwoods Advice

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Hardwoods advice

Plantation species profiles

Spotted gums

(*Corymbia maculata*, *Corymbia citriodora* subsp. *variegata*, *Corymbia citriodora* subsp. *citriodora*, *Corymbia henryi*).

David Lee, Simon Lawson, Matt Armstrong and Geoff Dickinson

Much of this information is generated from the results of research conducted by Hardwoods Queensland. The publication of supporting material is in progress.



Taxonomy and natural distribution of the spotted gums

Over the last few years there have been significant changes to the taxonomy of the spotted gum group. Prior to 1995 they were placed in the genus *Eucalyptus* with *E. maculata* occurring along the coast from Orbost, Victoria to Maryborough and inland to Carnarvon Gorge in Queensland and *E. citriodora* found from Maryborough, north into the southern part of Cape York Peninsula. Since then, taxonomic revision has placed the spotted gums in the genus *Corymbia*.

Natural populations of *Corymbia citriodora* subsp. *variegata* (spotted gum) occur in the Springsure-Maryborough region in central eastern Queensland to Coffs Harbour in New South Wales. *Corymbia citriodora* subsp. *citriodora* (spotted gum; lemon-scented gum) is found north from the Springsure-Maryborough region (overlapping with *C. citriodora* subsp. *variegata*) to the Atherton Tableland. *Corymbia henryi* (spotted gum; large-leaved spotted gum) is found on relatively infertile soils from the Brisbane area, to south of Grafton in New South Wales. *Corymbia maculata* (spotted gum) is the southernmost of the group and occurs from Orbost to south of Coffs Harbour^{1,2}. All the spotted gums except *C. maculata* are under consideration for plantation development in Queensland.



Properties and uses of spotted gum

All the spotted gums are recognised by the timber trade name 'spotted gum'. The series Timber Species provides a detailed description of the timber properties and uses of spotted gum timber³.

Spotted gum is a hard, durable timber and highly resistant to decay, although untreated wood is susceptible to lyctid borer attack. It can be dried satisfactorily and machines and finishes well. The heartwood colour varies between light brown and dark red-brown. The grain is moderately textured and variable and a wavy grain can produce an attractive fiddle back figure.

Spotted gum has a range of possible uses including as a sawn or round timber in engineering works; as an unseasoned timber in general framing and construction, joinery and fencing; fine and outdoor furniture, parquetry and turnery. Spotted gum plantings also play a significant role in land rehabilitation and management.

Current market value of spotted gum

Spotted gum timber is currently sourced from native regrowth forests on state and private land and it will be a number of years before plantation spotted gum is available on the market. The market value figures below are based on wholesale prices from a number of Queensland timber merchants, and should only be used as approximate figures.

Average current market value of spotted gum timber for 2001

Product	Price /m ³
Tongue and Groove Flooring	\$1,250 - \$1,300
Seasoned Structural (F17)*	\$950 - \$1,050
Unseasoned Structural (F14)*	\$550 - \$650

*stress grades¹⁰

Why is spotted gum recommended as a plantation species?

Spotted gum is a very high quality timber. Currently, spotted gum is the highest volume native hardwood harvested in Queensland, equivalent to 60% of the total. In plantations, spotted gum has good growth rates, and adapts well to a wide range of site types. Future, commercial volumes of plantation grown spotted gum timber are expected to be available

from most regions in central and southern Queensland on suitable soils and where the rainfall is between 600 and 1200 mm per year. Spotted gum copes with soils that have low to high fertility, with good to moderately impeded drainage, low to medium salinity and low to moderately high pH and sites that experience a moderate frequency of non-severe frosts⁹.

Spotted gum as a plantation timber

Measurements of air-dry density demonstrate that the density of young, plantation grown spotted gum timber is only slightly less than that of mature (forest grown) timber. An average air dry density of 11- and 41-year-old *Corymbia citriodora* subsp. *variegata* has been measured at 87% and 108% of that of mature timber, respectively. For three-year-old trees of *Corymbia citriodora* subsp. *citriodora*, air-dry density was 71% that measured for mature timber³. This range is comparable to the range of timber densities found in natural forests. Tests of timber shrinkage also demonstrate similarity between plantation and forest grown timbers³.

Spotted gum as a pulp species

In South Africa spotted gum is now considered a potential pulp species on the Zululand coast where disease and drought have previously limited forestry development. A pulping study of seven-year old trees indicated that spotted gum has good growth potential and pulp yields, when compared to highly selected *E. grandis* hybrid controls⁴. This finding has been verified in subsequent studies in Australia, indicating that spotted gum has potential as a dual-purpose species for both sawlogs and pulp⁵.

Early age growth in plantation spotted gum

Spotted gum has been grown in numerous Hardwoods Queensland field trials, especially in southeast Queensland. The current assessment of early age growth performance and potential productivity for spotted gum is summarised below.

Different provenances (specific geographical areas from which individual seed stocks originate) vary in their growth performance. This is due mainly to the effects of Ramularia Shoot Blight (RSB), a fungal disease that can severely damage trees by killing the growing points. Differential resistance to this disease is the basis for a tree improvement program for this *Corymbia* group. For trees that show tolerance to RSB, good early growth can exceed 4 m per year over the first three years.

Growth of spotted gum over a range of rainfall conditions and on soil types to which it is well adapted.

Site	Mean annual rainfall (mm)	Growth rate
High rainfall area (Tiaro)	1050	4.0 m/yr (10 m height at age 2.5 yrs)
Medium rainfall area (Gatton)	833	3.3 m/yr (10 m height at age 3 yrs)
Low rainfall area (Warwick)	650	2.5 m/yr (5 m height at 2 yrs)

Where is spotted gum expected to reach these growth rates and productivity levels?

Spotted gum is a suitable plantation species in areas of Queensland and northern New South Wales where the mean annual rainfall is between 700 and 1200 mm. Provided local site conditions are favorable and management is appropriate, it can be grown in 9 of the 10 regions defined by the Hardwoods Queensland project (below). Although provenance selection in spotted gum has been made primarily on the basis of superior tolerance to RSB, some of these provenances may also be suitable for lower rainfall regions.

Suitable regions for the development of spotted gum plantations

Hardwoods Queensland Region	Extent	Mean annual rainfall
2 North Qld - Dry tropics	North Qld - Dry tropics	700-1200 mm
3 Mackay coast and hinterland	Mackay coast and hinterland	>1200 mm
4 Central Queensland - Coastal	Rockhampton to Gympie	>900 mm
5 Central Queensland - Inland	Fitzroy/Dawson Valley	600-900 mm
6 Burnett	Burnett South, North and Central	600-900 mm
7 Sunshine Coast	Gympie to Brisbane	>1100 mm
8 Moreton	Lockyer/Brisbane/Logan Valleys	800-1100 mm
9 Downs	Eastern/Darling Downs (inc. Warwick and Dalby)	600-800 mm
10 Northern NSW	Northern/Central coast and New England Tableland	>600 mm

To see the location of Hardwoods Queensland's plantation development regions go to: [Regions map](#).

Choosing appropriate spotted gum species and provenances

"Provenance" in a tree species is the geographical area from which seed is collected. Provenances often grow well outside their natural area of origin. Hardwoods Queensland's extensive field trials have established that different provenances of spotted gum perform differently in different locations. For example, several provenances are particularly well suited to drier regions. Coupled with the fact that some provenances are genetically more tolerant of specific diseases, the choice of provenance or seed source is a significant consideration in establishing a spotted gum plantation. Sources of spotted gum seed or planting stock are

available from the Department of Primary Industries and Fisheries and some private companies. The appropriate provenance will depend on the location of the plantation. The impact of site conditions on the health and growth performance of different spotted gum provenances is the subject of current Hardwoods Queensland research.

Corymbia citriodora subsp. *variegata*

Provenance	Characteristics
High rainfall, coastal -eg provenances from the Gympie region.	These provenances have the highest level of tolerance to RSB and grow very well on red soils. They may be drought susceptible.
Sub-coastal provenances -eg provenances from west of Gympie in the Burnett region.	Tolerance to RSB is intermediate. Provenances should be well adapted to areas with 700 to 1000 mm rainfall.
Inland -eg Carnarvon.	Highly susceptible to RSB. Currently not recommended for plantation establishment.

Corymbia citriodora subsp. *citriodora*

Provenance	Characteristics
High rainfall, coastal -eg provenances from the Kirrama and Herbeton regions.	These provenances have a high level of tolerance to RSB although they may be drought susceptible.
Low rainfall, inland -eg Biloela	Moderately to highly susceptible to RSB. Currently not recommended for plantation establishment.

Corymbia henryi

Highly susceptible to RSB. Currently not recommended for plantation establishment.

Seed availability

Seed orchard seed (*C. citriodora* subsp. *variegata*)

Source	Availability
Department of Primary Industries and Fisheries Horticulture and Forestry Science Contact Dr. David Lee, Ph: 07 54820885.	Potentially from 2003-4

Forestry Plantations Queensland
Tree Seed Sales

Potentially from 2003-4

Natural stand seed (all species).

Source

Availability

Forestry Plantations Queensland
Tree Seed Sales

Now

Australian Tree Seed Centre, CSIRO, Canberra
www.ffp.csiro.au/tigr/atscmain.htm

Now

Private seed collectors

Now

Sites best suited to spotted gum

Site conditions can constrain productivity, even within a region with adequate rainfall. Here we present a summary of the soil types for which spotted gum has proven to reach a reasonable level of productivity in a limited time. Note that the relative resistance to diseases and pests will also have an impact on on-site performance.

MAR: mean annual rainfall

Soil type	Ferrosols (eg Krasnozems, refs 12 & 13)	Example of good productivity:	Average height of 10 m in 3 years at Blackbutt (950 mm MAR)
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Notes and constraints

These are free-draining, deep soils and generally do not require mounding.

If previously cultivated, these soils are often compacted at depth (plough pan) and need to be deep ripped.

These soils are well-drained and have a low water-holding capacity, so the effects of drought can be severe. It is important to plant hardy nursery stock and to water trees often after planting if dry conditions prevail.

Potential nutritional problems may include acidity (apply lime) and boron deficiency.

Soil type	Kandosols (eg Red & Yellow earths)	Example of good productivity:	Average height of 12 m in 3 years at Tiaro (1050 mmMAR)
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Notes and constraints

Use standard techniques⁹.

Soil type	Dermosols (eg Prarie soils)	Example of good productivity:	Average height of 5 m in 2 years at Monto (730 mm MAR)
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Notes and constraints

Use standard techniques⁹

Soil type	Chromosols (eg Red & Yellow Podzolics) and some Sodosols (eg Soloths & Solodized Solonetz)	Example of good productivity:	Average height of 7 m in years at Gatton (800 mm MAR)
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Notes and constraints

Deep ripping and mounding is highly recommended to improve drainage and root penetration in heavy clay sub-soils.

Avoid planting spotted gum in the following site conditions:

Soil type and/or condition	Comments
Poorly-drained sites	Extended waterlogging will result in a large reduction in growth and moderate mortality.
Frosty sites	Although mildly frost tolerant, spotted gum will suffer high mortality in heavy frost areas. While provenances from western Queensland are the most frost-tolerant, they are also more susceptible to RSB.
Vertosols (eg Black Earths and Grey Clays)	The surface roots of spotted gum do not appear to tolerate the regular cracking characteristics of this soil type.

Spotted gum silviculture - managing plantations for high value timber

Successful plantation establishment and management depends on appropriate site preparation and stocking rate, early and maintained weed management, early fertiliser treatment and appropriate pruning and thinning practices. General advice about good silvicultural practices for producing spotted gum solid wood products is given on the Hardwoods Queensland website⁹ [Managing hardwood plantations](#).

Managing site limitations

Some site conditions may compromise plantation productivity. In such cases, management practices can ameliorate site conditions such as difficult soil types, multiple frosts, drought at

planting or inappropriate planting time and vertebrate browsing. Suggested management of these site limitations can be found on the Hardwoods Queensland website⁹ [Managing hardwood plantations](#).

Diseases affecting growth of spotted gum

Ramularia Shoot Blight. Spotted gum is susceptible to Ramularia Shoot Blight (RSB), which is a fungal pathogen that damages young shoots, often resulting in the loss of the affected leader or side branches. For more information about this disease, see the DPI&F Note: [Shoot blight of spotted gums in Queensland](#)⁶.

Extensive testing of several provenances of spotted gum has shown that some are highly tolerant to RSB over a range of site conditions. Also, tolerance of provenances to RSB varies between planting locations. Early research results have provided greater confidence regarding the decision-making process in the establishment of spotted gum plantations. The best resistance to RSB has been found in provenances of *C. citriodora* subsp. *variegata* from the Gympie region. Field trials on Red Ferrosol soils in the Central Burnett region (Hardwoods Queensland Region 6) demonstrate that at age three years Gympie provenances of *C. citriodora* subsp. *variegata* can attain 80% greater diameter and 66% greater height than more susceptible provenances.

Pests - Insects affecting growth of spotted gum

Erinose mite (*Rhombacus* sp. Acarina: Eriophyidae). Sporadic outbreaks of this mite were observed in young spotted gum plantations (usually less than 18 months old) in the early summers of 1999/00 and 2001/02.



The mites are microscopic but produce highly visible blisters on the leaves. These blisters gradually become necrotic and the trees eventually drop badly affected leaves. Up to 90% of foliage can be affected on some trees.

Spotted gum leaves showing blisters caused by erinose mite.

Symptoms are most obvious from October/November to January/February. Dry conditions appear to promote the growth of mite populations. Trees usually recover, but early seasonal growth may be severely affected. Early research results indicate that there may be some differences in susceptibility between spotted gum provenances.

Management practices that promote vigorous growth, such as appropriate site selection, good weed control and fertilisation, will help to minimise the effects of this pest. However, unpredictable environmental factors, such as long dry periods, may be more important in promoting a population increase of the mite while decreasing the ability of the tree to outgrow its effects. Chemical spraying is not advised unless the infestation is severe and new growth is being affected consistently. Products containing dimethoate (400 g/L) are registered for use against erinose mite in eucalypt/*Corymbia* plantations in Queensland but these products have not yet been tested specifically in spotted gum plantations, so recommendations can not yet be made. However, it is the user's responsibility to ensure that registered agricultural chemicals are used in accordance with legal requirements. *Always read the label*. (Note: This information was correct at the time of publication). For some information about the assessment of damage in one spotted gum trial, see [Research Update 504](#).

Swarming scarabs (*Automolus* species). These small beetles attack young plantations in swarms during late spring to early summer, particularly following rainfall. The beetles feed on the growing tips and can have severe effects tree growth and form early in the growing season. Severe attack on very young seedlings can result in tree death. Plantations established on ex-pasture sites and/or are close to significant areas of pasture are most at risk. This is because the beetle larval stages live in the soil and feed on grass roots and soil organic matter. See the DPI&F Note: [Swarming Scarab beetles](#)⁷ for more information on the biology and management of these pests.

Christmas beetles (*Anoplognathus porosus*, *A. boisduvali*). These large beetles attack young plantations in early to mid- summer, usually following rainfall. Spotted gums are moderately susceptible to attack by Christmas beetles. They are voracious feeders and can defoliate trees quickly if numbers are high. Leaves fed on by these beetles have a characteristic jagged edge with the beetles not feeding on either the midribs or leaf margins. As with swarming scarabs, plantations that are established on or near ex-pasture sites are most at risk because the beetle larval stages live in the soil. See the DPI&F Note: [Christmas beetles](#)⁸ for more information on the biology and management of these pests.

Pests - Insects affecting timber quality

Longicorn beetles (*Phoracantha solida*, *P. mastersi*). Spotted gums generally show high levels of resistance to stem borers, although there are two species of longicorn beetle that can cause damage.

1. Young trees. The two-hole longicorn (*Phoracantha solida*) has attacked young spotted gums at a low incidence (range 0-9.5%) in some trial plantations. Current attack can be recognised by the cracking and swelling of bark associated with kino (resin) bleeds. 'Air' holes in the affected area indicate the presence of larger larvae. The bark around the affected area is shed exposing the sapwood and one or more oval-shaped holes that are formed when larvae tunnel into the heartwood to pupate. Holes not plugged with frass indicate that adults have already emerged.



The incidence of attack by these borers can increase if the trees become stressed due to drought, poor site selection or poor plantation management. Minimising the effects of these insects can best be achieved by promoting tree vigour through good site matching, fertilisation and thinning practices. Pruning, ideally, should be conducted during the winter months when these insects are inactive.

Bark cracking and resinosis associated with longicorn attack.

2. Older trees may be susceptible to attack by the ringbarking longicorn, (*Phoracantha mastersi*). This species has caused considerable death of spotted gums in native forest in the Dalby area (Hardwoods Queensland Region 9). However, to date, it has not been observed attacking trees in any research trial plantations in the State. Management practices that will minimise its impact are as for *P. solida*, above.

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Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	Bradley Wood	Eleas Nicholoau		P. Wootton		24/12/09
B	Bradley Wood	Eleas Nicholoau		P. Wootton		02/02/09

APPENDIX 13: EROSION MANAGEMENT PLAN

Westlink Pty Ltd

Report for Westlink Power Project
Erosion Management Plan

February 2010

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1. Introduction

1.1 The Project

In response to rapidly growing demand for electricity, Westlink Pty Ltd (Westlink) is proposing a staged development of a natural gas-fired power station at a site north of Gatton in South-East Queensland, referred to as the Westlink Power Project (WPP).

The proposed WPP is to be located on a parcel of land near the township of Gatton; approximately 90 km west of Brisbane and approximately two kilometres north of Gatton, immediately north of the Warrego Highway on Fords Rd, Adare.

On the 4th of September 2009, Westlink lodged with the Lockyer Valley Regional Council (LVRC) a Development Application (DA) complete with a detailed Review of Environmental Factors (REF) for the WPP. Specifically, the DA is over Lot 191 on Crown Plan CSH2361 situated in the County of Cavendish, Parish of Lockyer contained in Certificate of Title, Title Reference 17000028 and is seeking a:

- Development Permit for a Material Change of Use (MCU) for the Electricity Generation Infrastructure;
- Development Permit for Environmentally Relevant Activity (ERA) No.14; and
- Development Permit for Operational Work (OW) for Vegetation Clearing.

The proposed use is more specifically defined as a natural gas-fired power station, consisting of the following elements:

- Staged installation of six open-cycle gas turbines;
- An electrical switchyard;
- A gas receiving unit;
- An operations building, workshop, administration building and car park; and
- Associated safety and monitoring equipment.

The proposed WPP is to be built in stages, in line with growing demand for electricity. Subject to development approval, the first stage of the project is expected to consist of 200 to 300 MW of generating capacity, with future expansion leading to a total project comprising up to 1,000 MW of open cycle gas turbines.

1.2 Purpose

The purpose of this Erosion Management Plan (EMP) is to provide a response to Lockyer Valley Regional Council (LVRC) and the Department of Environment and Resource Management (DERM) with information requested as part of this application process. This Report/Management Plan specifically addresses request item/s no. PR P.5 of the DERM information request outlined in correspondence dated 22 October 2009.

1.3 Information Requested

The following requests for information relating to erosion and sediment management are as follows:

DERM Information Request - Vegetation Management Group (Item 3)

Prepare a Soil Erosion, Sediment and Drainage Control Plan which demonstrates how the applicant intends to reduce the impacts of land degradation or promote further evidence indicating how the application will meet PR. P.5 of the Regional Vegetation Management Code.

Response:

This EMP demonstrates a range of mitigation measures and devices which will assist in minimising land degradation on site and therefore meets the requirements of this request.

The performance requirement of PR. P.5 is as follows:

“To regulate the clearing of vegetation in a way that does not cause land degradation and maintains ecological processes—the effect of clearing does not result in—

- a) mass movement, gully erosion, rill erosion, sheet erosion, tunnel erosion, stream bank erosion, wind erosion, or scalding; and*
- b) any associated loss of chemical, physical or biological fertility—including, but not limited to water holding capacity, soil structure, organic matter, soil biology, and nutrients, within and/or outside the lot(s) that are the subject of the application.”*

Specific mitigation measures are described in detail in Sections 4, 5 and 6 of this EMP. The existing ground cover and vegetation will be preserved for the balance of the development site.

DERM Information Request - EPA (Project Reference Number 341117) Item 1(c)

Provide an Erosion Management Plan prepared in accordance with the DERM information sheet: “Information to be provided with an application for an environmentally relevant activity (ERA)”.

Response:

This Erosion Management Plan has been prepared in generally in accordance with the aforementioned factsheet.

LVRC Information Request – Item 3 Geotechnical Investigation

Advise proposed options to ensure slope stability and erosion protection on the steep and high batters.

Response:

Sections 4, 5, and 6 of this Erosion Management Plan outline specific mitigation measures to minimise erosion and promote slope stability for the development.

2. Regulatory Framework

Erosion and sediment control is regulated at both local and state levels of government. The key legal references and documents are:

- ▶ *Environmental Protection Act 1994*
- ▶ *Environmental Protection Regulation 2009*
- ▶ *Environment Protection (Water) Policy 2009*
- ▶ Queensland Water Quality Guidelines 2006
- ▶ IECA Australasia (IECA, November 2008). *Best Practice Erosion and Sediment Control*.

This EMP has been developed with reference to the above documentation.

3. Environmental Factors

3.1 Rainfall

Annual rainfall in Gatton is in the order of 760 mm (BOM, 2009). The months of October to March typically experience the heaviest rainfall followed by a noticeable decline of rainfall between April and September.

3.2 Geology

Reference to the 1:500 000 Moreton Geological Sheet indicates that Gatton is underlain by Quaternary Age flood plain and river terrace deposits, and is close to the boundary with Jurassic age, Marburg Formation deposits of sandstone, siltstone, shale, conglomerate, coal and oolitic ironstone.

The regional hydrogeology of the area has been deduced from the 1:2,500,000 map of Groundwater Resources of Queensland. According to the Queensland Department of Natural Resources and Water (DNR&W) Groundwater Database (2007), there are twelve registered bores within one kilometre of the site boundary. Limited stratigraphic records from these bores indicate that the majority of the site is underlain by residual soils of the Woogaroo Subgroup. According to historical records from DNR&W, groundwater has been encountered in the Woogaroo subgroup at depths of around 32m below ground level (BGL) and 114m BGL.

3.3 Topography

The site has varied topography with significant contour changes occurring on the north to south transect. The southern section of the site is relatively flat and rises gradually towards a NW-SE orientated ridge in the north. The southern extent of the site comprises gentle gradients climbing from the Warrego Highway and Fords Road. The south-western corner of the site forms a local depression and can become inundated, with saturated soils remaining for considerable periods of time.

A major gully system dissects the ridge and channels south towards the largest dam. A second smaller gully also extends from the ridgeline and joins with the larger gully system. The gullies range from 0.5m to 1.5m in depth. Minor erosion has occurred along creek beds but has been reduced by dense vegetation.

The northern portion of the site is situated on the opposite side of the central ridge and does not have significant bearing on the area in which the development is proposed. The southern catchment is approximately 30 ha. A small portion of the proposed development footprint has a gradient of greater than 10% (refer to Appendix A for further detail).

3.4 Soils

Geotechnical investigations indicate the soil comprises approximately 0.6 m of organic rich Clayey Sand/Sandy Clay overlying completely weathered sandstone. The soil layer is thinner (0.2 m thick) towards the north-eastern side of the proposed powerplant site.

3.5 Vegetation

The southern third of the site fronting Fords Road has been cleared and is covered with grass, with the northern portion of the property under vegetation. The primary vegetation type comprises open eucalypt woodland of various eucalypt species. The regional ecosystem remnant vegetation mapping prepared by the Queensland Herbarium describes the vegetation as a mix of RE 12.9-10.2 which is described as *Corymbia citriodora*, *Eucalyptus crebra* open forest on sedimentary rocks, and is classed as least concern under the VMA and accounts for 70% of the area, with the balance of the vegetation largely comprising RE 12.9-10.5 which is described as *Corymbia trachyphloia*, *C. citriodora*, *Eucalyptus crebra*, *E. fibrosa* subsp. *fibrosa* open forest on quartzose sandstone, and is classed as least concern under the VMA. The site also contains a small patch of 'High value regrowth vegetation that is a Least Concern regional ecosystem'.

The area to be affected by the proposed development will be completely cleared of all vegetation and the top soil will be stripped and removed from the area of disturbance.

3.6 Extent of Works

The proposed development will involve considerable reshaping of the land in the south east corner of the site, with six gas-fired turbines proposed in this area together with various support and ancillary infrastructure. The area of disturbance accounts for some seven hectares of the overall 70.151 ha contained within the parent parcel. The extent of works will involve significant cut and fill to create a relatively level platform on which the infrastructure is to be constructed.

4. Design Considerations

A number of design considerations have been proposed to minimise the risks associated with erosion on the site. Key design aspects are as follows:

- ▶ The area of disturbance on site will be limited to the footprint required to support the gas-fired turbines and necessary infrastructure and landscaping. Existing ground cover and vegetation will be preserved for the balance of the area.
- ▶ A relatively level platform is to be created using cut and fill techniques to enable the infrastructure to be constructed in a functional manner.
- ▶ Stormwater drainage systems will be established to manage stormwater runoff and to minimise velocity across open areas. Roofwater will be collected and discharged away from disturbed areas to minimise the risk of sediment entering the stormwater system.
- ▶ Vehicular access, manoeuvring and parking areas will be sealed to reduce the risk of erosion occurring within high traffic routes.
- ▶ Cut batters will be steepened toward the rear of the site where exposure of subsurface sandstone is likely. Weathered sandstone may be subject to the development of dispersive soils and therefore minimisation of exposure to rainfall is desirable.
- ▶ Diversion drains and bunding will be put in place upslope of the cut batters to divert all stormwater from upslope in the undisturbed portions of the catchment away from the construction area and the location of the new development. Diversion drains will be grass lined for the upper reaches where stormwater velocities are low and be rock lined at lower reaches as velocities and flow volumes increase. Specific design details will be provided at detailed design phase.
- ▶ Stormwater management will be achieved in the south western extent of the site through a series of large bunds that will be stabilised through revegetation as shown in Appendix A of this report.
- ▶ Progressive landscaping of all disturbed areas will be undertaken in accordance with the landscaping plans provided with this application. Jute matting and hydromulching will be installed in areas supporting batters steeper than 1 on 2 grades. Other areas are to be rehabilitated through a mixture of geofabric protection, mulch, hydromulching and the planting of shrubs and trees as shown in the landscape plan.
- ▶ The layout will assist in allowing efficient drainage of the site without resulting in high velocity flows being diverted over areas that may be subject to erosion.

5. Erosion & Sediment Control Strategy - Construction Phase

5.1 Planning

The following steps will be taken to prevent erosion and sedimentation, prior to commencement of works:

- ▶ All reasonable and practicable measures shall be taken to minimise changes to the volume, frequency, duration and velocity of stormwater runoff such that accelerated erosion within downstream waterways is minimised. This will be achieved in part through the installation of diversion drains and the detention bunds in the south west corner. Progressive rehabilitation of this area will be necessary to stabilise soils in the area.
- ▶ The location and design of works shall take appropriate consideration of the need to minimise potential erosion problems. This shall extend to include the location of access roads, temporary storage areas, stockpiles and site offices.
- ▶ To the maximum degree reasonable and practical, development layouts shall aim to minimise the duration that any, and all, areas of soil need to be exposed to other erosive effects of wind and rain during the construction of the proposed works.
- ▶ The staging and/or layout of works shall not cause unnecessary soil disturbance if an acceptable alternative layout is available that achieves the same, or equivalent, project outcomes.
- ▶ The Contractor shall be familiar with the preliminary geotechnical report prepared for the site as well as any additional geotechnical investigations and design plans. Adequate soil data shall be obtained for the site to:
 - Identify potential dispersive soils if present (dispersive soil risks may be associated with the weathering of the sandstone in areas of cut);
 - Maximise the erosion control benefits of the proposed site revegetation/stabilisation works; and
 - To allow the appropriate selection, design and specification of Erosion and Sediment Control (ESC) measures.

5.2 Site Preparation

The expansion area will be cleared and established, and site access points determined, in accordance with the following:

5.2.1 Site Clearing

- ▶ Land clearing shall be delayed as long as practical and shall be undertaken in conjunction with development of each stage of works, unless otherwise approved.
- ▶ All reasonable and practicable efforts shall be taken to delay the removal of, or disturbance to, existing ground cover prior to land-disturbing activities.
- ▶ No clearing shall be undertaken unless preceded or accompanied by installation of adequate drainage and sediment control measures.

- ▶ Prior to site clearing, areas of protected vegetation, and significant areas of retained vegetation shall be clearly identified for the purposes of minimising the risk of unnecessary land clearing.
- ▶ All reasonable measures shall be undertaken to protect “retained” vegetation from damage.

5.2.2 Site Establishment

- ▶ Development conditions shall be conveyed to the principal contractor prior to construction commencing.
- ▶ Prior to construction commencing, a site representative shall be nominated to undertake regular EMP audits of the site.
- ▶ Land disturbing activities shall be undertaken in such a manner that allows all reasonable and practicable measures to be undertaken to:
 - Permit stormwater to pass through or around the disturbance area in a controlled manner, and at non-erosive flow velocities;
 - Minimise soil erosion resulting from rain, water flow, and wind;
 - Minimise adverse effects of sediment runoff (including safety issues);
 - Minimise environmental harm resulting from work-related soil erosion and sediment runoff; and
 - Ensure that the value and use of land/properties adjacent to the development (including roads) are not diminished as a result of the adopted erosion and sediment control measures.
- ▶ All office facilities and operational activities shall be located such that any effluent, including wash-down water, can be totally contained, and treated, within the site.

5.2.3 Site Access

- ▶ Site access shall be stabilised and confined to the minimum practical number of locations.
- ▶ Vehicular access into the site shall be controlled so as to prevent tracking of sediment onto adjoining sealed roadways.
- ▶ Stormwater runoff from access roads and stabilised entry/exit systems shall drain to an appropriate sediment control device.

5.3 Site Management

The site will be managed in accordance with the following:

- ▶ All land-disturbing activities shall be conducted in accordance with the requirements of relevant environmental legislation.
- ▶ Construction schedules shall aim to minimise the duration that any and all areas of soil are exposed to the erosive effects of wind and rain.
- ▶ All land-disturbing activities shall be undertaken in accordance with the EMP and the conditions of development approval.
- ▶ All erosion and sediment control measures shall conform to the standards and specifications either contained in:
 - The approved EMP and supporting documentation; or

- The latest version of the IECA Guidelines if such standards and specifications are not contained in the approved EMP.
- ▶ Any works that cause significant soil disturbance that is ancillary to any purpose for which external approval is required, will not commence before the issue of that approval.
- ▶ Land disturbing activities shall not cause unnecessary soil disturbance if an acceptable alternative construction process is available that achieves the same or equivalent outcomes at equivalent cost.
- ▶ Sediment deposited off the site as a direct result of on-site activities, including sand, silt, soil, mud, gravel, cement, and ceramic waste shall be collected, and the area rehabilitated as soon as practical, with appropriate consideration given to both the safety, and environmental risk, associated with the sediment deposition.
- ▶ Adequate waste collection bins shall be provided on-site, and maintained such that potential and actual environmental harm is minimised.
- ▶ Concrete waste and chemical products, including petroleum and oil-based products, shall be prevented from entering an internal body, or an external drain, or piped stormwater system.
- ▶ All stormwater, sewer line, and services trenches not in streets, shall be mulched and seeded within seven days after backfill. No more than 150 m shall be open at any one time.
- ▶ Site spoil shall be disposed of in a manner that does not result in ongoing soil erosion or environmental harm.

5.4 Erosion and Sediment Control Treatments

This section of the EMP identifies the most appropriate erosion and sediment controls for the project. In addition, monitoring requirements are outlined. The selection of appropriate control measures is based on information provided in earlier sections of this EMP. Standard drawings and construction notes can be found in the relevant guideline.

5.4.1 Erosion Control

The following erosion control measures will be used to minimise the generation of sediment laden runoff during construction:

- ▶ Wherever practical, priority shall be given to the prevention, and minimisation, of soil erosion, rather than the trapping of displaced sediment.
- ▶ Within the limits of technology, erosion control measures used to control wind-borne erosion shall be designed to adequately manage a typical seasonal wind event in terms of wind direction and strength.
- ▶ Dust suppression activities shall ensure that sediment-laden runoff resulting from these measures is controlled and does not create a traffic hazard.
- ▶ All temporary earth banks, flow diversion systems and sediment dam embankments are to be seeded and mulched for temporary vegetative cover within 10 days after grading.
- ▶ Exposed earth surfaces are to be loosened, mulched, and seeded to maximise infiltration, minimise runoff, and promote revegetation.
- ▶ Unprotected slope lengths shall not exceed 80 m, or an equivalent vertical fall of 3 m prior to shutdown periods, or anticipated significant rainfall.

- ▶ Unprotected slopes exceeding 30 m are to be ripped across the slope at 10 m intervals to a depth of at least 0.2 m, or to contour furrows/banks.
- ▶ Construction and stabilisation of earth batters, steeper than 6:1 slope (horizontal:vertical), are staged such that no more than three vertical metres of batter is exposed to rainfall at any point in time.
- ▶ Steep slopes will require careful management and additional inspections of site performance at these locations should be considered during periods of higher risk.

Table 1 outlines some erosion controls recommended for use during construction, and their application.

Table 1 Erosion controls to be implemented during construction

ESC Measure	Application
Outlet protection	Placed at the outlet of temporary chutes to reduce discharge velocity and thus potential erosion.
Mulching	Applied on batters as soon as practicable and used to stabilise decommissioned access tracks. Erosion and sediment controls such as catch drains and sediment fences should be maintained until rehabilitated areas are stabilised.
Geofabric	Used as underlining for rock pads and channels to avoid soil exposure.
Rock Check Dams	Placed at regular intervals along catch drains to slow channelled runoff to non-erosive velocities.
Sediment Fences	These should be installed along down slope perimeter boundaries and other nominated areas to reduce the amount of material entering the floodway and existing pipe culverts. These fences will also allow runoff to pond and filter through the fence prior to entering these drainage lines and culverts.

5.4.2 Sediment Control

The following sediment control measures and procedures address treatment of sediment laden runoff during construction:

- ▶ All reasonable and practicable measures shall be taken to prevent or minimise the release of sediment from the site.
- ▶ All reasonable and practicable measures shall be taken to prevent the discharge to stormwater drains or waterways, any sediment-laden runoff resulting from the formation of exposed aggregate surfaces.
- ▶ Suitable all-weather access shall be provided to all sediment control devices.
- ▶ Sediment control devices shall be de-silted and made fully operational as soon as practical after a sediment-runoff event if their sediment retention capacity falls below 75% of the required capacity.
- ▶ Solid materials removed from sediment control devices shall be disposed of in a manner that does not cause ongoing soil erosion or environmental harm.

- ▶ Sediment basins shall be maintained and fully operational throughout the construction period and until the respective sediment basin's design catchment achieves the required ground vegetation coverage.
- ▶ Settled sediment shall be removed from sediment basins when its volume exceeds the nominated storage volume.
- ▶ Sediment-laden run-off from the site shall be directed to the designated sediment control device(s), which depending on the situation may include:
 - Rock check dams;
 - Vegetated channels;
 - Vegetated buffer strips;
 - Sediment fences;
 - Sediment basin (sized to the appropriate soil retainment characteristics, catchment area, and design rainfall event).

Suitable applications for the above sediment control devices are detailed in Table 2.

Table 2 Sediment control devices to use during the construction phase

ESC Measure	Application
Entry Points / Washdown Area	To assist in removing the soil from vehicles as they enter and exit the construction site. This will minimise the amount of sediment tracked onto Fords Road.
Sediment Trap	To trap sediment where concentrated flow is to be intercepted. These structures may be constructed from a number of materials including rock, sediment fence, geofabric, haybales or a combination of all.
Sediment Basin	A sediment basin has been designed for the site conditions and located within the floodway channel. This basin will capture runoff from the site, allowing the fine sediment to settle, thus reducing the amount to turbidity prior to downstream discharge.
Sediment Fences	These should be installed along down slope perimeter boundaries and other nominated areas to reduce the amount of material entering the floodway and existing pipe culverts. These fences will also allow runoff to pond and filter through the fence prior to entering these drainage lines and culverts.

5.4.3 Velocity Control

The velocity controls recommended for use during construction are detailed in Table 3.

Table 3 Velocity control measures

ESC Measure	Application
Rock / Sandbag Check Dams	Placed at regular intervals along catch drains to slow channelled runoff to non-erosive velocities.

5.5 Monitoring Requirements

The following monitoring regime will be used during the construction phase of the project:

- ▶ End of day inspection of erosion and sediment control devices and rectification where required.
- ▶ Daily following a rainfall event – inspection and sediment removal where required as soon as practicable.

6. Post Construction Measures

This section details site rehabilitation, monitoring, and maintenance procedures to be carried out post construction.

6.1 Site Rehabilitation

To rehabilitate the site following construction, the following measures will be taken:

- ▶ All disturbed areas shall be rendered erosion resistant by turfing, seeding, mulching, paving or otherwise suitably stabilised within 14 days of completion.
- ▶ The pH of topsoil shall be adequate to enable growth of vegetation.
- ▶ Inspection of revegetation zones will be undertaken to assess vegetation condition, and to identify if any erosion, channelling, or weed problems are occurring.

6.2 Site Monitoring

Site monitoring will be achieved through the following:

- ▶ Sediment basin water quality samples must be taken at a depth no greater than 200mm above the base/invert of the basin.
- ▶ All environmental incidents shall be recorded in a field log, which shall remain accessible to the various regulating authorities.

6.3 Site Maintenance

To ensure the site is maintained, the following procedures are to be followed:

- ▶ All ESC measures shall be maintained in good working order during their operational life.
- ▶ All temporary ESC measures to be maintained and fully operation during the maintenance period.
- ▶ The capacity and effectiveness of all ESC measures shall be implemented and maintained at all times.
- ▶ Where it is necessary to clear excess vegetation in order to restore the water carrying capacity of open drains, the vegetation shall be selectively cut and trimmed so as to leave a short, dense, live ground cover, for the purpose of minimising soil erosion.
- ▶ Maintenance of road shoulders, table drains, batters and other surfaces likely to erode shall aim to leave the grass length no shorter than 50 mm where practical.
- ▶ An emergency supply of repair materials such as wires, stakes, and filter cloths should be readily accessible and restocked after use.
- ▶ Post remediation, the site should be in a stable and non-erodible form.

Appendix A
Sediment Control Plan

SILT AND EROSION CONTROL

1. GENERAL

- 1.1 TAKE ALL REASONABLE AND PRACTICAL MEASURES TO PREVENT OR REDUCE HARM TO THE ENVIRONMENT AS SET OUT IN THE ENVIRONMENTAL PROTECTION ACT (1994). THE MANAGEMENT OF EROSION OF THE SITE AND ITS SURROUNDS AND THE TRANSPORTATION AND DEPOSITION OF SILT IS THE RESPONSIBILITY OF THE CONSTRUCTOR AND ALL INVOLVED WITH THE PROJECT.
- 1.2 NO SITE WORKS TO COMMENCE UNTIL APPROPRIATE EROSION AND SEDIMENT CONTROL HAS BEEN PROVIDED AND INSTALLED.
- 1.3 THE WORKS SHOWN ON THIS PLAN ARE FOR THE TEMPORARY CONTROL OF EROSION DURING THE CONSTRUCTION AND ESTABLISHMENT OF ACCEPTED GRASS COVER. THE REVEGETATION AND REHABILITATION WORKS ARE TO BE UNDERTAKEN AS SOON AS PRACTICALLY POSSIBLE.
THIS MANAGEMENT TO BE ADDRESSED THUS:
 - A) DURING CONSTRUCTION
PROVIDE AND MAINTAIN TEMPORARY CONTROLS FOR ALL ACTIVITIES WHICH POTENTIALLY COULD RESULT IN EROSION OR SEDIMENTATION - DEPENDING ON WEATHER CONDITIONS.
 - B) PRIOR TO PRACTICAL COMPLETION
PROVIDE AND MAINTAIN LONGER-TERM MEASURES TO MINIMISE EROSION AND SEDIMENTATION, TO AND FROM, THE COMPLETED WORKS. THE FINAL NATURE AND EXTENT OF THESE CONTROLS WILL BE AGREED WITH THE SUPERINTENDENT.
 - C) SILT AND EROSION CONTROL DEVICES ARE TO BE REMOVED WHEN SATISFACTORY GRASS COVER (8m² in 10m²) HAS BEEN ACHIEVED AND SITE IS STABLE.
- 1.4 CLEARING OF VEGETATION TO BE KEPT TO A MINIMUM AND LIMITS OF CLEARING TO BE VISIBLY DEFINED.
- 1.5 REFER TO IECA, BEST PRACTISE EROSION AND SEDIMENT CONTROL, NOV 2008 FOR GUIDELINES ON REQUIREMENTS FOR EROSION AND SEDIMENT CONTROL ON THIS SITE.
- 1.6 PROVIDE SILT FENCE DOWN GRADIENT OF ALL STOCK PILES.
- 1.7 CONSTRUCTION WORK TO BE STAGED TO MINIMISE EXPOSURE OF DISTURBED AREAS AND EROSION AND SEDIMENT CONTROL PLAN TO BE AMENDED ACCORDINGLY.
- 1.8 STOCKPILE SITES TO BE LOCATED A MINIMUM OF 50m FROM WATERCOURSES.
- 1.9 WITHIN 50m OF WATERCOURSES, TRENCH EXCAVATION MATERIAL TO BE PLACED UPSTREAM OF TRENCH.
- 1.10 WORKS ON SLOPES GREATER THAN 10% SHALL HAVE SPECIAL MEASURES TAKEN TO MINIMISE EROSION RISKS (e.g. EROSION CONTROL BLANKETS, MULCH, TURF etc)
- 1.11 ALL SURPLUS WASTE TO BE REMOVED FROM SITE AND DISPOSED OF ACCORDINGLY.
- 1.12 REGULAR MAINTENANCE OF STRUCTURES IS AN ESSENTIAL PART OF EFFECTIVE EROSION AND SEDIMENT CONTROL. THESE STRUCTURES SHOULD BE INSPECTED AT LEAST DAILY DURING DRY WEATHER AND AFTER EVERY STORM EVENT THAT CAUSES RUNOFF.
- 1.13 LANDSCAPING TO BE IN ACCORDANCE WITH THE LVRC TREE PLANTING AND LANDSCAPE GUIDELINES, IF APPLICABLE. (LVRC PLANNING SCHEME. SECTION 8.12 PSP No 11)

2. DUST SUPPRESSION

- 2.1 THE CONSTRUCTOR IS TO ENSURE THE SUPPRESSION OF DUST AT ALL TIMES DURING CONSTRUCTION. ACCEPTABLE METHODS OF DUST SUPPRESSION INCLUDE:
 - WATERING
 - REVEGETATE DISTURBED AREA
 - MULCHING

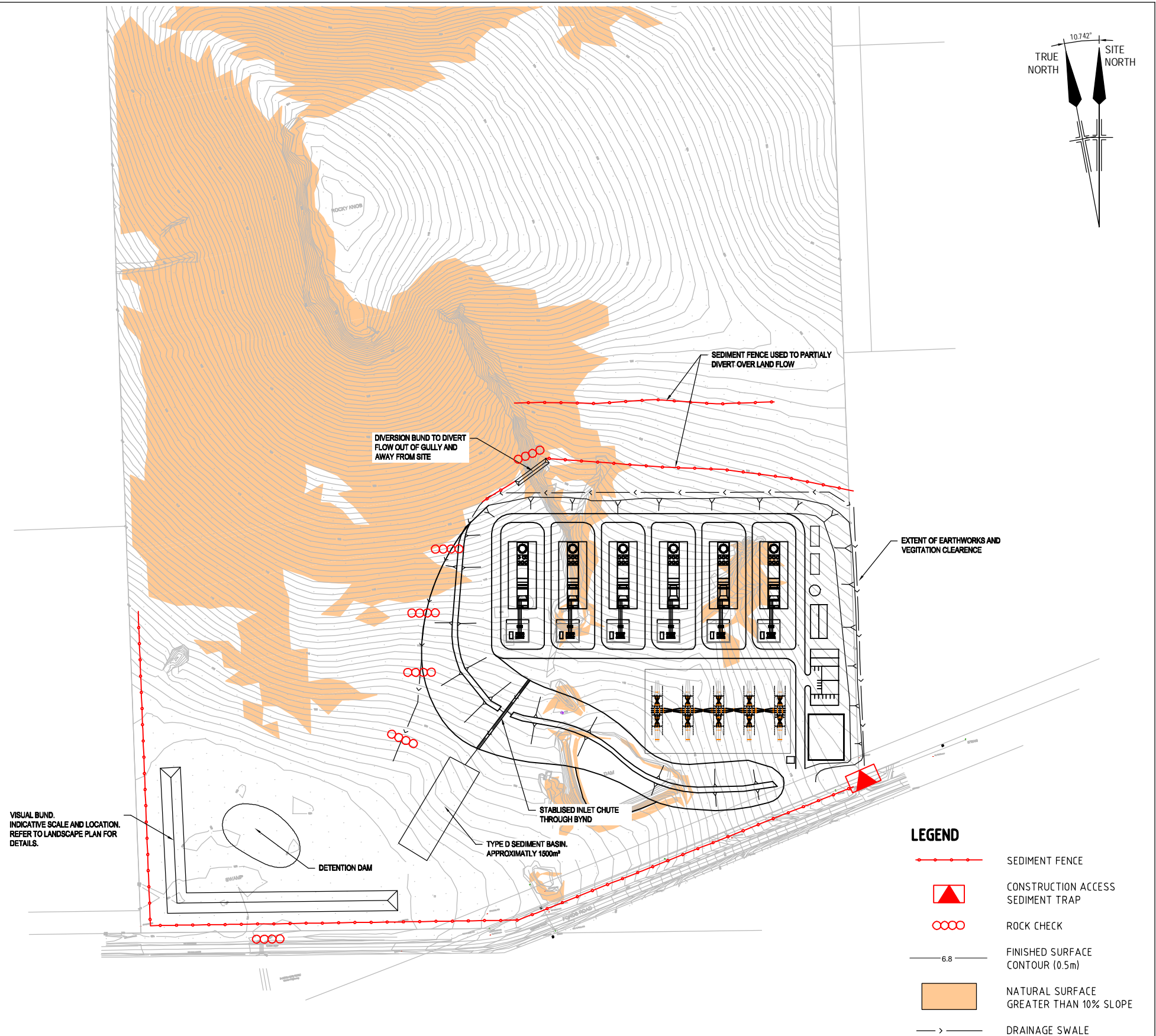
VEGETATION MANAGEMENT NOTES

1. GENERAL

- 1.1 NO CLEARING OF THE SITE IS TO COMMENCE UNTIL APPROVAL TO PROCEED HAS BEEN GIVEN BY THE SUPERINTENDENT.
- 1.2 ALL TREES TO BE REMOVED SHALL BE TAGGED AND INSPECTED FOR ANY SIGNS OF WILDLIFE. SHOULD ANY WILDLIFE BE IDENTIFIED THEN THE PROPONENT SHALL ORGANISE THE SAFE REMOVAL AND RELOCATION OF SUCH SPECIES TO AN APPROPRIATE LOCATION.
- 1.3 CARE IS TO BE TAKEN TO ENSURE THE OPERATION OF CONSTRUCTION EQUIPMENT DOES NOT DAMAGE TREES BEYOND THE LIMIT OF CLEARING. IF NECESSARY, TREE GUARDS ARE TO BE PLACED AROUND THE TREES TO PROTECT THEM. TUNNEL UNDER TREE ROOTS WHEREVER POSSIBLE DURING TRENCHING OPERATIONS. IN THE EVENT OF ROOT DAMAGE, MAKE A CLEAN CUT ABOVE THE SEVERED ROOT AND TREAT THE ROOT WITH A SUITABLE FUNGICIDE.
- 1.4 ALL SUITABLE VEGETATION MATERIAL SHALL BE PROCESSED THROUGH A MILLING MACHINE TO PRODUCE CHIP MULCH. UNSUITABLE MATERIAL SUCH AS ROOTS AND STUMPS SHALL BE DISPOSED OFF SITE. NO BURNING OF CLEARED MATERIAL IS ALLOWED. CHIP MULCH PRODUCED ON-SITE SHALL BE AGED AND LEACHED IN THE OPEN FOR AT LEAST ONE MONTH AFTER MILLING. CHIP MULCH SHALL BE FREE FROM WEEDS, STONES, SOIL AND OTHER CONTAMINATES. THE MAXIMUM SIZE OF CHIP SHALL FIT WITHIN A PRISM MEASURING 150mm x 100mm x 20mm.
OR
ALL VEGETATION IS TO BE DISPOSED OF IN A MANNER APPROVED BY THE SUPERINTENDENT.

2. REVEGETATION

- 2.1 REHABILITATION REQUIRED OF ALL DISTURBED AREAS. NOTE THAT AREAS OF EARTHWORKS AND TRENCHING ARE TO BE DECOMPACTED TO A DEPTH OF 250mm BY SCARIFYING.



LEGEND

- SEDIMENT FENCE
- CONSTRUCTION ACCESS SEDIMENT TRAP
- ROCK CHECK
- 6.8 FINISHED SURFACE CONTOUR (0.5m)
- NATURAL SURFACE GREATER THAN 10% SLOPE
- DRAINAGE SWALE

PRELIMINARY

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
A	ISSUED FOR CLIENT REVIEW		GHD			

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Project	WESTLINK POWERSTATION DEVELOPMENT ASSISTANCE
Title	EROSION AND SEDIMENT CONTROL PLAN
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		Name	Signature	Name	Signature	Date
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1	B. Anderson	D. Willis		P. Wootton		20/01/10

**APPENDIX 14: WESTLINK POWER PROJECT STORMWATER
MANAGEMENT PLAN**



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Westlink

Report for Westlink Post DA
Assistance

Stormwater Management Plan

February 2010

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1. Introduction

1.1 The Project

In response to rapidly growing demand for electricity, Westlink Pty Ltd (Westlink) is proposing a staged development of a natural gas-fired power station at a site north of Gatton in South-East Queensland, referred to as the Westlink Power Project (WPP).

The proposed WPP is to be located on a parcel of land near the township of Gatton; approximately 90 km west of Brisbane and approximately two kilometres north of Gatton, immediately north of the Warrego Highway on Fords Rd, Adare.

On the 4th of September 2009, Westlink lodged with the Lockyer Valley Regional Council (LVRC) a Development Application (DA) complete with a detailed Review of Environmental Factors (REF) for the WPP. Specifically, the DA is over Lot 191 on Crown Plan CSH2361 situated in the County of Cavendish, Parish of Lockyer contained in Certificate of Title, Title Reference 17000028 and is seeking a:

- Development Permit for a Material Change of Use (MCU) for the Electricity Generation Infrastructure;
- Development Permit for Environmentally Relevant Activity (ERA) No.14; and
- Development Permit for Operational Work (OW) for Vegetation Clearing.

The proposed use is more specifically defined as a natural gas-fired power station, consisting of the following elements:

- Staged installation of six open-cycle gas turbines;
- An electrical switchyard;
- A gas receiving unit;
- An operations building, workshop, administration building and car park; and
- Associated safety and monitoring equipment.

The proposed WPP is to be built in stages, in line with growing demand for electricity. Subject to development approval, the first stage of the project is expected to consist of 200 to 300 MW of generating capacity, with future expansion leading to a total project comprising up to 1,000 MW of open cycle gas turbines.

1.2 Purpose

The purpose of this Stormwater Management Plan is to provide a response to Lockyer Valley Regional Council (LVRC) and/or the Department of Environment and Resource Management (DERM) with information requested as part of this application process. This Management Plan specifically address request item no. 5 of the LVRC information request outlined in correspondence dated 9 October, 2009.

1.3 Information Requested

The following requests for information in relation to Stormwater Management have been received for the application and are addressed in this report as follows:

DERM Information Request - EPA (Project Reference Number 341117) Item 1(b)

Provide a Stormwater Management Plan in accordance with the DERM information sheet: "Information to be provided with an application for an environmentally relevant activity (ERA)".

Response:

This Stormwater Management Plan has been prepared generally in accordance with the aforementioned factsheet.

LVRC Information Request – Item 4 & 5 Stormwater Management Plan

Provide a preliminary Stormwater Management Plan which addresses the following issues:

- 1. Confirmation that peak flow mitigation shall be achieved at all ARI flow events (i.e. Q2, Q10, Q20, Q100) and outline the proposed method of achieving this;*
- 2. Outline the proposed method of meeting water quality objectives; and*
- 3. Identifies the legal point of discharge for stormwater runoff and demonstration that any flow concentration will not be detrimental to downstream property or public infrastructure.*

Response:

Responses to the above queries are as follows:

- 1. ARI peak flow events have been quantified in Section 3.2. Confirmation of how peak flow mitigation can be achieved for this development can be found in Section 3.2 of this report;*
- 2. Section 4.4 of this report outlines the way in which this development will meet industry standard quality objectives; and*
- 3. Section 3.3 of this report identifies a lawful point of discharge for stormwater runoff and Section 4.4 of this report outlines mitigation measures to achieve water quality which will prevent damage downstream property or public infrastructure.*

2. Review of Previous Work

Previous hydrological investigations were carried out as part of the Review of Environmental Factors (GHD 2009) for the WPP. These were:

- ▶ Existing environment – topography and climate;
- ▶ Groundwater – hydrogeological and geological environment, site hydrogeology, groundwater quality and aggressivity, groundwater mobility and surface water interaction, and groundwater recharge;
- ▶ Hydrology – regional flooding, flow monitoring gauges and regional water quality;
- ▶ Stormwater management – stormwater quantity, proposed drainage works and stormwater quality;
- ▶ Potential impacts and mitigation measures; and
- ▶ Ongoing monitoring

This report will use and build upon the information in the areas of hydrology and stormwater management to fulfil the information request made by LVRC to complete their Development Application. No additional information was sourced for this report.

3. Stormwater Quantity & Attenuation Requirements

The following objectives provide the basis for management of stormwater quantity on the site:

- ▶ There is no increase in peak flow rates post-development compared to pre-development peak flow rates;
- ▶ Reuse of water on site should be maximised by adopting rainwater tanks with first flush devices; and
- ▶ All stormwater that is discharged from the site (except during flood events) should be treated prior to release by filtration and/or infiltration.

Attenuation of peak flow rates can be achieved through the use of structures such as a detention basin. Infiltration trenches can be used to help manage surface runoff volumes.

Reuse of collected roof water can be performed by collecting water in tanks (above or below ground). Uses for this water include, but not limited to, toilet flushing and/or landscaping irrigation.

3.1 Hydrological Modelling

3.1.1 XP-RAFTS

Hydrologic modelling of the catchment was undertaken using the XP-RAFTS rainfall runoff routing model. RAFTS is based on the RSWM model developed by the Snowy Mountains Engineering Corporation (SMEC).

RAFTS is an industry standard rainfall runoff routing analysis package capable of modelling changes in development for both rural and urban sub-catchments.

RAFTS estimates the runoff hydrograph from an individual sub-catchment based on rainfall intensities and temporal patterns, and the definition of a series of parameters that describe the sub-catchment characteristics. These parameters include the sub-catchment area, slope, roughness and fraction of impervious area.

Sub-catchment outflow hydrographs are routed downstream through the model via links. In RAFTS, links take the form of either lag links or routing links. Lag links delay the hydrograph by a user specified time interval representing the time it takes for the flow to travel downstream to the next node. Routing links perform Muskingum-type channel routing calculations and require channel cross sectional dimensions and the slope, roughness and the length of the channel.

3.1.2 Rainfall data

Design Intensity Frequency Duration (IFD) rainfall data used for this study was calculated using methods described in Australian Rainfall and Runoff (AR&R, 1987). This IFD data was used in RAFTS to generate storm patterns for the system analyses. The IFD data is contained in Appendix A.

3.1.3 Design Storm Average Recurrence Intervals (ARI)

A range of ARIs were modelled for the investigation, these being;

- ▶ 2 year
- ▶ 5 year
- ▶ 10 year
- ▶ 20 year
- ▶ 50 year
- ▶ 100 year

Typically a detention basin is designed to a 100 year ARI design event; hence larger events were not modelled.

3.1.4 Design Storm Durations

Due to the size, extents, land use, and catchment slopes within the site, flows were simulated using a range of storm durations from 15 to 360 minutes in order to identify the critical stormwater flows at the outlet of the catchment.

3.1.5 Catchment Delineation

In establishing the hydrologic model for the existing scenario (pre-construction of the WPP), the site was treated as a single catchment. For the developed model (post-construction of the WPP) the site was divided into a number of sub-catchments as indicated in Appendix B. These sub-catchments were based on contour information obtained from a detailed site survey. The outlet of the catchment is in the south-west corner of the property.

3.1.6 Catchment and Hydrological Parameters

The following parameters were used in the RAFTS model.

Table 1 Catchment Parameters

Catchment ID	Area (ha)	Slope (%)	% Impervious ¹
A	8.17	1.80	0
B	0.96	3.37	0
C	8.07	1.00	100 ²

Catchment ID	Area (ha)	Slope (%)	% Impervious ¹
D	6.13	10.48	0
E	1.57	3.03	0
F	5.47	0.66	0

1. 0% impervious is equivalent to 100% pervious.

2. The power station pad has been assumed to be 100% impervious, however in the RAFTS model 70% has been adopted as the percentage impervious. Catchment storage is represented in the RAFTS model as a function of the fraction impervious. The fraction impervious in the model is assumed to be equivalent to 100% urbanised based a study of six catchments used to develop the catchment storage relationship. The RAFTS manual extrapolates the urbanised value to 100% for a 100% impervious area. However, adopting this relationship results in the available catchment storage reducing to approximately 10% of the pre-development storage, which is significantly lower than other similar models such as URBS (where the available catchment storage is reduced by around 25%). It was assumed that adopting 70% fraction impervious for the power station pad was a reasonable representation of catchment storage in this area.

Table 2 lists the adopted loss rates. For the impervious catchment C, an initial loss rate of 0 mm was used for all events.

Table 2 Loss Rates - WPP

Event ARI (years)	Initial Loss (IL) (mm)	Continuing Loss (CL) (mm/h)
2	40	2.5
5	20	2.5
10	10	2.5
20	5	2.5
50	0	2.5
100	0	2.5

A Manning's roughness coefficient (n) of 0.025 has been used for sub-catchments A, B, D, E and F, as this value represents grassed floodplains. For sub-catchment C a coefficient of 0.015 has been adopted. A lower roughness coefficient was chosen for the impervious area to account for the decrease in energy loss caused by the smoother properties of the flow surfaces.

3.2 Hydrological Model Results

3.2.1 Existing Conditions

The model was run for all nominated durations and ARI events mentioned previously. The maximum peak flow from the catchment for the nominated durations analysed are presented in Table 3.

Table 3 Peak Discharges – Existing Conditions

Catchment ID	Peak Discharge @ Outlet (m ³ /s)					
	2 year	5 year	10 year	20 year	50 year	100 year
Exist	0.76	3.20	5.35	7.67	9.32	10.73

The critical durations for the above events are given in Table 4.

Table 4 Critical Duration

Design Event ARI (years)	Critical Duration (hr)
2	4.5
5	1
10	1
20	1
50	1
100	1

3.2.2 Developed Conditions

Table 5 contains the results of the developed model.

Table 5 Peak Discharges – Developed Model

Catchment ID	Peak Discharge (m ³ /s)					
	2 year	5 year	10 year	20 year	50 year	100 year
A	0	0.91	1.49	2.13	2.57	2.95
B	0	0.19	0.29	0.38	0.43	0.50
C	2.77	3.20	3.60	4.19	4.66	5.26

Catchment ID	Peak Discharge (m ³ /s)					
	2 year	5 year	10 year	20 year	50 year	100 year
D	0	1.88	3.12	4.33	5.15	5.90
E	0	0.45	0.73	0.98	1.13	1.29
F (outlet)	2.77	4.71	7.56	9.93	11.58	13.25

The critical durations for the above events under developed conditions have remained unchanged from those in Table 4, except for the 2 year ARI design event where it has reduced to a 15 minute event.

3.2.3 Attenuation Requirements

When a comparison is made between the existing and developed peak discharges, it can be seen that the construction of the power station increases the peak discharge from the site. These increases are tabulated in Table 6.

Table 6 Change in Peak Discharge – Existing Vs Developed

Design Event ARI (years)	Change in Peak Discharge (m ³ /s)
2	+2.01
5	+1.51
10	+2.21
20	+2.26
50	+2.26
100	+2.52

To reduce these developed discharges to equal or less than those pre-development, a detention basin is required to attenuate the developed flows. Preliminary design of the detention basin is based on the following criteria (QUDM 2007):

- ▶ The low flow outlet should be designed so that the 5 year ARI design event can easily pass without great restriction;
- ▶ The maximum water depth for a 20 year ARI design event shall be equal or less than 1.2 m deep; and
- ▶ The spillway should have capacity to pass a 100 year ARI design event, should the low flow outlet become partially or fully blocked.

3.2.4 Developed Conditions with Detention Basin

Preliminary design of a detention basin has yielded the following parameters

- ▶ 13 ML (~1.8x85x85 m) basin consisting of:
 - 2x 750 mm diameter reinforced concrete pipe at the invert of the basin
 - A spillway 1 m above the invert, 10 m wide with 10H:1V side slopes
 - A total height of 1.8 m, including 300 mm freeboard

This is a preliminary design and has potential for further refinement in the detailed design stage.

The routing results of the above specified detention basin are given in Table 7.

Table 7 Peak Discharges – Developed Model with Detention Basin

Catchment ID	Peak Discharge (m ³ /s)					
	2 year	5 year	10 year	20 year	50 year	100 year
Outlet (D/S of F)	0.23	1.5	2.9	5.3	7.5	9.0

The discharges exiting the basin are less than the existing discharges and displays that the designed basin is acceptable for reducing the developed (increased) discharges from the site.

3.3 Lawful Point of Discharge

The Queensland Urban Drainage Manual (QUDM, 2007) states that a lawful point of discharge exists if the following criteria are not met:

1. That the location of the discharge is under the lawful control of the local government or other statutory authority from whom permission to discharge has been received. This will include park, drainage or road reserve, stormwater drainage easement.
2. That in discharging in that location, the discharge will not cause an actionable nuisance (i.e. a nuisance for which the current or some future neighbouring proprietor may bring an action or claim for damages (arising out of the nuisance)). In general terms this implies no worsening as a result of the discharge.

The WPP meets the above criteria and consequently does not have a lawful point of discharge. Runoff from the site drains into a road reserve and into existing stormwater

infrastructure created for that road. In addition it has been shown that using a detention basin will attenuate the flow so that it is no worse than the pre-development discharge.

4. Stormwater Quality Assessment

4.1 Overview

Industrial and urban development increases stormwater pollutant and hydraulic loads primarily due to the increase in impervious areas associated with roads, buildings, car parks and pathways. These surfaces accumulate a range of pollutants during dry periods and transport them rapidly to receiving waters during rainfall events. As a result, there is potential for stormwater pollutant loads to be significantly higher as a consequence of development, which can cause adverse impacts on downstream water bodies and ecosystems unless appropriate mitigation measures are implemented.

Studies suggest that pollutant loads delivered to receiving waters from minor rainfall events (less than the 3 month ARI) constitute in excess of 90% of the average annual volume of stormwater discharge (Wong, 1997 cited in Austroads, 2003). Urban pollutants accumulate during dry weather and are successively washed off by the initial rainfall on urban surfaces. Thus by providing water quality treatment measures for these minor events, a significant portion of the annual load can be captured and treated.

4.2 Stormwater Quality Objectives

As there were no Water Quality Objectives (WQOs) available from LVRC, the following WQOs have been adopted from the Queensland Water Quality Guidelines (QWQG, 2009). Table 8 contains the construction phase objectives and Table 9 contains the post-construction objectives.

Table 8 Construction Phase Design Objectives

Pollutant/Issue	Stormwater Design Objectives
Coarse sediment	Retain coarse sediment onsite
Fine sediment (Total Suspended Solids – TSS)	Take all reasonable and practicable measures to collect all runoff from disturbed areas and drain to a sediment basin—up to the design storm event. Site discharge during sediment basin dewatering complies with a TSS concentration less than 50 mg/L up to the design event—flocculation as required. In storms greater than the design event take all other reasonable and practicable measures to minimize erosion and sediment export.
Turbidity	Released waters from the approved discharge point(s) have turbidity (NTU) less than 10% above receiving waters turbidity - measured immediately upstream of the site.

Pollutant/Issue	Stormwater Design Objectives
Nutrients (N and P)	Manage through sediment control.
pH	Acceptable site discharge pH range 6.5 to 8.5.
Litter or other waste	Prevent litter/waste entering the site or the stormwater system or internal watercourses that discharge from the site—minimise on-site production, contain onsite and regularly clear bins.
Hydrocarbons and other contaminants	Prevent from entering the stormwater system or internal watercourses that discharge from the site - control storage, limit application and contain contaminants at source. Waste containing contaminants must be disposed of at authorised facilities. Store oil and fuel in accordance with Australian Standard AS1940—no visible oil or grease sheen on released waters.
Wash down water	Prevent from entering the stormwater system or internal watercourses that discharge from the site.
Cations and anions	As required under an approved Acid Sulfate Soil Management Plan, including aluminium, iron and sulfate.

For further information regarding construction phase water quality objectives, please refer to Section 5 of the Erosion Management Plan located on Appendix 9 of the Information Request Response Document.

Table 9 Post Construction Phase Design Objectives

Pollutant	Minimum reductions in mean annual loads from unmitigated development (%)
Suspended Solids (TSS)	80
Total Phosphorous	60
Total Nitrogen	45
Gross Pollutants >5 mm	80

4.3 Pollutant Sources

Table 10 outlines the typical pollutants and sources produced by industrial activities.

Table 10 Pollutants of Concern

Pollutant	Roof	Hardstand	Car park / Access
Litter	N	Y	Y
Sediment	N	Y	Y
BOD	N	N	N
Nutrients (N and P)	Y	N	N
Pathogens - faecal coliform	N	N	N
Hydrocarbons (incl. oil and grease)	N	Y	Y
Heavy Metals	N	Y	Y
Surfactants	N	N	N
Organochlorins / organophosphates	N	N	N
Thermal pollution	N	Y	Y
pH altering substances	N	N	N

Therefore the key indicators to be evaluated are:

- ▶ Litter;
- ▶ Sediments (Suspended Solids);
- ▶ Nutrients (Total Nitrogen and Total Phosphorus);
- ▶ Hydrocarbons (Oils and greases);
- ▶ Heavy Metals; and
- ▶ Thermal Pollution..

4.4 Stormwater Quality Treatment Options

The stormwater treatment train (hierarchy of treatment devices) has been selected based on the constraints, opportunities, likely pollutants, and pollutant sources, of the site. The QWQG (2009) state that the objectives outlined in Table 9 are expected to be exceeded by an appropriately sequenced treatment train. The following stormwater treatment devices are proposed for the site:

- ▶ Rainwater tanks (or equivalent) with treated first flush devices;
- ▶ Solid pollutant filter (in-pit);
- ▶ Sand Filters;
- ▶ Car park rain gardens/Bio-retention swales;

- ▶ Gross pollutant traps.

4.4.1 Rainwater tanks (or equivalent) with first flush treatment

To improve the effectiveness of potential Stormwater Quality Improvement Devices (SQIDs) by reducing their hydraulic load and reduce potable water consumption it is recommended that all roofs be fitted with rainwater tanks. Stormwater collected from the roofs of the buildings can be stored within underground or above ground tanks and reused for toilet flushing and vehicle wash down facilities. These tanks could be located underground to minimise the area required for installation and be designed so that potable water top up would maintain a continuous supply of water when the tank empties. The use of stormwater tanks provide an effective way of diverting “clean” stormwater away from the other SQIDs reducing their hydraulic load and potentially improving their effectiveness to treat stormwater from the more polluted areas of the development.

Rainwater tanks are an excellent first line SQID as well as allowing for water re-use in situations that use water for wash down areas, irrigation and toilet flushing. It is important to firstly treat the first flush from roofed areas to prevent pollutants from entering the tank system and comprising their operation due to clogging and blockage. Diverted first flush water should be treated (sand filter box or equivalent) and subsequently discharged to the main stormwater system.

4.4.2 Solid pollutant filter (in-pit)

The in-pit pollutant filters have the capacity to remove both coarse and fine sediment, and gross pollutants thereby reducing the pollutant loading to the downstream system and should be inserted into each stormwater pit.

4.4.3 Sand Filters

Sand filters operate in a similar manner to bio-retention system with the stormwater runoff passing through filter media.

Typically sand filters consist of three chambers; sedimentation chamber that traps gross pollutants and allows sedimentation. The second chamber is a filter chamber, which removes finer sediments by allowing the stormwater runoff to percolate through a filter media. The third is a discharge chamber, this functions as a bypass system by conveying stormwater runoff to the downstream drainage when the water levels in the sedimentation and sand filter chambers exceed the extended detention depth. The treated runoff from the filter media is collected in the underdrain and discharged to the legal point to the stormwater system. Figure 1 shows a typical cross-section of a sand filter.

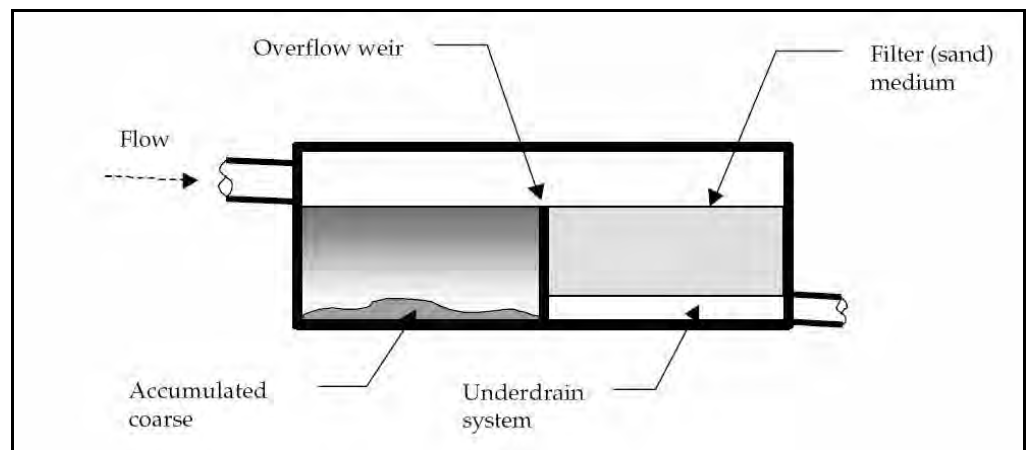


Figure 1 Typical section of a sand filter

Source: Managing Urban Stormwater: Treatment Techniques, November 1997

4.4.4 Car park rain gardens/Bio-retention swales

Bio-retention uses a soil matrix to act as a filter to remove fine and medium sediment and the attached pollutants. The soil matrix also provides a media for the attachment of micro-organisms and plants to assimilate dissolved pollutants such as metals and nutrients. The size of a bio-retention area is normally designed to contain the volume of runoff from the catchment for the 3-month critical storm, which represents over 90% of rainfall events. The volume of stormwater is contained in the soil voids as well as a temporary storage zone above the bio-retention area. Discharges from the bio-retention will be either into the underlying aquifer through the natural sandy soils or through a sub-soil pipe that collects stormwater and conveys it to the stormwater pits.

Infiltration through the bio-retention media is controlled so the residence time of stormwater within the system can be maintained. This can be controlled through either engineering the soil or utilising orifice plates and subsoil lines to collect the filtrate. The infiltration rates should be configured to drain the bio-retention over a period of 24 to 48 hours. The recommended planting within the bio-retention area is either turf or rock and the selection of planting can either delineate the bio-retention area or blend it with

the surrounding verges. The proposed development is to include car park bio-retention swales and a standard pit and pipe drainage system. With the inclusion of breakouts in the car park kerb line, low flows are directed over the surface of the bio-retention area while higher flows are directed to the piped stormwater system. Bio-retention has excellent nutrient removal treatment efficiencies Figure 2 shows a typical cross-section of a Bio-retention device.

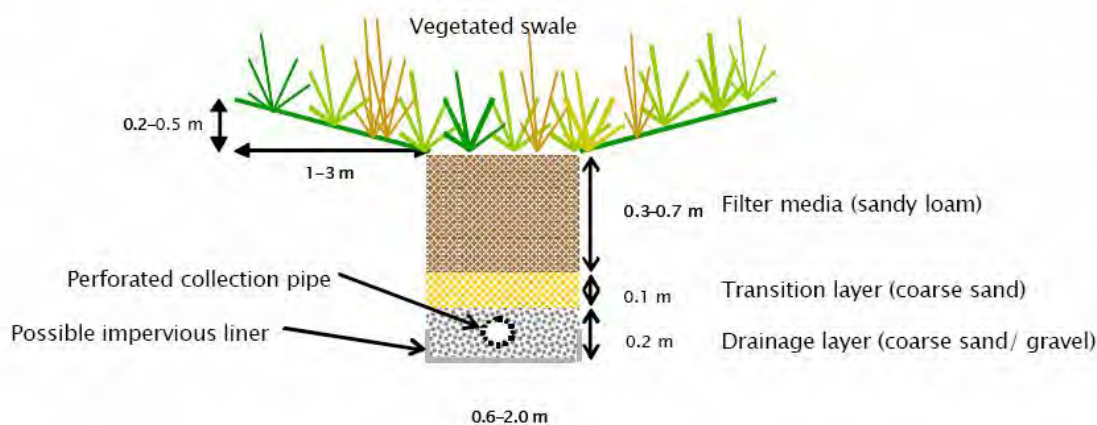


Figure 2 Typical section of a Bio-retention system

Source: Brisbane City Council: Draft Water Sensitive Urban Design Engineering Guidelines, August 2005

4.4.5 Gross pollutant traps

Gross Pollutant Traps (GPT's) remove litter and coarse to medium sediments. Some GPT's can also remove oils and greases.

4.5 Maintenance and Monitoring Requirements

The routine maintenance of the proposed infrastructure is required to minimise the potential for untreated stormwater discharging from the site. Maintenance requirements for the proposed stormwater management of the site are detailed in the following sections.

4.6 Rainwater Stormwater Treatment

Roof water from the development will be discharged into the underground tank fitted with a first flush system. The units should be maintained in accordance with the manufacturer's requirement.

4.7 Bio-retention Swales

Proper maintenance of bio-retention devices is critical in ensuring that filtering capacity of the system will not be reduced. This will be primarily achieved by maintaining complete vegetation covering of the soil throughout the length or area of the system,

and prevent conduct of activities that could compact the soil and limit the infiltration rate of water through it. Other maintenance works will include:

- ▶ Watering, replanting and weeding to maintain vegetation cover especially during establishment;
- ▶ Removal of litter and debris removal;
- ▶ Routine inspection of inlet point, surcharge pits and field inlet pits;
- ▶ Routine inspection and repairing any damage to the profile;
- ▶ Removal and management of invasive plants;
- ▶ Inspection after all storm events to verify that they are working as intended.
- ▶ Removal of dead vegetation and replaced with plants of equivalent size and species;
- ▶ Checking for channelling or erosion; and
- ▶ Monitoring of ponding areas in the filter material.

4.8 Sand Filters

Sand filters must be designed to provide adequate access for inspection and maintenance. To determine the required cleaning frequency, regular filter inspections are necessary to check for signs of blockages. The following maintenance activities might be required for sand filters:

- ▶ Routine removal of collected sediments;
- ▶ Drying of sediments may be require before disposal;
- ▶ Sand filter media may required removal of vegetation;
- ▶ The sand filters should be inspected after all storm events to verify that they are working as intended.
- ▶ The filter surface could be regularly raked to remove sediment and to break up any crusts; and
- ▶ When necessary the top layer of the filter media can be removed and replaced.

Maintenance works will be the responsibility of the property owners and will be undertaken on a regular basis. The maintenance of treatment trains will form part of the developer's maintenance program for the site.

4.9 In-Pit Pollutant Baskets

In-pit pollutant baskets should be checked regularly at initial development stage, as there are higher levels of sediment and litter loads due to significant disturbance and the nature of the site construction. The units should be checked at monthly intervals and immediately after significant rain event. Once the construction phase is completed routine maintenance should be subject to the manufacturer's guidelines. It is important that the in-pit basket unit be maintained accordingly to minimise the incidence of failure

due to debris reducing the effectiveness of the system. Utilising a maintenance log will assist in providing long term maintenance requirements.

4.10 GPTs

The GPTs should be checked regularly at initial development stage, as there are higher levels of sediment and litter loads due to significant disturbance and the nature of the site construction. The unit should be checked at monthly intervals and immediately after significant rain event. Once the construction phase is completed routine maintenance should be subject to the manufacturer’s guidelines. It is important that the GPT unit be maintained accordingly to minimise the incidence of failure due to debris reducing the effectiveness of the system. Utilising a maintenance log will assist in providing long term maintenance requirements.

4.11 Maintenance Frequency

The proposed maintenance frequency for the proposed treatment devices is detailed in Table 11. This table is provided as guide and should be updated as more detailed performance information from the site is obtained through the maintenance log.

Table 11 Stormwater Maintenance Frequency

Element	Inspection Frequency	Maintenance Frequency	Maintenance Activities
GPT	Monthly After every major runoff event.	During Inspection or when litter sump is full	Remove captured pollutant and dispose in an appropriate manner.
In-pit baskets	Monthly After every major runoff event.	During Inspection or when litter sump is full	Remove captured pollutant and dispose in an appropriate manner.

Element	Inspection Frequency	Maintenance Frequency	Maintenance Activities
Sand Filters	Monthly After every major runoff event.	During Inspection or when inlet chamber is full	<p>Routine removal of collected sediments; Drying of sediments may be require before disposal; Sand filter media may required removal of vegetation; The sand filters should be inspected after all storm events to verify that they are working as intended. The filter surface could be regularly raked to remove sediment and to break up any crusts; and When necessary the top layer of the filter media can be removed and replaced.</p>
Bio-retention	Monthly After every major runoff event.	Water ponding for over 24 hours after a storm event.	<p>Watering, replanting and weeding to maintain vegetation cover especially during establishment; Removal of litter and debris removal; Routine inspection of inlet point, surcharge pits and field inlet pits; Routine inspection and repairing any damage to the profile; Removal and management of invasive plants; Inspection after all storm events to verify that they are working as intended. Removal of dead vegetation and replaced with plants of equivalent size and species; Checking for channelling or erosion; and Monitoring of ponding areas in the filter material.</p>

4.11.1 Maintenance Record

A record of all maintenance checks for all stormwater controls onsite and should be kept to evolve an appropriate maintenance routine. The maintenance record will also provide verification that maintenance procedures are being carried out and the maintenance report should include details of the following;

- ▶ The date of maintenance;
- ▶ The name of the persons performing the maintenance;

- ▶ Type of maintenance actions performed for each water quality device; and
The state of the device including an estimate of the type and weight of litter removed and the amount of sediment captured where appropriate.

5. Conclusions

5.1 Stormwater Quantity

Using RAFTS rainfall runoff routing software, it has been found that there is an increase in peak discharge from the site as a result of construction of the power station. However this increase can be rectified by using a detention basin to attenuate the flow. Preliminary design parameters of a suitable basin are given in Section 3.2.4. The resulting effect of such a detention basin has shown that the outflow will not be detrimental to downstream properties or infrastructure.

5.2 Stormwater Quality

As a result of the WPP, there will be an increase in pollutants produced at the site from various sources. It is recommended that runoff be treated using a treatment train, including the measures below:

- ▶ Rainwater tanks (or equivalent) with treated first flush devices;
- ▶ Solid pollutant filter (in-pit);
- ▶ Sand Filters;
- ▶ Car park rain gardens /Bio-retention swales;
- ▶ Gross pollutant traps.

6. References

Department of Natural Resources and Water, *Queensland Urban Drainage Manual* 2007.

Department of Environment and Resource Management, *Queensland Water Quality Guidelines*, 2009.

NSW Environmental Protection Authority, *Managing Urban Stormwater – Treatment techniques*, 1997.

Appendix A
IFD Table

Rainfall Intensity-Frequency-Duration Calculation to AR&R

Program : IFD.xls
 Version : 3.0

Data

Location : **Gatton, QLD**






1 HR DUR 2 ARI	41.50	mm/hr
12 HR DUR 2 ARI	6.90	mm/hr
72 HR DUR 2 ARI	1.70	mm/hr
1 HR DUR 50 ARI	76.00	mm/hr
12 HR DUR 50 ARI	12.00	mm/hr
72 HR DUR 50 ARI	3.40	mm/hr
G (skewness)	0.30	mm/hr
F2 Geo factor 2 ARI	4.36	
F50 Geo factor 50 ARI	17.00	

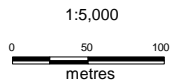
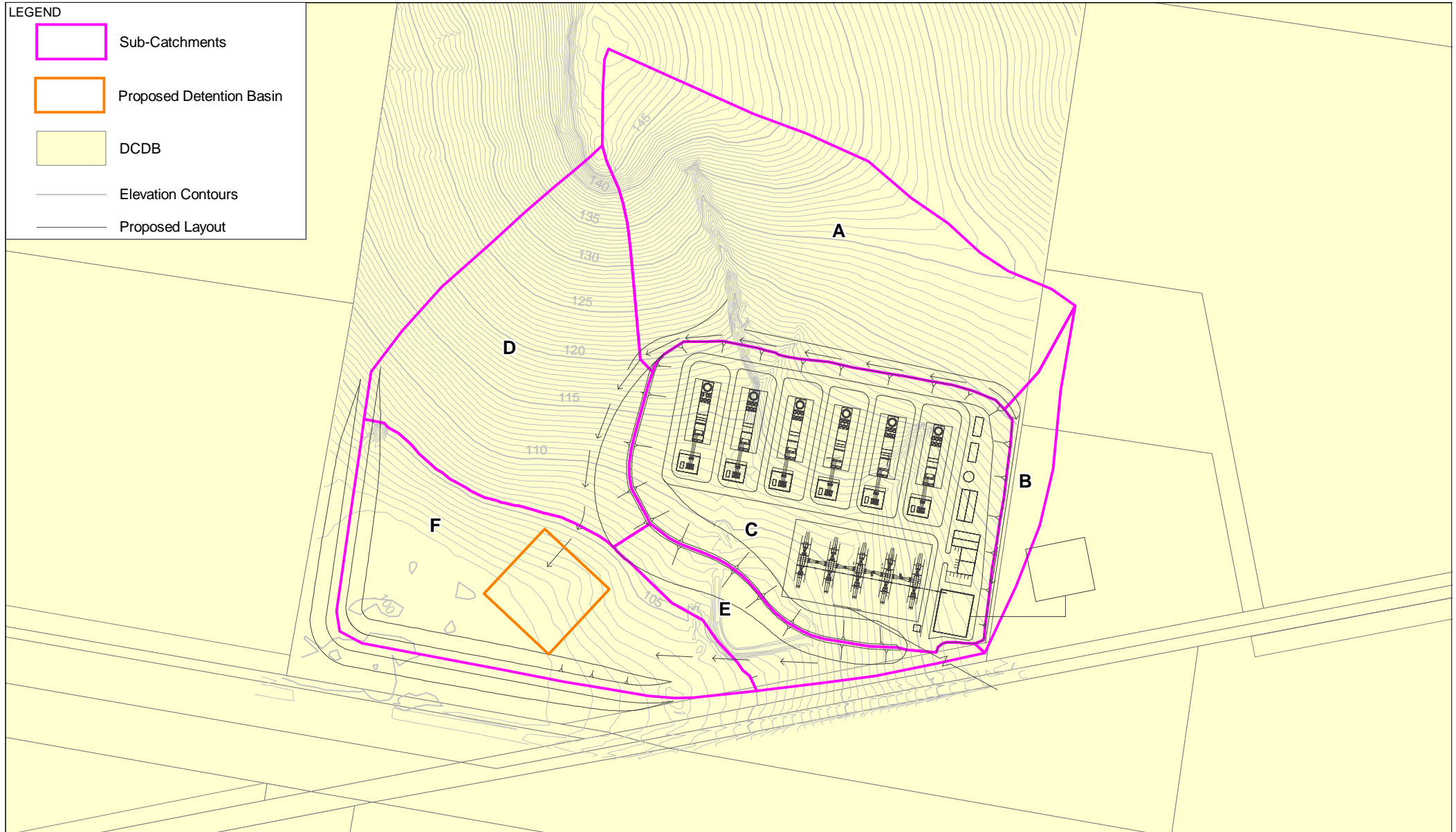
Duration		Design Rainfalls for Average Recurrence Intervals								
(min)	(hr)	1 Year (mm/hr)	2 Years (mm/hr)	5 Years (mm/hr)	10 Years (mm/hr)	20 Years (mm/hr)	50 Years (mm/hr)	100 Years (mm/hr)	200 Years (mm/hr)	500 Years (mm/hr)
5	0.083	101.3	130.5	165.4	187.1	216.8	257.6	289.9	324.0	371.9
6	0.100	95.0	122.5	155.1	175.5	203.4	241.7	272.0	304.0	348.9
7	0.117	89.7	115.7	146.5	165.8	192.1	228.2	256.9	287.1	329.5
8	0.133	85.2	109.9	139.2	157.4	182.5	216.8	244.0	272.7	312.9
9	0.150	81.3	104.8	132.8	150.2	174.1	206.8	232.7	260.1	298.5
10	0.167	77.9	100.4	127.1	143.8	166.7	198.0	222.9	249.1	285.8
11	0.183	74.8	96.4	122.1	138.1	160.1	190.2	214.1	239.2	274.5
12	0.200	72.0	92.9	117.6	133.1	154.2	183.2	206.2	230.4	264.4
13	0.217	69.5	89.6	113.5	128.4	148.8	176.8	199.0	222.4	255.2
14	0.233	67.3	86.7	109.8	124.2	144.0	171.0	192.5	215.1	246.9
15	0.250	65.2	84.0	106.4	120.4	139.5	165.7	186.5	208.4	239.2
16	0.267	63.3	81.5	103.3	116.8	135.4	160.8	181.0	202.3	232.1
17	0.283	61.5	79.3	100.4	113.5	131.6	156.3	175.9	196.6	225.6
18	0.300	59.8	77.1	97.7	110.5	128.1	152.1	171.2	191.3	219.5
20	0.333	56.9	73.3	92.8	105.0	121.7	144.6	162.7	181.8	208.6
25	0.417	50.9	65.6	83.0	93.9	108.9	129.3	145.5	162.6	186.6
30	0.500	46.3	59.7	75.6	85.5	99.1	117.7	132.4	148.0	169.8
35	0.583	42.7	55.0	69.6	78.8	91.3	108.4	122.0	136.3	156.4
40	0.667	39.7	51.2	64.8	73.3	84.9	100.8	113.5	126.8	145.5
45	0.750	37.2	47.9	60.7	68.7	79.6	94.5	106.3	118.8	136.4
50	0.833	35.1	45.2	57.2	64.7	75.0	89.1	100.3	112.1	128.6
55	0.917	33.2	42.8	54.2	61.4	71.1	84.4	95.0	106.2	121.8
60	1.00	31.6	40.8	51.6	58.4	67.7	80.4	90.4	101.1	115.9
75	1.25	27.1	34.9	44.1	49.8	57.7	68.4	76.9	85.9	98.5
90	1.5	23.8	30.7	38.7	43.7	50.5	59.9	67.3	75.1	86.1
120	2	19.4	24.9	31.4	35.4	40.9	48.4	54.4	60.6	69.3
180	3	14.5	18.6	23.3	26.2	30.3	35.7	40.1	44.6	51.0
240	4	11.8	15.1	18.9	21.2	24.4	28.8	32.2	35.9	40.9
300	5	10.0	12.8	16.0	17.9	20.7	24.3	27.2	30.3	34.5
360	6	8.8	11.2	14.0	15.7	18.0	21.2	23.7	26.4	30.1
480	8	7.1	9.1	11.3	12.7	14.6	17.1	19.1	21.2	24.2
540	9	6.5	8.4	10.4	11.6	13.3	15.7	17.5	19.4	22.1
600	10	6.1	7.7	9.6	10.7	12.3	14.5	16.2	17.9	20.4
720	12	5.3	6.8	8.4	9.4	10.8	12.6	14.1	15.6	17.8
810	13.5	4.9	6.2	7.7	8.7	10.0	11.7	13.1	14.5	16.5
900	15	4.5	5.8	7.2	8.1	9.3	10.9	12.2	13.6	15.5
1,080	18	3.9	5.0	6.3	7.1	8.2	9.7	10.9	12.1	13.8
1,440	24	3.2	4.1	5.1	5.8	6.7	8.0	9.0	10.1	11.5
2,160	36	2.3	3.0	3.8	4.3	5.1	6.1	6.9	7.7	8.9
2,880	48	1.8	2.4	3.1	3.5	4.1	4.9	5.6	6.3	7.3
4,320	72	1.3	1.7	2.2	2.5	3.0	3.6	4.1	4.7	5.5

Note: Values for 200 and 500 yearARI are approximate only and does not conform to Book 6 of AR&R (1999)

Appendix B
Catchment Map

LEGEND

-  Sub-Catchments
-  Proposed Detention Basin
-  DCDB
-  Elevation Contours
-  Proposed Layout



Map Projection: Universal Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia 1994
 Grid: Map Grid Of Australia, Zone 56



Westlink Pty Ltd.
 Westlink Power Project

Job Number | 41-22282
 Revision | A
 Date | 18 Dec 2009

Catchment Delineation

Figure 1

GHD

1-3 Annand Street Toowoomba QLD 4350 Australia
PO Box 1642 Toowoomba Qld 4350 Australia
T: (07) 4633 8000 F: (07) 4613 1687 E: tbamail@ghd.com.au

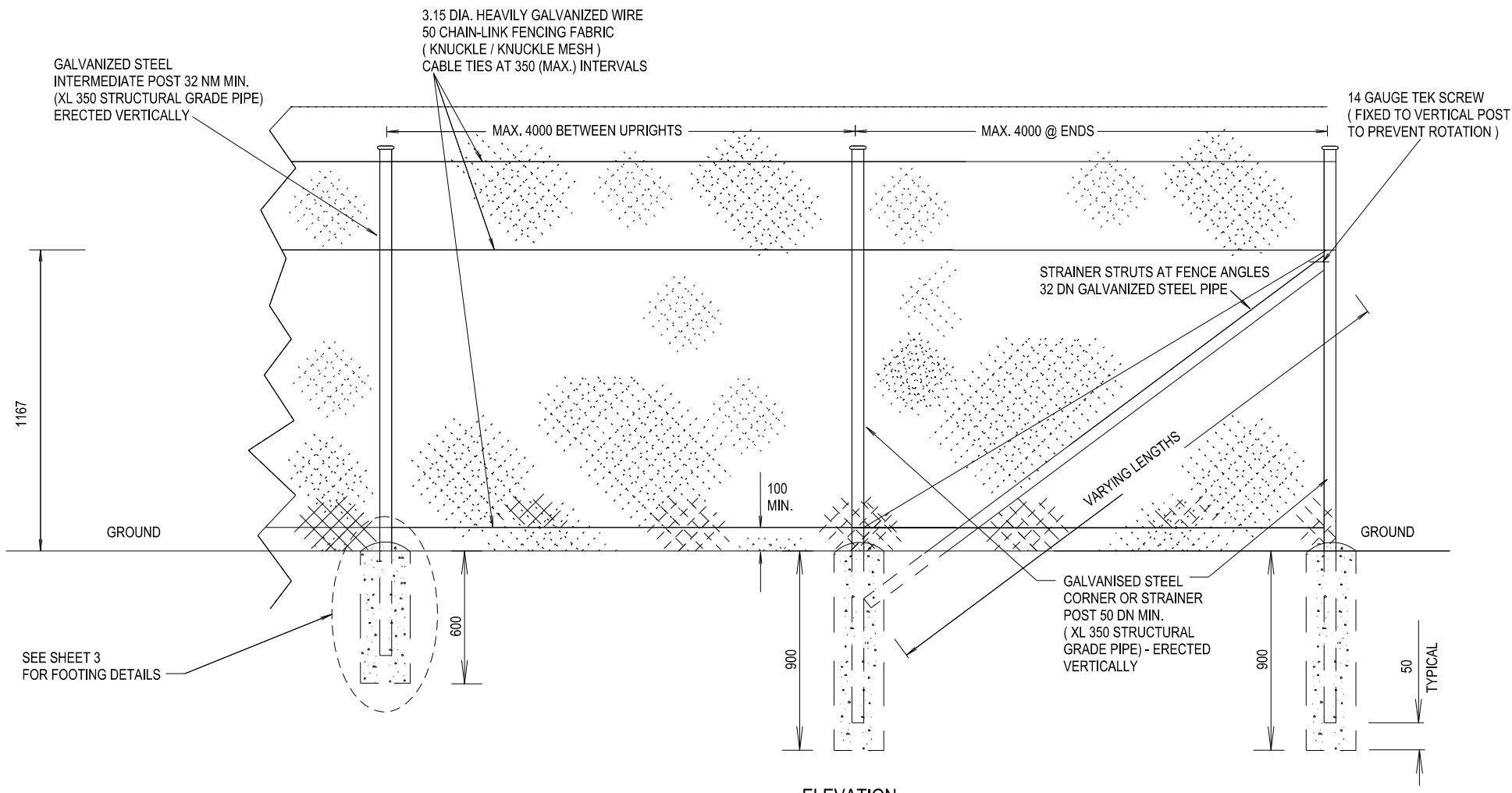
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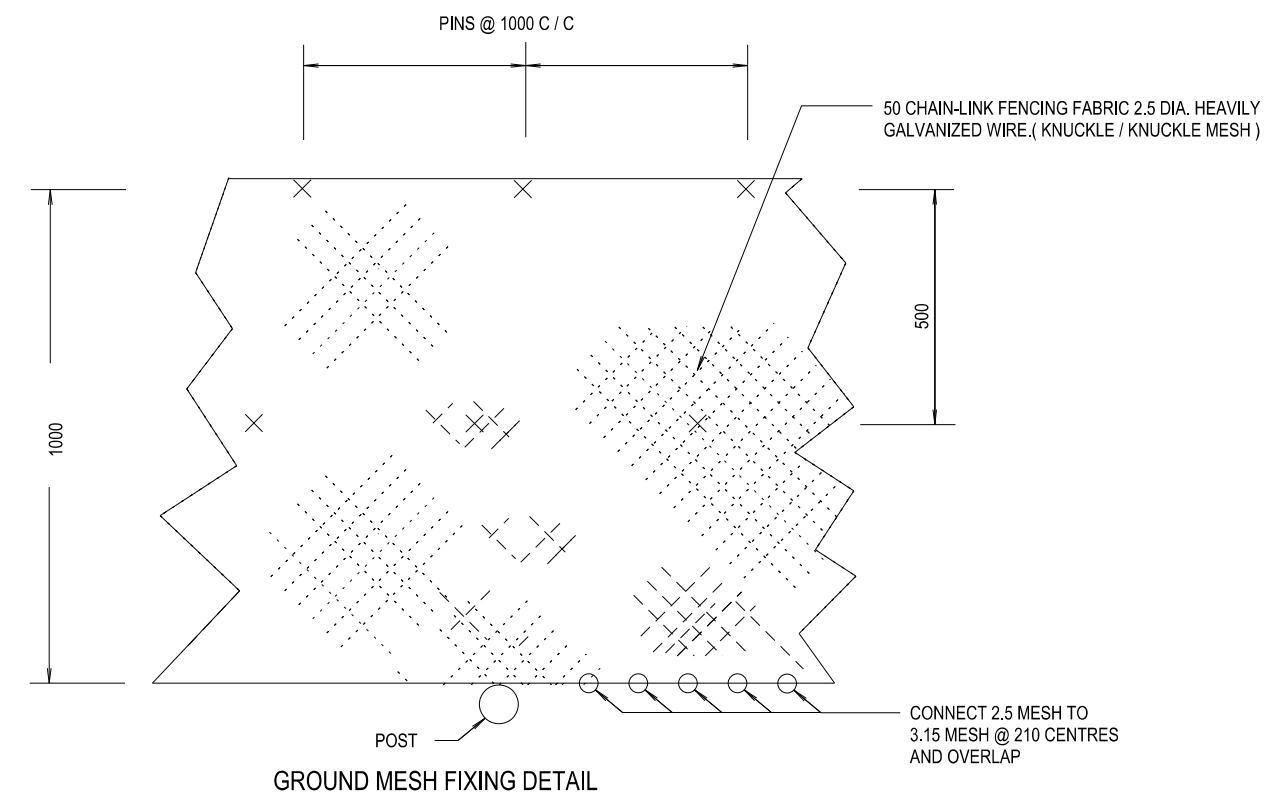
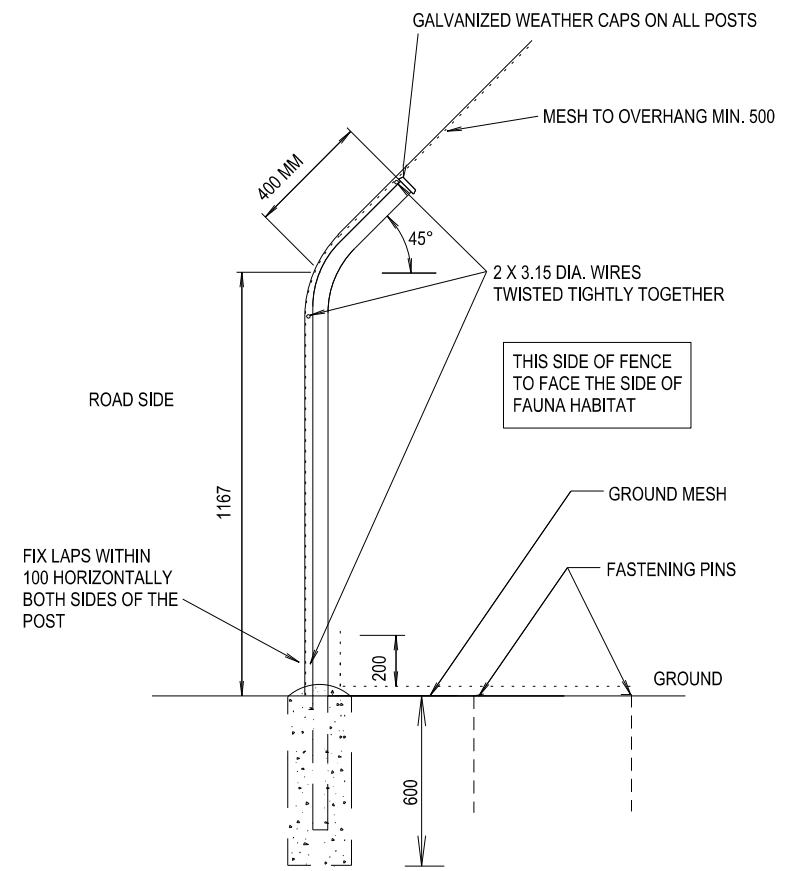
Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	P. Muir	A. Hallgarth		P. Wootton		24/01/09
B	P. Muir	A. Hallgarth		P. Wootton		29/01/10

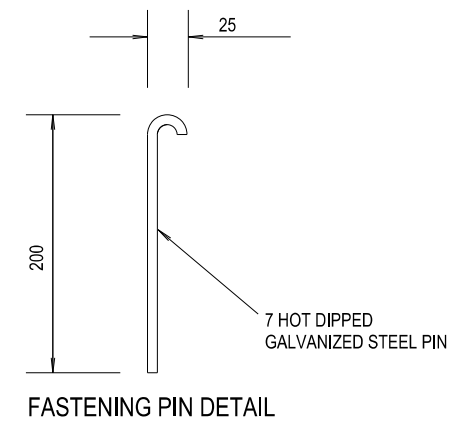
**APPENDIX 15: ROADS AND TRAFFIC AUTHORITY STANDARD
DRAWING**



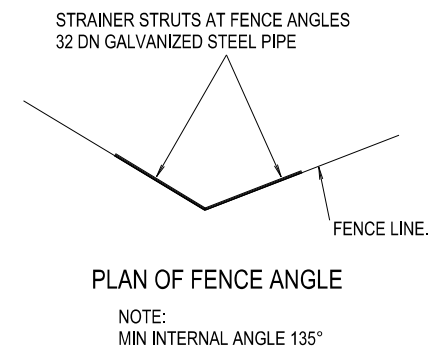
ELEVATION



GROUND MESH FIXING DETAIL



NOTE:
FOR LOOSE OR SANDY SOILS 350 (MIN.)
GALVANISED FASTENING PINS MUST BE USED.



PLAN OF FENCE ANGLE
NOTE:
MIN INTERNAL ANGLE 135°

NOTES
SPECIAL REQUIREMENTS MAY APPLY TO THE ERECTION PROCEDURES FOR FENCES INSTALLED NEAR HIGH VOLTAGE TRANSMISSION LINES. THE RELEVANT ELECTRICITY AUTHORITY SHOULD BE CONTACTED PRIOR TO THE INSTALLATION OF THE FENCE.

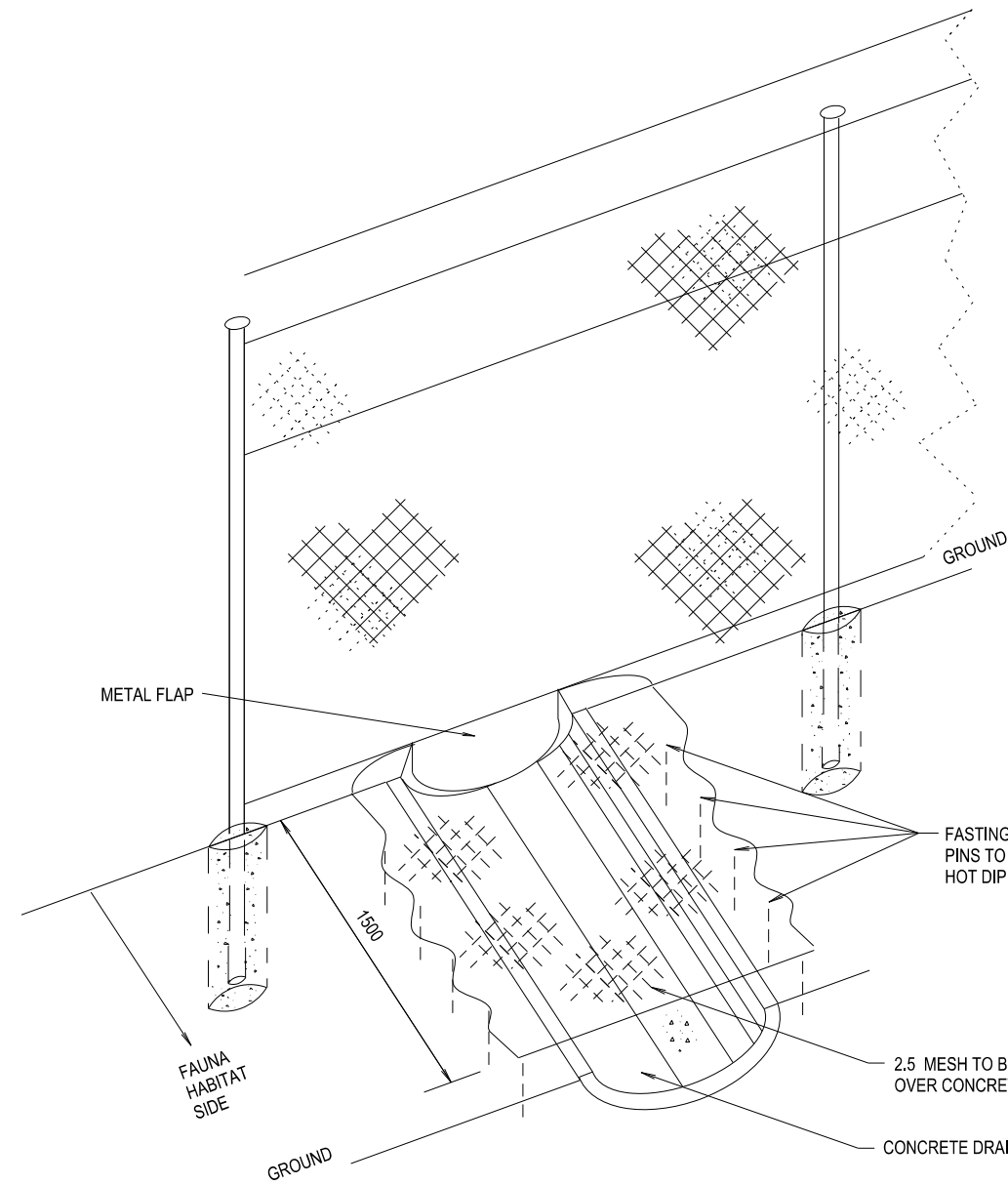
THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL

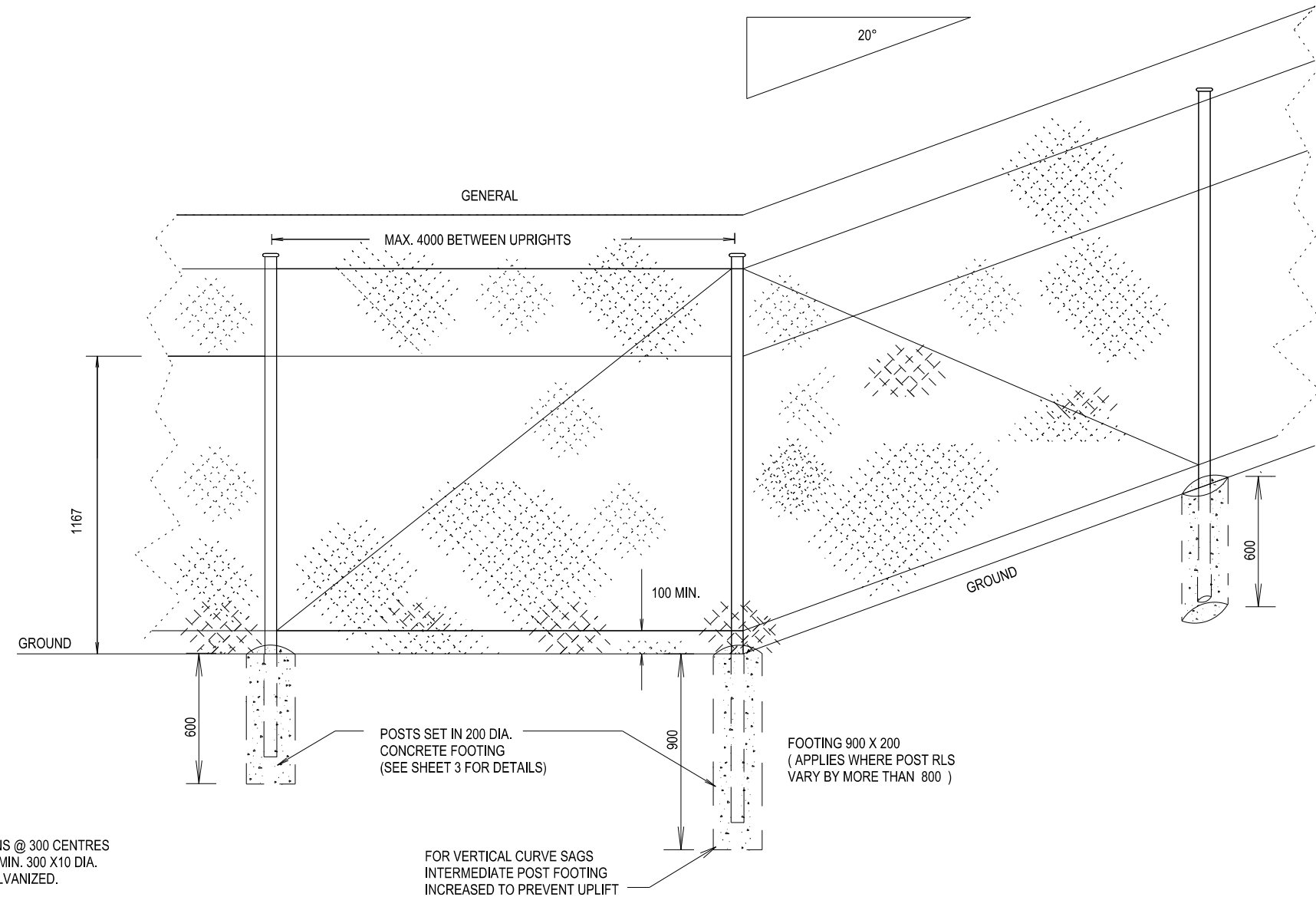
QR CODE		SCAN TO CHECK DOCUMENT VER.		REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN		ISSUED	Transport Roads & Maritime Services	STANDARD DRAWING ROAD DESIGN ENGINEERING R0800 FENCING SERIES FAUNA EXCLUSION FENCE	SHEET 1 OF 3
									CONTACT DETAILS	MANAGER ROAD POLICY, SPECIFICATIONS & TECHNOLOGY	PREPARED BY ENGINEERING SERVICES ROAD POLICY, SPECIFICATIONS AND AND TECHNOLOGY			
									SCALES ON A3 SIZE DRAWING	SEND FEEDBACK ON THIS STANDARD DRAWING TO : technologystandards@rms.nsw.gov.au	DATE 20.01.17	STATUS ISSUED	EDMS No. DS2014/006018	ORIGINAL ISSUE DATE JANUARY 2017

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL



FAUNA PROTECTION DRAINAGE DETAILS

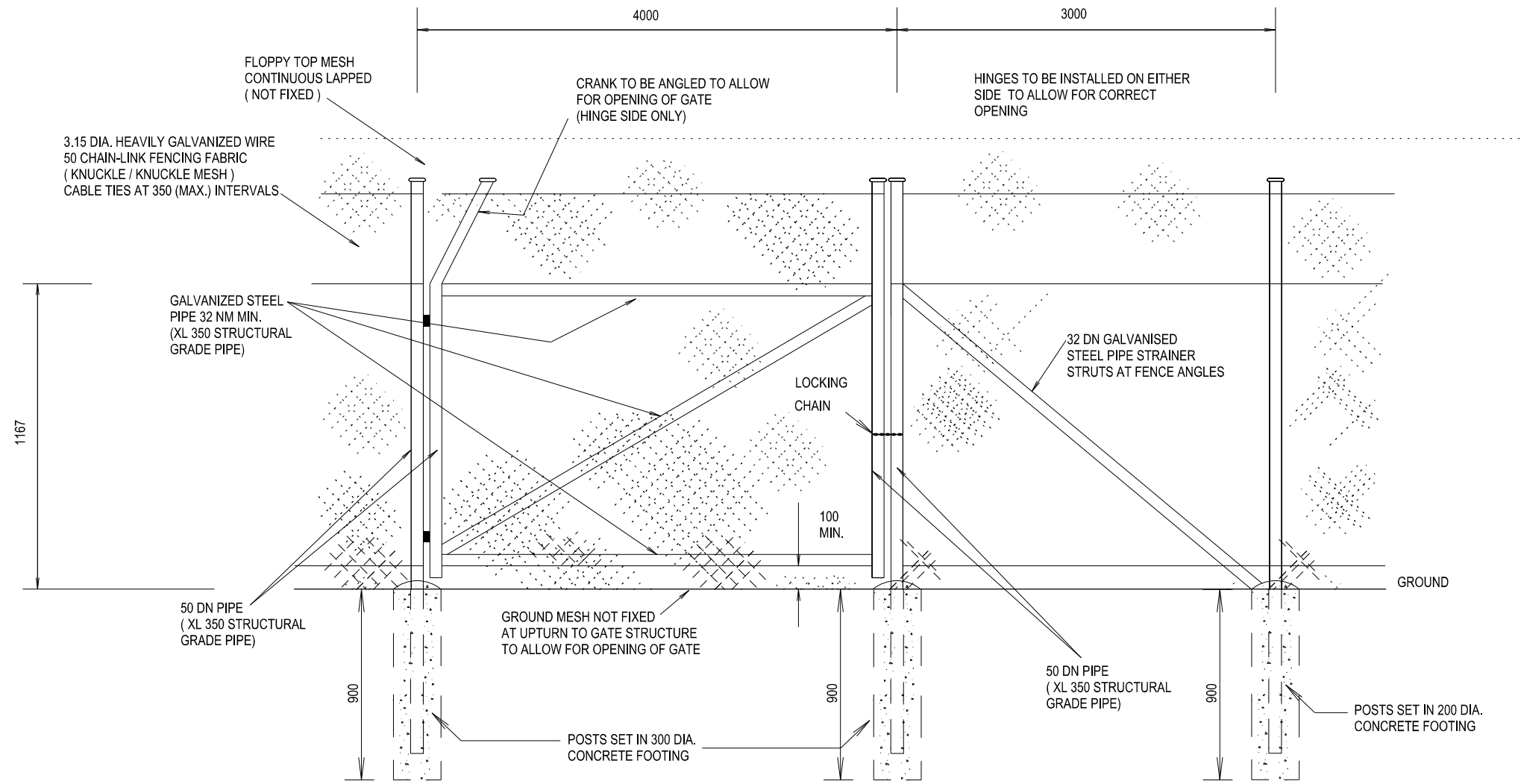


ELEVATION INTERMEDIATE POST AT LOW POINT

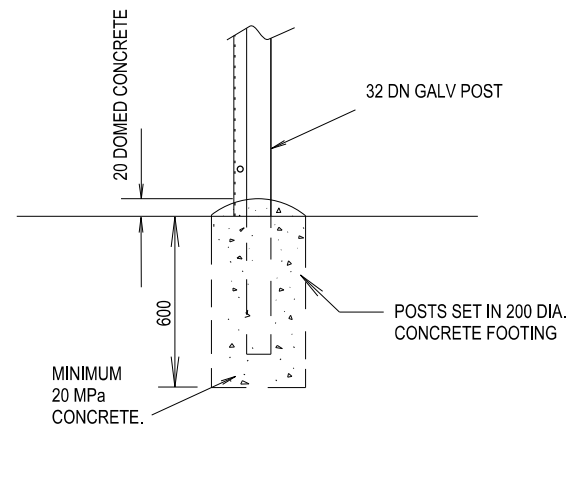
NOTES

1. AT DRAINAGE LINES AND GATES LIGHT CORROSION - RESISTANT METAL FLAP TO BE INSTALLED WITH LESS THAN 50 GAP. FLAP TO BE DESIGNED TO SUIT HYDRAULIC FLOWS AND DRAIN SHAPE IN STORMWATER FLOW PATHS. METAL FLAP TO BE CONNECTED TO FENCE ON DOWNSTREAM SIDE OF FENCE.
2. SPECIAL REQUIREMENTS MAY APPLY TO THE ERECTION PROCEDURES FOR FENCES INSTALLED NEAR HIGH VOLTAGE TRANSMISSION LINES. THE RELEVANT ELECTRICITY AUTHORITY SHOULD BE CONTACTED PRIOR TO THE INSTALLATION OF THE FENCE.

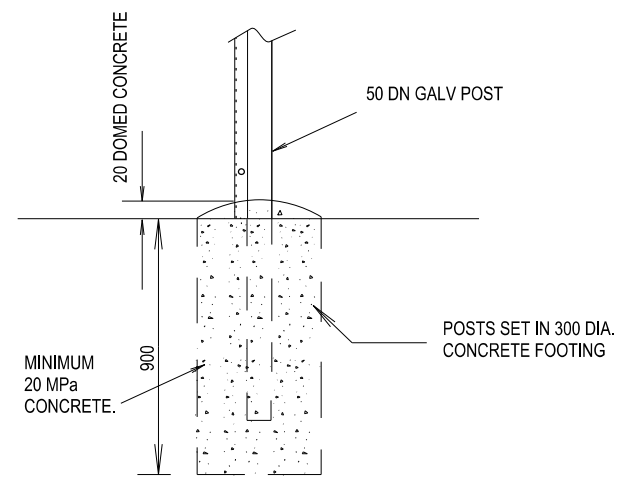
ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN										ISSUED		STANDARD DRAWING		A3	
QR CODE	SCAN TO CHECK DOCUMENT VER.	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	CONTACT DETAILS	ISSUED	SFR		ROAD DESIGN ENGINEERING		SHEET 2 OF 3	
								SEND FEEDBACK ON THIS STANDARD DRAWING TO : technologystandards@rms.nsw.gov.au	MANAGER ROAD POLICY, SPECIFICATIONS & TECHNOLOGY	NSW GOVERNMENT		R0800 FENCING SERIES		REV.	
									DATE 20.01.17	Transport Roads & Maritime Services		FAUNA EXCLUSION FENCE		-	
									PREPARED BY ENGINEERING SERVICES ROAD POLICY, SPECIFICATIONS AND AND TECHNOLOGY	EDMS No. DS2014/006018		ORIGINAL ISSUE DATE JANUARY 2017			
										STANDARD DRAWING No. R0800-31		ISSUED			



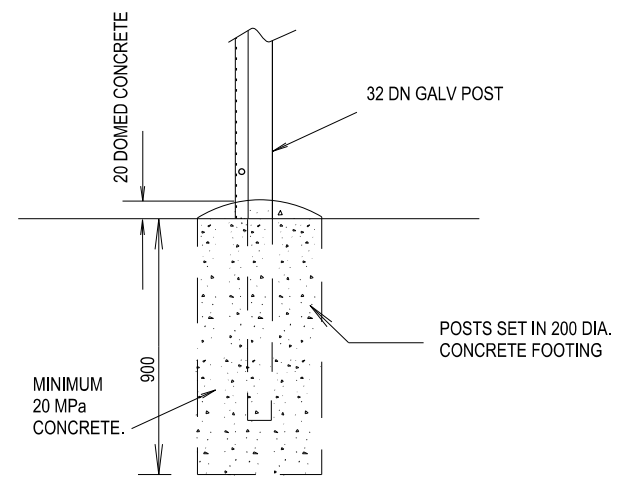
MAINTENANCE GATE DETAILS



INTERMEDIATE POSTS FOOTING DETAILS



STRAINER & CORNER POSTS FOOTING DETAILS




INTERMEDIATE POSTS FOOTING DETAILS AT LOW POINT

NOTES

- SPECIAL REQUIREMENTS MAY APPLY TO THE ERECTION PROCEDURES FOR FENCES INSTALLED NEAR HIGH VOLTAGE TRANSMISSION LINES. THE RELEVANT ELECTRICITY AUTHORITY SHOULD BE CONTACTED PRIOR TO THE INSTALLATION OF THE FENCE.

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL

ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN										ISSUED		STANDARD DRAWING No. R0800-31		SHEET 3 OF 3	
QR CODE	SCAN TO CHECK DOCUMENT VER.	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	CONTACT DETAILS	ISSUED	 Transport Roads & Maritime Services		STANDARD DRAWING ROAD DESIGN ENGINEERING R0800 FENCING SERIES FAUNA EXCLUSION FENCE WITH GATE		REV. -	
								SEND FEEDBACK ON THIS STANDARD DRAWING TO : technologystandards@rms.nsw.gov.au	SFR	PREPARED BY ENGINEERING SERVICES ROAD POLICY, SPECIFICATIONS AND AND TECHNOLOGY		STANDARD DRAWING No. R0800-31		STATUS ISSUED	
								DATE 20.01.17	EDMS No. DS2014/006018		ORIGINAL ISSUE DATE JANUARY 2017		© Roads and Maritime Services		

APPENDIX 16: INCIDENT REPORTING FORM

INCIDENT REPORT FORM

Name of person(s) completing this form:

Signature of person(s) completing this form:

Date:

INCIDENT DETAILS

Date and time of incident:

Name of person(s) involved:

Description of incident:

Witness(es) of incident (include contact details):

INCIDENT REPORT FORM

INJURY DETAILS (if applicable)

Description of injury (include parts of body affected):

REPORTING OF THE INCIDENT

Incident reported to:

Date:

Reporting method (in person, email, phone etc.):

FOLLOW UP ACTION

Description of action(s) to be taken:

APPENDIX 17: CORRECTIVE ACTIONS REGISTER

