Carmichael Coal Mine and Rail Project
Supplementary Environmental Impact Statement

Volume 4, Appendix C3a – MCU Application Laydown Areas

Containing

- Part 1 – Application Forms
- Part 2 – Planning Assessment Report
- Part 3 – Proposal Plans
- Part 4 – Codes
- Part 5 – Stormwater and Hydraulics Parts 1 and 2

PART

1

APPLICATION FORMS

- IDAS Form 1: Application Details and Owners Consent
- IDAS Form 5: Material Change of Use Assessable Against the Planning Scheme
- IDAS Form 8: Environmentally Relevant Activity – ERA 8
- IDAS Form 8: Environmentally Relevant Activity – ERA 63
- IDAS Checklist 1: Various Aspects of Development
- IDAS Checklist 2: Material Change of Use

IDAS form 1—Application details

(*Sustainable Planning Act 2009* version 3.0 effective 1 July 2013)

This form must be used for **ALL** development applications.

You **MUST** complete **ALL** questions that are stated to be a mandatory requirement unless otherwise identified on this form.

For all development applications, you must:

- complete this form (*IDAS form 1—Application details)*
- complete any other forms relevant to your application
- provide any mandatory supporting information identified on the forms as being required to accompany your application.

Attach extra pages if there is insufficient space on this form.

All terms used on this form have the meaning given in the *Sustainable Planning Act 2009* (SPA) or the Sustainable Planning Regulation 2009.

This form and any other IDAS form relevant to your application must be used for development applications relating to strategic port land and Brisbane core port land under the *Transport Infrastructure Act 1994* and airport land under the *Airport Assets (Restructuring and Disposal) Act 2008*. Whenever a planning scheme is mentioned, take it to mean land use plan for the strategic port land, Brisbane core port land or airport land.

PLEASE NOTE: This form is not required to accompany requests for compliance assessment.

This form can also be completed online using MyDAS at www.dsdip.qld.gov.au/MyDAS

Mandatory requirements

Applicant details (Note: the applicant is the person responsible for making the application and need not be the owner of the land. The applicant is responsible for ensuring the information provided on all IDAS application forms is correct. Any development permit or preliminary approval that may be issued as a consequence of this application will be issued to the applicant.)

Name/s (individual or company name in full)	Adani Mining Pty Ltd			
For companies, contact name	Hamish Manzi			
Postal address	GPO Box 2569			
	Suburb	BRISBANE		
	State	QLD	Postcode	4001
	Country	AUSTRALIA		
Contact phone number	(07) 3223 4800			
Mobile number (non-mandatory requirement)				
Fax number (non-mandatory requirement)				

Email address (non-mandatory requirement)	
	@
Applicant's reference number (non-mandatory requirement)	

1. What is the nature of the development proposed and what type of approval is being sought?

Table A—Aspect 1 of the application (If there are additional aspects to the application please list in Table B—Aspect 2.)

a) What is the nature of the development? (Please only tick one box.)

☑ Material change of use ☐ Reconfiguring a lot ☐ Building work ☐ Operational work

b) What is the approval type? (Please only tick one box.)

☐ Preliminary approval under s241 of SPA ☐ Preliminary approval under s241 and s242 of SPA ☑ Development permit

c) Provide a brief description of the proposal, including use definition and number of buildings or structures where applicable (e.g. six unit apartment building defined as a *multi-unit dwelling*, 30 lot residential subdivision etc.)

Establishment of various uses on sixty-seven (68) separate sites that are required to facilitate the construction and ongoing maintenance of the proposed Carmichael Coal Mine Railway Line.

d) What is the level of assessment? (Please only tick one box.)

☑ Impact assessment ☐ Code assessment

Table B—Aspect 2 of the application (If there are additional aspects to the application please list in Table C—Additional aspects of the application.)

a) What is the nature of development? (Please only tick one box.)

☐ Material change of use ☐ Reconfiguring a lot ☐ Building work ☐ Operational work

b) What is the approval type? (Please only tick one box.)

☐ Preliminary approval under s241 of SPA ☐ Preliminary approval under s241 and s242 of SPA ☐ Development permit

c) Provide a brief description of the proposal, including use definition and number of buildings or structures where applicable (e.g. six unit apartment building defined as a *multi-unit dwelling*, 30 lot residential subdivision etc.)

d) What is the level of assessment?

☐ Impact assessment ☐ Code assessment

Table C—Additional aspects of the application (If there are additional aspects to the application please list in a separate table on an extra page and attach to this form.)

☐ Refer attached schedule ☑ Not required

2. Location of the premises (Complete Table D and/or Table E as applicable. Identify each lot in a separate row.)

Table D—Street address and lot on plan for the premises or street address and lot on plan for the land adjoining or adjacent to the premises (Note: this table is to be used for applications involving taking or interfering with water). (Attach a separate schedule if there is insufficient space in this table.)

☑ Street address **and** lot on plan (All lots must be listed.)

☐ Street address **and** lot on plan for the land adjoining or adjacent to the premises (Appropriate for development in water but adjoining or adjacent to land, e.g. jetty, pontoon. All lots must be listed.)

Street address					**Lot on plan description**		**Local government area** (e.g. Logan, Cairns)
Lot	Unit no.	Street no.	Street name and official suburb/ locality name	Post-code	Lot no.	Plan type and plan no.	
i)							See attached
ii)							
iii)							

Planning scheme details (If the premises involves multiple zones, clearly identify the relevant zone/s for each lot in a separate row in the below table. Non-mandatory)

Lot	Applicable zone / precinct	Applicable local plan / precinct	Applicable overlay/s
i)	Rural Zone		
ii)			
iii)			

Table E—Premises coordinates (Appropriate for development in remote areas, over part of a lot or in water not adjoining or adjacent to land e.g. channel dredging in Moreton Bay.) (Attach a separate schedule if there is insufficient space in this table.)

Coordinates (Note: place each set of coordinates in a separate row)				**Zone reference**	**Datum**	**Local government area (if applicable)**
Easting	Northing	Latitude	Longitude			
					☐ GDA94 ☐ WGS84 ☐ other	

3. Total area of the premises on which the development is proposed (indicate square metres)

625Ha (Combined area of all sites)

4. Current use/s of the premises (e.g. vacant land, house, apartment building, cane farm etc.)

Cattle grazing, vacant land and mineral exploration

Property Number	Lot	Plan No.
1	Lot 662	CP PH1491
2	Lot 3	BL26
3	Lot 637	PH1980
4	Lot 1	SP147546
5	Lot 4	SP116046
6	Lot 10	BL49
7	Lot 1	SP118814

5. Are there any current approvals (e.g. a preliminary approval) associated with this application? (Non-mandatory requirement)

☑ No ☐ Yes—provide details below

List of approval reference/s	Date approved (dd/mm/yy)	Date approval lapses (dd/mm/yy)

6. Is owner's consent required for this application? (Refer to notes at the end of this form for more information.)

☐ No

☑ Yes—complete either Table F, Table G or Table H as applicable

Table F	
Name of owner/s of the land	
I/We, the above-mentioned owner/s of the land, consent to the making of this application.	
Signature of owner/s of the land	
Date	

Table G	
Name of owner/s of the land	See attached
☑ The owner's written consent is attached or will be provided separately to the assessment manager.	

Table H	
Name of owner/s of the land	
☐ By making this application, I, the applicant, declare that the owner has given written consent to the making of the application.	

7. Identify if any of the following apply to the premises (Tick applicable box/es.)

☑ Adjacent to a water body, watercourse or aquifer (e.g. creek, river, lake, canal)—complete Table I

☐ On strategic port land under the *Transport Infrastructure Act 1994*—complete Table J

☐ In a tidal water area—complete Table K

☐ On Brisbane core port land under the *Transport Infrastructure Act 1994* (No table requires completion.)

☐ On airport land under the *Airport Assets (Restructuring and Disposal) Act 2008* (no table requires completion)

Table I
Name of water body, watercourse or aquifer
Belyando River - Batching Plant 7, Turning Circle 37, Track Laydown 24 and Bridge Laydown 19

Table J	
Lot on plan description for strategic port land	Port authority for the lot

Table K	
Name of local government for the tidal area (if applicable)	Port authority for the tidal area (if applicable)

8. Are there any existing easements on the premises? (e.g. for vehicular access, electricity, overland flow, water etc)

☑ No ☐ Yes—ensure the type, location and dimension of each easement is included in the plans submitted

9. Does the proposal include new building work or operational work on the premises? (Including any services)

☐ No ☑ Yes—ensure the nature, location and dimension of proposed works are included in plans submitted

10. Is the payment of a portable long service leave levy applicable to this application? (Refer to notes at the end of this form for more information.)

☑ No—go to question 12 ☐ Yes

11. Has the portable long service leave levy been paid? (Refer to notes at the end of this form for more information.)

☐ No

☐ Yes—complete Table L and submit with this application the yellow local government/private certifier's copy of the receipted QLeave form

Table L		
Amount paid	Date paid (dd/mm/yy)	QLeave project number (6 digit number starting with A, B, E, L or P)

12. Has the local government agreed to apply a superseded planning scheme to this application under section 96 of the *Sustainable Planning Act 2009*?

☑ No

☐ Yes—please provide details below

Name of local government	Date of written notice given by local government (dd/mm/yy)	Reference number of written notice given by local government (if applicable)

13. List below all of the forms and supporting information that accompany this application (Include all IDAS forms, checklists, mandatory supporting information etc. that will be submitted as part of this application. Note: this question does not apply for applications made online using MyDAS)

Description of attachment or title of attachment	Method of lodgement to assessment manager
IDAS Forms 1 & 5	Electronic
Town Planning Report prepared by Cardno HRP	Electronic
Owners Consent	Electronic
Application Fee	Electronic
Proposal Plans and Technical Reports prepared by Cardno	Electronic

14. Applicant's declaration

☐ By making this application, I declare that all information in this application is true and correct (Note: it is unlawful to provide false or misleading information)

Notes for completing this form

- Section 261 of the *Sustainable Planning Act 2009* prescribes when an application is a properly-made application. Note, the assessment manager has discretion to accept an application as properly made despite any non-compliance with the requirement to provide mandatory supporting information under section 260(1)(c) of the *Sustainable Planning Act 2009*

Applicant details

- Where the applicant is not a natural person, ensure the applicant entity is a real legal entity.

Question 1

- Schedule 3 of the Sustainable Planning Regulation 2009 identifies assessable development and the type of assessment. Where schedule 3 identifies assessable development as "various aspects of development" the applicant must identify each aspect of the development on Tables A, B and C respectively and as required.

Question 6

- Section 263 of the *Sustainable Planning Act 2009* sets out when the consent of the owner of the land is required for an application. Section 260(1)(e) of the *Sustainable Planning Act 2009* provides that if the owner's consent is required under section 263, then an application must contain, or be accompanied by, the written consent of the owner, or include a declaration by the applicant that the owner has given written consent to the making of the application. If a development application relates to a state resource, the application is not required to be supported by evidence of an allocation or entitlement to a state resource. However, where the state is the owner of the subject land, the written consent of the state, as landowner, may be required. Allocation or entitlement to the state resource is a separate process and will need to be obtained before development commences.

Question 11

- The *Building and Construction Industry (Portable Long Service Leave) Act 1991* prescribes when the portable long service leave levy is payable.
- The portable long service leave levy amount and other prescribed percentages and rates for calculating the levy are prescribed in the Building and Construction Industry (Portable Long Service Leave) Regulation 2002.

Question 12

- The portable long service leave levy need not be paid when the application is made, but the *Building and Construction Industry (Portable Long Service Leave) Act 1991* requires the levy to be paid before a development permit is issued.
- Building and construction industry notification and payment forms are available from any Queensland post office or agency, on request from QLeave, or can be completed on the QLeave website at www.qleave.qld.gov.au. For further information contact QLeave on 1800 803 481 or visit www.qleave.qld.gov.au.

Privacy—The information collected in this form will be used by the Department of State Development, Infrastructure and Planning (DSDIP), assessment manager, referral agency and/or building certifier in accordance with the processing and assessment of your application. Your personal details should not be disclosed for a purpose outside of the IDAS process or the provisions about public access to planning and development information in the *Sustainable Planning Act 2009*, except where required by legislation (including the *Right to Information Act 2009*) or as required by Parliament. This information may be stored in relevant databases. The information collected will be retained as required by the *Public Records Act 2002*.

OFFICE USE ONLY

Date received		Reference numbers	

NOTIFICATION OF ENGAGEMENT OF A PRIVATE CERTIFIER

To _____ Council. I have been engaged as the private certifier for the building work referred to in this application

Date of engagement	Name	BSA Certification license number	Building classification/s

QLEAVE NOTIFICATION AND PAYMENT (For completion by assessment manager or private certifier if applicable.)

Description of the work	QLeave project number	Amount paid ($)	Date paid	Date receipted form sighted by assessment manager	Name of officer who sighted the form

The *Sustainable Planning Act 2009* is administered by the Department of State Development, Infrastructure and Planning. This form and all other required application materials should be sent to your assessment manager and any referral agency.

Department of State Development, Infrastructure and Planning
PO Box 15009 City East Qld 4002
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IDAS form 5—Material change of use assessable against a planning scheme

(*Sustainable Planning Act 2009* version 3.0 effective 1 July 2013)

This form must be used for development applications for a material change of use assessable against a planning scheme.

You **MUST** complete **ALL** questions that are stated to be a mandatory requirement unless otherwise identified on this form.

For all development applications, you must:

- complete *IDAS form 1—Application details*
- complete any other forms relevant to your application
- provide any mandatory supporting information identified on the forms as being required to accompany your application.

Attach extra pages if there is insufficient space on this form.

All terms used on this form have the meaning given in the Sustainable Planning Act 2009 (SPA) or the Sustainable Planning Regulation 2009.

This form must also be used for material change of use on strategic port land and Brisbane core port land under the *Transport Infrastructure Act 1994* and airport land under the *Airport Assets (Restructuring and Disposal) Act 2008* that requires assessment against the land use plan for that land. Whenever a planning scheme is mentioned, take it to mean land use plan for the strategic port land, Brisbane core port land or airport land.

This form can also be completed online using MyDAS at www.dsdip.qld.gov.au/MyDAS

Mandatory requirements

1. Describe the proposed use. (Note: this is to provide additional detail to the information provided in question 1 of *IDAS form 1—Application details*. Attach a separate schedule if there is insufficient space in this table.)

General explanation of the proposed use	Planning scheme definition (include each definition in a new row) (non-mandatory)	No. of dwelling units (if applicable) or gross floor area (if applicable)	Days and hours of operation (if applicable)	No. of employees (if applicable)
Construction Depot	Industry / Storage Facility		N/A	N/A
Concrete Batching Plants	Industry			
Rolling Stock Maintenance Yard	Railway Activities			
Turning Circle Areas	Storage Facility			
Bridge & Track Laydown Areas	Storage Facility			

2. Are there any current approvals associated with the proposed material change of use? (e.g. a preliminary approval.)

☑ No ☐ Yes—provide details below

List of approval reference/s	Date approved (dd/mm/yy)	Date approval lapses (dd/mm/yy)

3. **Does the proposed use involve the following?** (Tick all applicable boxes.)				
The reuse of existing buildings on the premises	☑	No	☐	Yes
New building work on the premises	☐	No	☑	Yes
The reuse of existing operational work on the premises	☑	No	☐	Yes
New operational work on the premises	☑	No	☐	Yes

Mandatory supporting information

4. Confirm that the following mandatory supporting information accompanies this application

Mandatory supporting information	**Confirmation of lodgement**	**Method of lodgement**
All applications		
A site plan drawn to an appropriate scale (1:100, 1:200 or 1:500 are **recommended** scales) which shows the following: • the location and site area of the land to which the application relates (*relevant land*) • the north point • the boundaries of the relevant land • any road frontages of the relevant land, including the name of the road • the location and use of any existing or proposed buildings or structures on the relevant land (note: where extensive demolition or new buildings are proposed, two separate plans [an existing site plan and proposed site plan] may be appropriate) • any existing or proposed easements on the relevant land and their function • the location and use of buildings on land adjoining the relevant land • all vehicle access points and any existing or proposed car parking areas on the relevant land. Car parking spaces for persons with disabilities and any service vehicle access and parking should be clearly marked • for any new building on the relevant land, the location of refuse storage • the location of any proposed retaining walls on the relevant land and their height • the location of any proposed landscaping on the relevant land • the location of any stormwater detention on the relevant land.	☑ Confirmed	
A statement about how the proposed development addresses the local government's planning scheme and any other planning instruments or documents relevant to the application.	☑ Confirmed	
A statement about the intensity and scale of the proposed use (e.g. number of visitors, number of seats, capacity of storage area etc.).	☑ Confirmed	
Information that states: • the existing or proposed floor area, site cover, maximum number of storeys and maximum height above natural ground level for existing or new buildings (e.g. information regarding existing buildings but not being reused) • the existing or proposed number of on-site car parking bays, type of vehicle cross-over (for non-residential uses) and vehicular servicing arrangement (for non-residential uses).	☑ Confirmed ☐ Not applicable	

A statement addressing the relevant part(s) of the State Development Assessment Provisions (SDAP).	☐ Confirmed ☑ Not applicable	
When the application involves the reuse of existing buildings		
Plans showing the size, location, existing floor area, existing site cover, existing maximum number of storeys and existing maximum height above natural ground level of the buildings to be reused.	☐ Confirmed ☑ Not applicable	
When the application involves new building work (including extensions)		
Floor plans drawn to an appropriate scale (1:50, 1:100 or 1:200 are **recommended** scales) which show the following: • the north point • the intended use of each area on the floor plan (for commercial, industrial or mixed use developments only) • the room layout (for residential development only) with all rooms clearly labelled • the existing and the proposed built form (for extensions only) • the gross floor area of each proposed floor area.	☑ Confirmed	
Elevations drawn to an appropriate scale (1:100, 1:200 or 1:500 are **recommended** scales) which show plans of all building elevations and facades, clearly labelled to identify orientation (e.g. north elevation)	☑ Confirmed	
Plans showing the size, location, proposed site cover, proposed maximum number of storeys, and proposed maximum height above natural ground level of the proposed new building work.	☑ Confirmed ☐ Not applicable	
When the application involves reuse of other existing work		
Plans showing the nature, location, number of on-site car parking bays, existing area of landscaping, existing type of vehicular cross-over (non-residential uses), and existing type of vehicular servicing arrangement (non-residential uses) of the work to be reused.	☐ Confirmed ☑ Not applicable	
When the application involves new operational work		
Plans showing the nature, location, number of new on-site car parking bays, proposed area of new landscaping, proposed type of new vehicle cross-over (non-residential uses), proposed maximum new vehicular servicing arrangement (non-residential uses) of the proposed new operational work.	☐ Confirmed ☑ Not applicable	

Privacy—Please refer to your assessment manager, referral agency and/or building certifier for further details on the use of information recorded in this form.

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IDAS form 8—Environmentally relevant activity

(*Sustainable Planning Act 2009* version 3.0 effective 1 July 2013)

This form must be used for development applications for an environmentally relevant activity.

You **MUST** complete **ALL** questions that are stated to be a mandatory requirement unless otherwise identified on this form.

For all development applications, you must:

- complete *IDAS form 1—Application details*
- complete any other forms relevant to your application
- provide any mandatory supporting information identified on the forms as being required to accompany your application.

Attach extra pages if there is insufficient space on this form.

All terms used on this form have the meaning given in either the *Sustainable Planning Act 2009* (SPA), the Sustainable Planning Regulation 2009, the *Environmental Protection Act 1994* or the Environmental Protection Regulation 2008.

This form can also be completed online using MyDAS at www.dsdip.qld.gov.au/MyDAS

Mandatory requirements

1. What is the nature of the proposed environmentally relevant activity (ERA)? (complete a new Table A for each proposed ERA—including ERAs that are not concurrence ERAs)

Table A	
ERA number and name	ERA 8 - Chemical Storage
ERA threshold	Storing a total of 50t or more of chemicals class 1 or class 2,
Applicable fees	$ TBC
Proposed scale/capacity	
Type of approval sought	☑ Development permit and environmental authority (see notes) ☐ Preliminary approval
Is the proposed ERA a concurrence ERA?	☐ No ☑ Yes

2. Are there any existing ERAs on or associated with the premises?

☑ No

☐ Yes—complete a new Table B for each existing ERA

Table B	
ERA number and name	
ERA threshold	
Existing scale/capacity	
Is the ERA proposed to continue on site?	☐ No ☐ Yes

3. **Does the proposed activity involve any of the following?** (Tick all applicable boxes.)

☐ Release of water or waste to a wetland for treatment

☐ Release of waste directly to groundwater

Mandatory supporting information

4. **Confirm that the following mandatory supporting information accompanies this application**		
About the subject land	**Confirmation of lodgement**	**Method of lodgement**
Description of the site, including site maps showing vegetation, topography and any areas of cultural or heritage significance.	☑ Confirmed	Electronic
Details of any known acid sulphate soils within or adjoining the premises.	☐ Confirmed ☑ Not applicable	Electronic
Details about how the choice of the site, at which the activity is to be carried out, minimises serious environmental harm on areas of high conservation value and special significance and sensitive land uses at adjacent places.	☑ Confirmed	Electronic
Details about how the location for the activity on a site protects all environmental values relevant to adjacent sensitive uses.	☑ Confirmed	Electronic
Details about how the design of the facility permits the operation of the site, at which the activity is to be carried out, in accordance with best practice environmental management.	☑ Confirmed	Electronic
About the proposed ERA		
Attachment to IDAS form 8—application for an environmental authority (EM941) completed and required information provided.	☑ Confirmed	Electronic
A statement addressing the relevant part(s) of the State Development Assessment Provisions (SDAP).	☐ Confirmed ☑ Not applicable	

Notes for completing this form:

- An environmental authority is required to operate an ERA.
- A development approval is only required if at least one of the ERAs to be operated is a concurrence ERA.
- Schedule 2 of the *Environmental Protection Regulation 2008* states the aggregate environmental scores, the thresholds that apply to ERAs, and which ERAs are concurrence ERAs (denoted by a 'C' in schedule 2, column 3).
- This development application is taken to be an application for an environmental authority. This application is not properly made unless it includes the Attachment to IDAS form 8—application for an environmental authority (EM941).
- There are annual fees associated with the operation of an ERA. These fees are initially payable 20 business days after the environmental authority takes effect. After this initial payment, annual fees will be payable on the anniversary of the take effect day. Chapter 8 and Schedule 10 of the Environmental Protection Regulation 2008 contain all information about the applicable fees and how they are calculated.

Privacy—Please refer to your assessment manager, referral agency and/or building certifier for further details on the use of information recorded in this form.

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IDAS form 8—Environmentally relevant activity

(*Sustainable Planning Act 2009* version 3.0 effective 1 July 2013)

This form must be used for development applications for an environmentally relevant activity.

You **MUST** complete **ALL** questions that are stated to be a mandatory requirement unless otherwise identified on this form.

For all development applications, you must:

- complete *IDAS form 1—Application details*
- complete any other forms relevant to your application
- provide any mandatory supporting information identified on the forms as being required to accompany your application.

Attach extra pages if there is insufficient space on this form.

All terms used on this form have the meaning given in either the *Sustainable Planning Act 2009* (SPA), the Sustainable Planning Regulation 2009, the *Environmental Protection Act 1994* or the Environmental Protection Regulation 2008.

This form can also be completed online using MyDAS at www.dsdip.qld.gov.au/MyDAS

Mandatory requirements

1. What is the nature of the proposed environmentally relevant activity (ERA)? (complete a new Table A for each proposed ERA—including ERAs that are not concurrence ERAs)

Table A	
ERA number and name	ERA 63 Sewage Treatment
ERA threshold	S
Applicable fees	$ TBC
Proposed scale/capacity	
Type of approval sought	☑ Development permit and environmental authority (see notes) ☐ Preliminary approval
Is the proposed ERA a concurrence ERA?	☐ No ☑ Yes

2. Are there any existing ERAs on or associated with the premises?

☑ No

☐ Yes—complete a new Table B for each existing ERA

Table B	
ERA number and name	
ERA threshold	
Existing scale/capacity	
Is the ERA proposed to continue on site?	☐ No ☐ Yes

3.	**Does the proposed activity involve any of the following?** (Tick all applicable boxes.)

☑ Release of water or waste to a wetland for treatment

☐ Release of waste directly to groundwater

Mandatory supporting information

4.	**Confirm that the following mandatory supporting information accompanies this application**		
About the subject land		**Confirmation of lodgement**	**Method of lodgement**
Description of the site, including site maps showing vegetation, topography and any areas of cultural or heritage significance.		☑ Confirmed	Electronic
Details of any known acid sulphate soils within or adjoining the premises.		☐ Confirmed ☑ Not applicable	Electronic
Details about how the choice of the site, at which the activity is to be carried out, minimises serious environmental harm on areas of high conservation value and special significance and sensitive land uses at adjacent places.		☑ Confirmed	Electronic
Details about how the location for the activity on a site protects all environmental values relevant to adjacent sensitive uses.		☑ Confirmed	Electronic
Details about how the design of the facility permits the operation of the site, at which the activity is to be carried out, in accordance with best practice environmental management.		☑ Confirmed	Electronic
About the proposed ERA			
Attachment to IDAS form 8—application for an environmental authority (EM941) completed and required information provided.		☑ Confirmed	Electronic
A statement addressing the relevant part(s) of the State Development Assessment Provisions (SDAP).		☐ Confirmed ☑ Not applicable	

Notes for completing this form:

- An environmental authority is required to operate an ERA.
- A development approval is only required if at least one of the ERAs to be operated is a concurrence ERA.
- Schedule 2 of the *Environmental Protection Regulation 2008* states the aggregate environmental scores, the thresholds that apply to ERAs, and which ERAs are concurrence ERAs (denoted by a 'C' in schedule 2, column 3).
- This development application is taken to be an application for an environmental authority. This application is not properly made unless it includes the Attachment to IDAS form 8—application for an environmental authority (EM941).
- There are annual fees associated with the operation of an ERA. These fees are initially payable 20 business days after the environmental authority takes effect. After this initial payment, annual fees will be payable on the anniversary of the take effect day. Chapter 8 and Schedule 10 of the Environmental Protection Regulation 2008 contain all information about the applicable fees and how they are calculated.

Privacy—Please refer to your assessment manager, referral agency and/or building certifier for further details on the use of information recorded in this form.

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Schedule 3 Assessable Development Checklist 1—Various aspects of development

(Sustainable Planning Act 2009 version 3.0 effective 1 July 2013)

This checklist applies to the carrying out of various aspects of development, as specified in the Sustainable Planning Regulation 2009, Schedule 3, Part 1, Table 5.

You may complete this checklist as part of your development application. The checklist will:

- help you identify whether you need to make a development application for the proposed development
- help you identify the relevant Integrated Development Assessment System (IDAS) form you need to complete as part of your application
- assist in identifying the assessment manager or referral agency for development that is assessable development under schedule 3 of the Sustainable Planning Regulation 2009.

If your development involves a material change of use, reconfiguring a lot, operational work or building work, it is recommended you complete the relevant checklists: *Checklist 2—Material change of use*, *Checklist 3—Reconfiguring a lot*, *Checklist 4—Operational work*, or *Checklist 5—Building work*.

If you are unsure how to answer any questions on this checklist, phone or visit your local government, or go to the Department of State Development, Infrastructure and Planning's (DSDIP) website at **www.dsdip.qld.gov.au**.

All terms used in this checklist have the meaning given in the *Sustainable Planning Act 2009* or the Sustainable Planning Regulation 2009.

Part 1—General questions

1.1 Does the proposal involve removing quarry material from a watercourse or lake for which an allocation notice is required under the *Water Act 2000*, other than within a priority development area or on a premises to which structure plan arrangements apply?

☑ No	• Continue to question 1.2
☐ Yes	• Complete part 2 of this checklist

1.2 Is any part of the proposed development intended to be carried out on a Queensland heritage place under the *Queensland Heritage Act 1992*?

☑ No	• Continue to question 1.3
☐ Yes	• Complete part 3 of this checklist

1.3 Does the proposal involve development on a local heritage place?

☑ No	• Continue to question 1.4
☐ Yes	• Complete part 4 of this checklist

1.4 Is any part of the development on strategic port land or airport land (other than development for a material change of use that is inconsistent with the land use plan for the strategic port land or airport land mentioned in the Sustainable Planning Regulation 2009, Schedule 3, Part 1, Table 2, item 3 or 4)?

☑ No	• End of checklist – A development permit is not required for this aspect of development under Sustainable Planning Regulation 2009, Schedule 3, Part 1, Table 5

☐ Yes	• Complete part 5 of this checklist

Part 2—Removing quarry material

2.1 Is any part of the quarry material which is intended to be removed, located within a wild river area under the *Wild Rivers Act 2005*?

☐ No	• A development permit is required and this application requires assessment by the chief executive of DSDIP as assessment manager or concurrence agency against the *Sustainable Management of Water Resources State Code* in the State Development Assessment Provisions (SDAP). • Your application must include *IDAS form 18—Removal of quarry material from a watercourse or lake*.
☐ Yes	• Continue to question 2.2

2.2 Will the development be carried out on land to which a property development plan under the *Wild Rivers Act 2005* applies?

☐ No	A development permit is required and this application requires assessment by the chief executive of DSDIP as assessment manager or concurrence agency against the *Sustainable Management of Water Resources State Code* in the SDAP. Your application must include *IDAS form 18—Removal of quarry material from a watercourse or lake*.
☐ Yes	Continue to question 2.3

2.3 Is the development consistent with the property development plan?

☐ Yes	A development permit is required and this application requires assessment by the chief executive of DSDIP as assessment manager or concurrence agency against the *Sustainable Management of Water Resources State Code* in the SDAP. Your application must include *IDAS form 18—Removal of quarry material from a watercourse or lake*.
☐ No	This aspect of development is prohibited development. A development application for this development cannot be made.

Section reference:

- Sustainable Planning Regulation 2009, schedule 3, part 1, table 5, item 1
- Sustainable Planning Regulation 2009, schedule 7, table 2, item 12
- *Sustainable Planning Act 2009*, schedule 1, item 2

Part 3—Queensland heritage place

3.1 Do any of the following apply to the proposal?

The proposed development is only ongoing maintenance or minor work permitted by a general exemption certificate issued under section 75 of the *Queensland Heritage Act 1992*.	☐ Yes ☐ No
An exemption certificate has been issued under the *Queensland Heritage Act 1992*.	☐ Yes ☐ No
The proposed development is liturgical development under section 78 of the *Queensland Heritage Act 1992*.	☐ Yes ☐ No
The work is being carried out by the state.	☐ Yes ☐ No
The work is being carried out in a priority development area.	☐ Yes ☐ No
The development is mentioned in schedule 4 of the Sustainable Planning Regulation 2009.	☐ Yes ☐ No

- If you answered **no** to all of the above, a development permit is required and this application requires assessment by the chief executive of DSDIP as assessment manager or concurrence agency against the *Queensland Heritage Place State Code* in the SDAP.
- Your application must include *IDAS form 3—Queensland heritage place*.
- If you answered **yes** to any of the above, a development permit is not required. End of part 3 of this checklist.

Section reference:

- Sustainable Planning Regulation 2009, schedule 3, part 1, table 5, item 2
- Sustainable Planning Regulation 2009, schedule 7, table 2, item 19

Part 4—Local heritage place

4.1 Do any of the following apply to the proposal?

The development is building works to be carried out by or on behalf of the state, a public sector entity or a local government	☐ Yes ☐ No
The development is for public housing	☐ Yes ☐ No
The development is to be carried out by the state on land designated for community infrastructure under the *Sustainable Planning Act 2009*.	☐ Yes ☐ No
The development is mentioned in schedule 4 of the Sustainable Planning Regulation 2009.	☐ Yes ☐ No
The local heritage place is on an airport lessee's airport land under the *Airport Assets (Restructuring and Disposal) Act 2008*.	☐ Yes ☐ No

- If you answered **no** to all of the above, a development permit is required and your application to the local government, as assessment manager, must include *IDAS form 4—Local heritage place*.
- If you answered **yes** to any of the above, a development permit is not required.

Section reference:

- Sustainable Planning Regulation 2009, schedule 3, part 1, table 5, item 3
- Sustainable Planning Regulation 2009, schedule 3, part 2, table 1, item 1
- *Airports Assets (Restructuring and Disposal) Act 2008*, section 54

Part 5—Strategic port land or airport land

5.1 Does the land use plan for the strategic port land or airport land state that the development is assessable development?

☐ No	• A development permit is not required for this aspect of development; end of this checklist.

☐ Yes	• A development permit is required and your application may include, where applicable:
	  • for a material change of use—*IDAS form 5—Material change of use assessable against a planning scheme*
	  • for building or operational work—*IDAS form 6—Building or operational work assessable against a planning scheme*
	  • for reconfiguring a lot—*IDAS form 7—Reconfiguring a lot*
	• The assessment manager will either be the local government or the port authority or DSDIP.

Section reference:

- Sustainable Planning Regulation 2009, schedule 3, 1part , table 5, items 6 and 7

Privacy—Please refer to your assessment manager for further details on the use of information recorded in this checklist.

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To the full extent permitted by law, DSDIP expressly disclaims all liability (including but not limited to liability for negligence) for errors or omissions of any kind or for any loss (including direct and indirect losses), damage or other consequence which may arise from your reliance on this process and the information contained on this checklist.

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Schedule 3 Assessable Development Checklist 2—Material change of use

(*Sustainable Planning Act 2009* version 3.0 effective 1 July 2013)

This checklist only applies when the development application seeks approval for a material change of use of premises. Before completing this checklist, please complete *Checklist 1—Various aspects of development*.

You may complete this checklist as part of your development application. The checklist will:

- help you identify whether you need to make a development application for the proposed development
- help you identify the relevant Integrated Development Assessment System (IDAS) forms you need to complete as part of your application
- assist in identifying the assessment manager or referral agency for development that is assessable development under schedule 3 of the Sustainable Planning Regulation 2009.

If your development involves reconfiguring a lot, building work or operational work, it is recommended you complete the relevant checklists: *Checklist 3—Reconfiguring a lot, Checklist 4—Operational* or *Checklist 5—Building work*, where relevant.

If you are unsure how to answer any questions on this checklist, phone or visit your local government, or go to the Department of State Development, Infrastructure and Planning's (DSDIP) website at **www.dsdip.qld.gov.au**

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Part 1—General questions

1.1 Is the proposed material change of use of premises for a brothel?

☑ No	• Continue to question 1.2
☐ Yes	• Complete part 2 of this checklist

1.2 Is the proposed material change of use of premises on strategic port land?

☑ No	• Continue to question 1.3
☐ Yes	• Complete part 3 of this checklist

1.3 Is the proposed material change of use of premises on airport land?

☑ No	• Continue to question 1.4
☐ Yes	• Complete part 4 of this checklist

1.4 Is the proposed material change of use of premises for a major hazard facility or proposed major hazard facility?

☑ No	• Continue to question 1.5

☐ Yes	• A development permit is required. • The chief executive of DSDIP will be assessment manager or concurrence agency for the development application. • You must complete *IDAS form 22—Major hazard facility*.

Section reference:

- Sustainable Planning Regulation 2009, schedule 3, part 1, table 2, item 5
- Sustainable Planning Regulation 2009, schedule 6, table 3, item 4
- Sustainable Planning Regulation 2009, schedule 7, table 2, item 8

1.5 Is the proposed material change of use of a potentially affected premises?

☑ No	• Continue to question 1.6
☐ Yes	• Complete part 5 of this checklist

1.6 Is the proposed development a potentially sensitive material change of use of premises?

☑ No	• Continue to question 1.7
☐ Yes	• Complete part 6 of this checklist

1.7 Is the proposed material change of use of premises for aquaculture?

☑ No	• Continue to question 1.8
☐ Yes	• Complete part 7 of this checklist

1.8 Is the proposed material change of use of premises in a wild river area and is the proposed use for agricultural activities or animal husbandry activities (as defined under the *Wild Rivers Act 2005*)?

☑ No	• Continue to question 1.9
☐ Yes	• Complete part 8 of this checklist

1.9 Is the proposed material change of use of premises for an environmentally relevant activity that, under the Environmental Protection Regulation 2008, section 16, is identified as a concurrence ERA (the relevant ERA)?

☐ No	• End of part 1 of checklist
☑ Yes	• Complete part 9 of this checklist

Part 2—Brothel

2.1 Do any of the following apply?

More than five rooms in the proposed brothel are proposed to be used for providing prostitution.	☐ Yes ☐ No
Any land, the subject of the development, is in, or within 200 metres of the closest point on any boundary of, a primarily residential area, or an area approved for residential development or intended to be residential in character (measured according to the shortest route a person may reasonably and lawfully take, by vehicle or on foot, between the land the subject of the development and the other land).	☐ Yes ☐ No

Any land, the subject of the development, is within 200 metres of the closest point on any boundary of land on which there is a residential building, place of worship, hospital, school, kindergarten or any other facility or place regularly frequented by children for recreational or cultural activities (measured according to the shortest route a person may reasonably and lawfully take, by vehicle or on foot, between the land the subject of the development and the other land).	☐ Yes ☐ No
Any land, the subject of the development, is within 100 metres of the closest point on any boundary of land on which there is a residential building, place of worship, hospital, school, kindergarten or any other facility or place regularly frequented by children for recreational or cultural activities, measured in a straight line.	☐ Yes ☐ No
The land, the subject of the development, is in a town with a population of less than 25 000, the local government for the local government area has required that all material changes of use for such development within the area be prohibited, and the Minister has agreed that the development should be prohibited.	☐ Yes ☐ No

- If **yes** to any of the above, this aspect of the development is prohibited development and a development application cannot be made.
- If **no** to all of the above, a development permit is required. You must complete *IDAS form 9—Brothel*, and submit your application to the local government if the development is completely in a single local government area.

Section reference:

- Sustainable Planning Regulation 2009, schedule 3, part 1 , table 2, item 2
- Sustainable Planning Regulation 2009, schedule 6, table 1, item 1(a)(iv)
- *Sustainable Planning Act 2009*, schedule 1, item 5

Part 3—Strategic port land

3.1 Do any of the following apply?

The proposed material change of use of premises is inconsistent with the land use plan approved under the *Transport Infrastructure Act 1994*.	☐ Yes ☐ No
The proposed material change of use of premises is assessable development under the land use plan approved under the *Transport Infrastructure Act 1994*, but is not inconsistent with it.	☐ Yes ☐ No

- If **yes** to either of the above, a development permit is required. The port authority may be the assessment manager for the development application (see schedule 6 of the Sustainable Planning Regulation 2009).
- If the proposed material change of use of premises is inconsistent with the land use plan, you are also required to refer the application to the Minister under the *Transport Infrastructure Act 1994* as concurrence agency.
- You must complete *IDAS Form 10—Inconsistent development on strategic port land or Brisbane core port land*.

Section reference:

- Sustainable Planning Regulation 2009, schedule 3, part 1, table 2, item 3
- Sustainable Planning Regulation 2009, schedule 3, part 1, table 5, item 6
- Sustainable Planning Regulation 2009, schedule 6
- Sustainable Planning Regulation 2009, schedule 7, table 2, item 6

Part 4—Airport land

4.1 Do any of the following apply?

The proposed material change of use of premises is inconsistent with the land use plan approved under the *Airport Assets (Restructuring and Disposal) Act 2008*.	☐ Yes ☐ No

The proposed material change of use of premises is assessable development under the land use plan approved under the *Airport Assets (Restructuring and Disposal) Act 2008* for the airport land, but is not inconsistent with it.	☐ Yes ☐ No

- If **yes** to either of the above, a development permit is required for this aspect of development. The chief executive of DSDIP may be the assessment manager (see schedule 6 of the Sustainable Planning Regulation 2009).
- If the proposed material change of use of premises is inconsistent with the land use plan approved under the *Airport Assets (Restructuring and Disposal) Act 2008,* you are also required to refer the application to the chief executive of DSDIP as concurrence agency, if the chief executive of DSDIP is not the assessment manager.
- You must complete *IDAS Form 5—Material change of use assessable against a planning scheme*.

Section reference:

- Sustainable Planning Regulation 2009, schedule 3, part 1, table 2, item 4
- Sustainable Planning Regulation 2009, schedule 3, part 2, table 5, item 7
- Sustainable Planning Regulation 2009, schedule 6
- Sustainable Planning Regulation 2009, schedule 7, table 2, item 7

Part 5—Potentially affected premises

5.1 Do any of the following apply?

A suitability statement has been given for the premises, a site management plan has been approved in relation to the proposed use and the material change of use only involves: • the fit-out of a building, or • minor site excavation (e.g. post holes for open-sided non-habitable structures).	☐ Yes ☐ No
The proposed use is industrial and only involves minor site excavation (e.g. post holes for open-sided non-habitable structures).	☐ Yes ☐ No

- If **no** to both of the above:
  - A development permit is required for this aspect of development
  - The development application will require assessment by the chief executive of DSDIP, as assessment manager or concurrence agency
  - You must complete *IDAS form 24—Contaminated land*
- If **yes** to either of the above, this aspect of development is not assessable development but it is recommended that you provide a copy of any suitability statement or approved site management plan to the assessment manager to support your claim for exemption if any other aspects of your proposed use are assessable development.

Section reference:

- Sustainable Planning Regulation 2009, schedule 3, part 1, table 2, item 6
- Sustainable Planning Regulation 2009, schedule 6
- Sustainable Planning Regulation 2009, schedule 7, table 2, item 23

Part 6—Potentially sensitive material change of use

6.1 Do either of the following apply?

All or part of the premises is used for, or if there is no existing use, was last used for, an industrial activity (other than a mining activity or chapter 5A activity).	☐ Yes ☐ No
All or part of the premises is in an area for which an area management advice has been given for natural mineralisation or industrial activity (other than for a mining activity or a chapter 5A activity).	☐ Yes ☐ No

- If **yes** to either of the above:
  - A development permit is required
  - The development application requires assessment by the chief executive of DSDIP as assessment manager or concurrence agency
  - You must complete *IDAS form 24—Contaminated land*
- If **no** to all of the above, this aspect of development does not require a development permit.

Section reference:

- Sustainable Planning Regulation 2009, schedule 3, part 1, table 2, item 7
- Sustainable Planning Regulation 2009, schedule 6
- Sustainable Planning Regulation 2009, schedule 7, table 2, item 23

Part 7—Aquaculture

7.1 Will the proposed material change of use of premises for aquaculture cause discharge of waste into Queensland waters (as defined in section 36 of the *Acts Interpretation Act 1954)* ?

☐ No	• Continue to question 7.2
☐ Yes	• Go to question 7.3

7.2 Do any of the following apply?

The aquaculture is: • of indigenous freshwater fish species mentioned in the Fisheries Regulation 2008, schedule 10C • in a catchment listed in that schedule for that species for aquarium display or human consumption only • carried out in ponds, or using above-ground tanks, that have a total water surface area of no more than five hectares.	☐ Yes ☐ No
The aquaculture is of indigenous freshwater fish for aquarium display or human consumption only, or non-indigenous freshwater fish for aquarium display only, and is carried out using only above-ground tanks that have: • a floor area, excluding water storage area, of no more than $50m^2$ • a roof impervious to rainwater.	☐ Yes ☐ No
The aquaculture is of indigenous marine fish for aquarium display only and is carried out using only above-ground tanks that have a total floor area, excluding water storage areas, of no more than $50m^2$.	☐ Yes ☐ No

- If **no** to all of the above, continue to question 7.3
- If **yes** to any of the above, a development permit is not required for this aspect of development, but the proposed material change of use will be self assessable development and must comply with applicable codes

7.3 Is any part of the proposed material change of use of premises for aquaculture intended to be located in a wild river area?

☐ No	• A development permit is required for this aspect of development and this aspect of development requires assessment by the chief executive of DSDIP as assessment manager or concurrence agency • You must complete *IDAS form 25—Aquaculture* • End of part 7 of this checklist

☐ Yes	• Continue to question 7.4

7.4 Is the proposed material change of use of premises for aquaculture in a wild river high preservation area or wild river special floodplain management area?

☐ No	• Continue to question 7.5
☐ Yes	• To the extent the development is in a wild river high preservation area or wild river special floodplain management area, this aspect of development is prohibited development and a development application cannot be made. If this is the only aspect of development, then that is the end of part 7 of this checklist, otherwise continue to question 7.5

7.5 Is any part of the proposed material change of use of premises on land to which a property development plan under the *Wild Rivers Act 2005* applies?

☐ No	• A development permit is required for this aspect of development and this aspect of development requires assessment by the chief executive of DSDIP as assessment manager or concurrence agency • You must complete *IDAS form 25—Aquaculture* • End of part 7 of this checklist
☐ Yes	• Continue to question 7.6

7.6 Is the proposed material change of use inconsistent with the property development plan under the *Wild Rivers Act 2005*?

☐ No	• A development permit is required for this aspect of development and this aspect of development requires assessment by the chief executive of DSDIP as assessment manager or concurrence agency • You must complete *IDAS form 25—Aquaculture* • End of part 7 of this checklist
☐ Yes	• This aspect of development is prohibited development and a development application can not be made for this aspect of development • End of part 7 of this checklist

Section reference:

- Sustainable Planning Regulation 2009, schedule 3, part 1, table 2, item 10
- Sustainable Planning Regulation 2009, schedule 3, part 2, table 2, item 1
- Sustainable Planning Regulation 2009, schedule 6
- Sustainable Planning Regulation 2009, schedule 7, table 2, item 28
- *Sustainable Planning Act 2009*, schedule 1, items 2 and 6

Part 8—Agriculture and animal husbandry activities

8.1 Is the proposed material change of use of premises for animal husbandry activities in a wild river high preservation area or wild river special floodplain management area?

☐ No	• Continue to question 8.2
☐ Yes	• To the extent the development is in a wild river high preservation area or wild river special floodplain management area, it is prohibited development and a development application cannot be made. If this is the only aspect of development, end of part 8 of this checklist, otherwise continue to question 8.2

8.2 Is the proposed material change of use of premises for agricultural activities in any of the following?	
• A wild river high preservation area	☐ Yes ☐ No
• A wild river preservation area or wild river special floodplain management area and the development involves the production of a high risk species	☐ Yes ☐ No
• A wild river special floodplain management area and the development is for agricultural activities that involve irrigation	☐ Yes ☐ No

- If **yes** to any of the above, this aspect of development is prohibited development and a development application cannot be made. If this is the only aspect of development, end of part 8 of checklist, otherwise continue to question 8.3
- If **no** to all of the above, continue to question 8.3

8.3 Will the development be carried out on land to which a property development plan under the *Wild Rivers Act 2005* applies?	
☐ No	• A development permit is required and this application requires assessment by the chief executive of DSDIP as assessment manager or concurrence agency • Your application must include *IDAS form 29—Agricultural activities in a wild river area* or *IDAS form 30—Animal husbandry activities in a wild river area*
☐ Yes	• Continue to question 8.4

8.4 Is the development inconsistent with any property development plan that applies to the land?	
☐ Yes	• This aspect of the development is prohibited development and a development application cannot be made. End of part 8 of checklist
☐ No	• A development permit is required and this application requires assessment by the chief executive of DSDIP as assessment manager or referral agency • Your application must include *IDAS form 29—Agricultural activities in a wild river area* or *IDAS form 30—Animal husbandry activities in a wild river area*

Section reference:

- Sustainable Planning Regulation 2009, schedule 3, part 1, table 2, item 11
- Sustainable Planning Regulation 2009, schedule 6
- Sustainable Planning Regulation 2009, schedule 7, table 2, item 41
- *Sustainable Planning Act 2009*, schedule 1, items 1 and 2

Part 9—Environmentally relevant activities (ERA)

9.1 Has an environmental authority to carry out a concurrence ERA been approved for the premises?	
☑ No	• Continue to question 9.4
☐ Yes	• Continue to question 9.2

9.2 Is the relevant ERA and the concurrence ERA approved under the environmental authority to be carried out under the environmental authority?	
☐ No	• Continue to question 9.4
☐ Yes	• Continue to question 9.3

9.3	Does the relevant ERA have a lower aggregate environmental score than the concurrence ERA approved under the environmental authority, under the Environmental Protection Regulation 2008, section 14(1)?

☐ No	• Continue to question 9.4
☐ Yes	• This aspect of development does not require a development permit. End of checklist

9.4	Do all of the following apply?

The environmentally relevant activity is to be carried out in the North Stradbroke Island Region.	☐ Yes ☑ No
The environmentally relevant activity is mentioned in the Environmental Protection Regulation 2008, schedule 2, part 4, section 16.	☐ Yes ☑ No
The environmentally relevant activity involves dredging or extracting more than 10 000 tonnes of material a year.	☐ Yes ☑ No

- If **yes** to all of the above, this aspect of development is prohibited development (to the extent it involves dredging or extracting more than 10000 tonnes of material a year) and a development application cannot be made. If this is the only aspect of development, end of checklist, otherwise continue to question 9.5
- If **no** to any of the above, continue to question 9.5

9.5	Is any part of the proposed material change of use of premises for an environmentally relevant activity intended to be located in a wild river area?

☑ No	• Go to question 9.14
☐ Yes	• Continue to question 9.6

9.6	Does the proposed development involve development in waters in a wild river area that is for an extraction ERA?

☑ No	• Go to question 9.8
☐ Yes	• Continue to question 9.7

9.7	Will the development application for the proposed development be accompanied by an allocation notice?

☑ No	• This aspect of development is prohibited development and a development application cannot be made. If this is the only aspect of development, end of checklist, otherwise continue to question 9.8
☐ Yes	• Continue to question 9.8

9.8	Does the proposed development involve development in a wild river high preservation area or a wild river special floodplain management area?

☑ No	• Go to question 9.10
☐ Yes	• Continue to question 9.9

9.9	Is the proposed development any of the following?

A sewage ERA under the *Environmental Protection Act 1994*, section 174(4)	☐ Yes ☐ No
A water treatment ERA under the *Environmental Protection Act 1994*, section 174(4)	☐ Yes ☐ No

A dredging ERA	☐ Yes ☐ No
An extraction ERA, if the activity is a low impact activity carried out outside waters and is for specified works, residential complexes, or another commercial, industrial or residential purpose in a designated urban area, in the wild river high preservation area or a wild river special floodplain management area	☐ Yes ☐ No
A screening ERA, if the activity is carried out outside waters and is for specified works, or residential complexes, in the wild river high preservation area or a wild river special floodplain management area	☐ Yes ☐ No
A crude oil or petroleum product storage ERA, if the activity is for residential complexes in the wild river high preservation area or a wild river special floodplain management area, and is carried out outside a designated urban area	☐ Yes ☐ No
An exempt prescribed ERA under the *Environmental Protection Act 1994*, section 174(4), in a designated urban area	☐ Yes ☐ No

- If **yes** to any of the above, continue to question 9.10
- If **no** to all of the above, this aspect of development is prohibited development and a development application cannot be made. If this is the only aspect of development, end of checklist, otherwise continue to question 9.10

9.10 Does the proposed development involve an extraction ERA in a wild river floodplain management area?

☑ No	• Go to question 9.12
☐ Yes	• Continue to question 9.11

9.11 Is the proposed development either of the following?

A low impact activity carried out outside waters	☐ Yes ☐ No
For specified works, residential complexes, or another commercial, industrial or residential purpose in a designated urban area, in the wild river floodplain management area	☐ Yes ☐ No

- If **yes** to either of the above, continue to question 9.12
- If **no** to all of the above, this aspect of development is prohibited development and a development application cannot be made. If this is the only aspect of development, end of checklist, otherwise continue to question 9.12

9.12 Will the development be carried out on land to which a property development plan under the *Wild Rivers Act 2005* applies?

☑ No	• Go to question 9.14
☐ Yes	• Continue to question 9.13

9.13 Is the development inconsistent with any property development plan that applies to the land?

☐ Yes	• This aspect of the development is prohibited development and a development application cannot be made. End of checklist
☑ No	• Continue to question 9.14

9.14 Is the concurrence ERA devolved to local government under the Environmental Protection Regulation 2008?

☑ No	• A development permit is required and this application requires assessment by the chief executive of DSDIP as assessment manager or concurrence agency • Your application must include *IDAS form 8—Environmentally relevant activity* • End of checklist
☐ Yes	• A development permit is required and this application requires assessment by the local government as assessment manager or concurrence agency • End of checklist

Section reference:

- Sustainable Planning Regulation 2009, schedule 3, part 1, table 2, item 1
- Sustainable Planning Regulation 2009, schedule 6
- Sustainable Planning Regulation 2009, schedule 7, table 2, item 1
- *Sustainable Planning Act 2009*, schedule 1, items 2, 9, 10, 11 and 13

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PART

2

PLANNING ASSESSMENT REPORT

> Planning Assessment Report prepared by Cardno HRP

Planning Assessment Report

Carmichael Coal Rail Project – SP1 Laydown Areas

HRP12297

Development Permit for Impact Assessable Material Change of Use

Proposed Industry, Railway Activities and Storage Facility Uses

Prepared for
Adani Mining Pty Ltd

July 2013

Cardno HRP

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1	12.07.13	Final Draft	SM		MS	
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Version	Reason for Issue	Approved for Release By	Approved	Approved Release Date

This report is based on our opinion of the town planning issues that arise from the statutory provisions relating to this site. Comments and conclusions in or construed from this report relating to matters of law are not to be relied upon. You should only rely upon the advice of your professional legal advisors with respect to matters of law. This report is provided on the basis that our standard Terms and Conditions apply. For a copy, please contact us or visit:
http://www.cardno.com/en-au/AboutUs/CardnoHRP/Documents/Cardno%20HRP%20Terms%20and%20Conditions.pdf. Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno HRP is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person

Table of Contents

Part 5 Stormwater and Hydraulics

Stormwater Management Strategy for Laydown Areas prepared by Cardno

Stormwater Management Strategy Concrete Batching Plants

Stormwater Management Strategy for the Maintenance Yard and Laydown Facility prepared by Cardno

Part 6 Environmentally Relevant Activities

Information in Support of an Application for an Environmentally Relevant Activity 8 (Chemical Storage) prepared by Cardno

Information in Support of an Application for an Environmentally Relevant Activity 63 (Sewage Treatment) prepared by Cardno

Part 7 Transport and Traffic

Laydown Area Transport Assessment Strategy prepared by Cardno

Part 8 Civil Plans and Drawings

Civil Engineering Drawings prepared by Cardno

Part 9 Ecology

Ecological Assessment prepared by Saunders Havill

Figures

Tables

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1 Details of Application

1.1 Site Details

Table 1: Site Details

Real Description & Land Owner or Lessee	Seven (7) separate allotments described as follows: > Lot 662 on CP PH1491 (Moray Downs) - Adani Mining Pty Ltd - Leasehold > Lot 3 on BL26 (Cassiopeia) - Graham Stanley Wilkinson & Zoe Ann Wilkinson - Freehold > Lot 637 on PH1980 (Elgin Downs) - Elgin Downs Pastoral Company Pty Ltd - Leasehold > Lot 1 on SP147546 (Goodawa) - Edwin Francis Dennis & Patricia Robyn Dennis – Crown Land / Leasehold > Lot 4 on SP116046 (Disney) - Paul Joseph Kirkwood, Margaret Agnes Kirkwood & Timothy John Kirkwood - Leasehold > Lot 10 on BL49 (Avon Downs) - Richard Hugh Simmons & Robyn Jane Simmons - Leasehold > Lot 1 on SP118814 (Talki) - Stephen Peter Lund - Leasehold
Existing Uses	Mining Exploration / Cattle Grazing
Local Government Authority	Isaac Regional Council
Regional Planning Designation	Regional Landscape and Rural Production Area of the Mackay Isaac and Whitsunday Regional Plan
Applicable Planning Scheme	Planning Scheme for the Shire of Belyando
Planning Scheme Designation	Rural Zone (all sites)
Previous Council Approvals	Nil

1.2 Application Details

Table 2: Application Details

Development Type	Development Permit Material Change of Use – 'Industry', 'Railway Activities' and 'Storage Facility' Environmentally Relevant Activity 8 – Chemical Storage (Maintenance Facility, Construction Depot & Concrete Batching Plants) Environmentally Relevant Activity 63 – Sewerage Treatment (Maintenance Facility and Construction Depot)
Defined Planning Scheme Use – Planning Scheme for the Shire of Belyando	*"Industry" – means "premises" used for:* *an industrial activity such as:* *a) a manufacturing process whether or not such process results in the production of a finished article;* *b) the breaking up or dismantling of any goods or article for trade, sale, or gain, or ancillary to any business;* *c) repairing, servicing and cleaning of articles, including vehicles, machinery; or* *d) an operation connected with the installation of equipment and services but not including on-site work on "premises"; and* *the following activities when carried out in connection with an industrial activity:* *a) the storage of goods used in connection with or resulting from an industrial activity;* *b) the provision of amenities for persons engaged in an industrial activity;*

	c) the sale of goods resulting from but ancillary to an industrial activity; and *d) any work of administration or accounting.* *"Railway activities" – means "premises" used for the purposes of planning, construction, maintaining and operating rail infrastructure, facilities and rolling stock, including:* *(1) rail maintenance depots;* *(2) rail workshops; and* *(3) rail freight centres.* *"Storage facility" – means "premises" used for the storage of goods, and may include the selling of those goods by wholesale. The term includes storage activities such as a builder's yard or construction contractor's yard, a truck, vehicle or plant parking depot. The term also includes the following activities when carried out in connection with a storage activity:* *(1) the work of administration or accounting; and* *(2) the garaging and routine servicing of vehicles associated with the conduct of the storage activity.*
IDAS Process	Development Permit
Level of Assessment	Impact Assessment
Proposal Summary	The proposal seeks approval for the establishment of laydown and maintenance facilities required to facilitate the construction and ongoing maintenance of the SP1 portion of the proposed Carmichael Coal Railway Line. The sites proposed to be established as part of this application are essential to facilitating an efficient and economically viable construction process in addition to allowing for ongoing operational maintenance of the line. The proposed railway line is a vital component of the Carmichael Coal Mine and Rail Project which is a proposal deemed to be of 'State Significance'. The SP1 section of the line will travel a total distance of approximately 120km from east to west. The line begins at the locality of Diamond Creek situated 66km west of Moranbah and traverses a large tract of isolated land to the locality of Moray Downs which is situated adjacent to the proposed mine site. The proposal involves the establishment of 68 different sites that are required to support a variety of different uses that are essential to the construction and ongoing maintenance of the proposed Carmichael Coal Mine Railway Line. The proposal includes a mix of temporary and permanent uses such as temporary construction material laydown areas, temporary concrete batching plants, a construction/welding facility and a permanent rolling stock maintenance yard. A list of all sites types included in the proposal is as follows: > Turning Circle Areas (temporary) > Track Laydown Areas (temporary) > Bridge Laydown Areas (temporary) > Concrete Batching Plants (temporary) > Construction Depot (temporary) > Maintenance Facility (permanent) The sites included in this development application are required to be established in order to ensure that an efficient, timely and cost effective construction process be can be facilitated for the proposed railway line. A number of the sites will also ensure that ongoing maintenance of the track and rolling stock can occur throughout its operational lifetime. The location of each of the proposed sites was determined through a combination of response to environmental constraints, proximity to potential construction sites (bridges) and required separation intervals along the line. There are a number of instances throughout the proposal where uniform spacing has not been achieved due to the need respond to local environmental conditions such as the presence of protected vegetation and waterway corridors. The application also seeks approval for two environmentally relevant activities (ERAs) including ERA 8 (Chemical Storage) and ERA 63 (Sewage Treatment). ERA 8 relates to the establishment of a locomotive refueling facility at the proposed maintenance facility and the establishment of fuel storage locations at various points along the line including the concrete batching plants and the construction depot. ERA 63 is proposed in order to allow for the establishment of a sewage treatment facility at the proposed maintenance facility and the proposed construction depot. A report containing the relevant information required to obtain ERA approval is contained in Part 5 of the

	application package. This town planning application is supported by a number of specialist reports which demonstrate that all sites are appropriate from a technical perspective including civil design, stormwater management, flood management, transport management and operational management of the various industrial type facilities. The reports provided as part of the application include Site Based Management Plans, Stormwater Management Strategies and Traffic Management Plans. Copies of these reports are contained within Parts 4-7 of the application package. The report also draws on a large suite of technical studies which have been prepared by the Applicant as part of an EIS and Supplementary EIS for the Carmichael Coal Mine and Rail project under the parallel Coordinated Project process. In summary, the establishment of the various sites included within this proposal is vital to ensuring that the proposed Carmichael Coal Mine and Rail Project, which is deemed to be of State Significance, can proceed in a timely and cost effective manner. The construction of the rail line to the proposed mine is essential to the operation of the facility and the various sites included within this proposal are vital in ensuring that construction of the rail line can occur. This report demonstrates that the proposal meets all relevant requirements of the Belyando Planning Scheme and our assessment has established that the proposed development does not conflict with the planning scheme or any other relevant planning instrument.
Referral Agencies	This development application will not be referred to Queensland Single State referral Agency as the exemptions provided under Section 37 of the *State Development and Public Works Organisation Act 1971* are sought as part of this application. Consequently, the relevant State Development Assessment Provisions (SDAP) have not been addressed as part of this application.
Applicant	Adani Mining Pty Ltd
Applicant's Representative	Cardno HRP PO Box 2855 NERANG QLD 4211 Telephone: (07) 5594 1322 Facsimile: (07) 5594 1366
Relevant plan(s)	Civil Engineering Drawings dated April 2013 as prepared by Cardno Stormwater Management drawings dated April/June 2013 as prepared by Cardno Proposal Location Plans as prepared July 2013 as prepared by Cardno

2 Introduction

2.1 Overview

This planning report has been prepared for Adani Mining Pty Ltd, the proponent of the development described within the **Table 2 above**. The purpose of this Planning Report is to provide a town planning assessment in support of the development of proposed construction and maintenance facilities that are required to facilitate the construction and ongoing maintenance of the SP1 section of the proposed Carmichael Coal Rail Project. The proposal involves the creation of a total of 68 different sites which are of varying size and purpose that are all directly associated with either the construction process or ongoing maintenance of the proposed railway line.

The subject development application is intended to be provided to the Coordinator General as part of the Supplementary Environmental Impact Statement (SEIS) submission for the Carmichael Coal Mine and Rail Project. The purpose of the inclusion of this document within the SEIS is to facilitate particular exemptions from the supplementary IDAS process that are afforded under the *State Development and Public Works Organisation Act 1971* (SDPWO Act).

The sites that are proposed to be established are to be located along the SP1 section of the proposed railway line which travels from east to west a total distance of approximately 120km. The line begins at the locality of Diamond Creek situated approximately 66km west of Moranbah and travels to the locality of Carmichael adjacent to the proposed mine facility. The SP1 section of the proposed railway corridor is the western portion of the entire line and is essentially isolated with no direct connection to existing railway infrastructure. Approval for the laydown areas associated with the SP2 (eastern) section of the line will be applied for at a later date. Please refer to **Figure 1** on page 8 of this report for a general illustration of the entire railway corridor.

The sites that are included in this application will be located within a total of seven (7) separate allotments which are all traversed by the proposed SP1 rail alignment. The in terms of allotments, the property locally known as 'Moray Downs', described as Lot 662 on PH1491, contains the largest number sites with 21 different locations proposed to be established within this property. The remaining 47 sites are spread across the remaining six allotments.

The proposal involves a combination of temporary and permanent facilities that have been situated based on both the needs of the proposed railway and a response to the local topography and environment. The general location of all sites proposed as part of this application was informed by the various studies undertaken as part of the EIS process. Ideally, most site types are to be located equidistant along the line however, this has not always been possible given local environmental constraints such as flooding and remnant vegetation. This has resulted in a generally non-uniform spacing between certain site types but this is necessary in order to minimise impact upon the local environment.

The proposal involves various types of laydown areas that are intended for the storage of materials required for the construction of the new railway. These facilities will allow for various types of materials to be stored at a location close to where they will be utilised as part of the construction process. There are two types of specific laydown areas proposed; one for the storage of railway line material and another for the storage of bridge materials.

Turning Circles

The establishment of turning circle areas is an aspect of the proposal which will allow for large vehicles (such as B-triples) delivering materials along the corridor to safely manoeuvre and then travel in the opposite direction. The turning circle sites are temporary facilities and all will have access to the proposed access track which will run along the proposed rail corridor. All turning circle sites are located on the northern side of the rail corridor in accordance with the location of the proposed access track.

Concrete Batching Plants

The proposal includes the establishment of five (5) separate concrete batching plant locations which will provide the concrete needed for the construction of the railway line. The concrete batching plants are

essential to the construction process in their proposed locations as it is not feasible to transport concrete from an existing plant or one constructed within an existing urban centre.

Maintenance Yard and Construction Depot

The proposal includes two larger sites including a permanent rolling stock maintenance yard and a temporary construction depot which will only be required for the construction process. The maintenance yard is essential to the ongoing operation and safety of the proposed rail line as it will allow for rolling stock to be serviced, refuelled and maintained in a location close to the mine itself.

The construction depot will contain a variety of components that will combine to form a central facility that facilitates the ongoing construction process. The area in which the construction depot will be located is located within an 'L' shape configuration with the remainder of the overall triangular area to be utilised for the purposes of material storage, namely rail line and sleepers. However, the main focus of activities will be within the 'L' shaped area to the west of the site.

Environmentally Relevant Activities

The proposal also seeks approval for a number of Environmentally Relevant Activities (ERAs) including ERA 8 – Chemical Storage and ERA63 – Sewage Treatment. ERA 8 approval is sought for the establishment of a diesel storage at the Maintenance Yard, Construction Depot and all of the proposed concrete batching plants. The diesel storage facilities will be utilised for a combination of vehicle refuelling, rolling stock refuelling and fuel supply for the proposed power generators. Approval for ERA63 is sought for the establishment sewage treatment facility within the proposed Construction Depot and Maintenance Yard.

Summary

The proposal forms part of a larger infrastructure project within the region that has been deemed to be of State Significance. When completed, the Carmichael Coal Mine and Rail Project will represent a major increase in employment opportunities within the region and the establishment of railway corridor is an essential component in the mineral extraction process. The subject proposal is critical to ensuring that the construction of the rail line can occur.

As demonstrated by this report, the proposal is appropriate for the land in which it is situated and will not result in any significant adverse impacts upon the local environment. The proposal meets all relevant requirements of the Belyando Planning Scheme. It does not conflict with the planning scheme or any other relevant statutory planning instrument.

This report should be read in conjunction with the following documentation:

- Response to Rural Zone Code of the Planning Scheme for the Shire of Belyando (**Part 3**);
- Stormwater Management Strategies prepared by Cardno (**Part 4**);
- Information in Support of Application for an Environmentally Relevant Activity prepared by Cardno (**Part 5**);
- Traffic Impact Assessment prepared by Cardno (**Part 6**); and
- Civil Engineering Drawings prepared by Cardno (**Part 7**)

Summaries of these reports are included in this Application Package, with full copies of the technical reports appended.

2.2 Key Planning Matters

The proposed development of the site constitutes development as defined by Section 7 of the *Sustainable Planning Act 2009* ("the SPA"). More specifically, the proposal seeks a development permit for an Impact Assessable Material Change of Use ("MCU").

The key planning issues considered necessary to be addressed in the assessment of this proposal are as follows:

- **Appropriateness of proposed uses within Rural Zone designation** – The proposal involves the establishment of 'Railway Activities' and 'Storage Yard' uses within the Rural Zone which are not

identified within the Table of Assessment for this land designation. The proposal also involves the establishment of an 'Industrial Activities' use within the Rural Zone with a 'total use area' (as defined by the scheme) greater than 150m². This report therefore demonstrates that the proposed facilities are appropriate within the Rural Zone and will not significantly impact upon the amenity or long term viability of land included within this designation.

It should be noted that the establishment of the above uses within the Rural Zone is not considered to be inconsistent with the planning scheme. However, given the impact assessable designation, this report seeks to demonstrate that compliance with the applicable performance criteria has been achieved.

3 Background

3.1 Overview of Carmichael Coal Mine and Rail Project

Adani Mining Pty Ltd commenced an Environmental Impact Statement (EIS) process for the Carmichael Coal Mine and Rail Project in 2010. On 26 November 2010, the Queensland (Qld) Office of the Coordinator General declared the Project a 'significant project' and the Project was referred to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (referral No. 2010/5736). The Project was assessed to be a controlled action on the 6 January 2011 under section 75 and section 87 of the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The controlling provisions for the Project include:

- World Heritage properties (sections 12 & 15A)
- National Heritage places (sections 15B & 15C)
- Wetlands (Ramsar) (sections 16 & 17B)
- Listed threatened species and communities (sections 18 & 18A)
- Listed migratory species (sections 20 & 20A)
- The Great Barrier Reef Marine Park (GBRMP) (sections 24B & 24C).

The Qld Government's EIS process has been accredited for the assessment under Part 8 of the EPBC Act in accordance with the bilateral agreement between the Commonwealth of Australia and the State of Queensland.

The Proponent prepared an EIS in accordance with the Terms of Reference (ToR) issued by the Qld Coordinator-General in May 2011 (Qld Government, 2011). The EIS process is managed under section 26(1)(a) of the *State Development and Public Works Act 1971* (SDPWO Act), which is administered by the Qld Government's Department of State Development, Infrastructure and Planning (DSDIP).

The EIS, submitted in December 2012, assessed the environmental, social and economic impacts associated with developing a 60 million tonne (product) per annum (Mtpa) thermal coal mine in the northern Galilee Basin, approximately 160 kilometres (km) north-west of Clermont, Central Queensland, Australia. Coal from the Project will be transported by rail to the existing Goonyella and Newlands rail systems, operated by Aurizon Operations Limited (Aurizon). The coal will be exported via the Port of Hay Point and the Point of Abbot Point over the 60 year (90 years in the EIS) mine life.

Project components are as follows:

- The Project (Mine): a greenfield coal mine over EPC 1690 and the eastern portion of EPC 1080, which includes both open cut and underground mining, on mine infrastructure and associated mine processing facilities (the Mine) and the Mine (offsite) infrastructure including a workers accommodation village and associated facilities, a permanent airport site, an industrial area and water supply infrastructure.
- The Project (Rail): a greenfield rail line connecting to mine to the existing Goonyella and Newlands rail systems to provide for the export of coal via the Port of Hay Point (Dudgeon Point expansion) and the Port of Abbot Point, respectively including:
    - Rail (west): a 120 kilometre (km) dual gauge portion running west from the Mine site east to Diamond Creek (referred to in this report as SP1).
    - Rail (east): a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella rail system south of Moranbah (referred to in this report as SP2)
    - Quarries: The use of five (5) local quarries to extract quarry materials for construction and operational purposes.

Figure1 below provides a general illustration of the overall rail corridor and mine lease location. It is noted that blue section of line in the diagram is the section relevant to this particular application as it represents the SP1 section of the line.

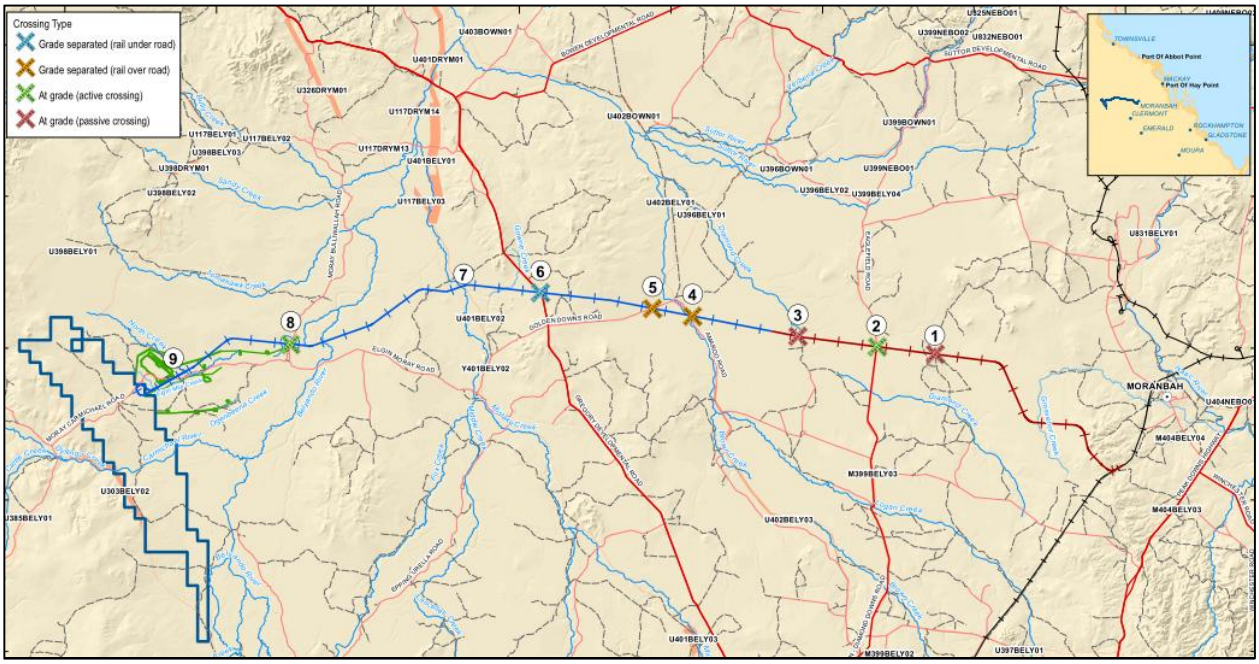


Figure 1: General Outline of Rail Corridor – SP1 Section of Line Shown in Blue (Source GHD)

Figure 2 below provides a general illustration of the major facilities, waterway crossings and road crossings proposed as part of the rail construction. The below diagram is general in nature and more detail illustration of the proposed site are contained later in this report.

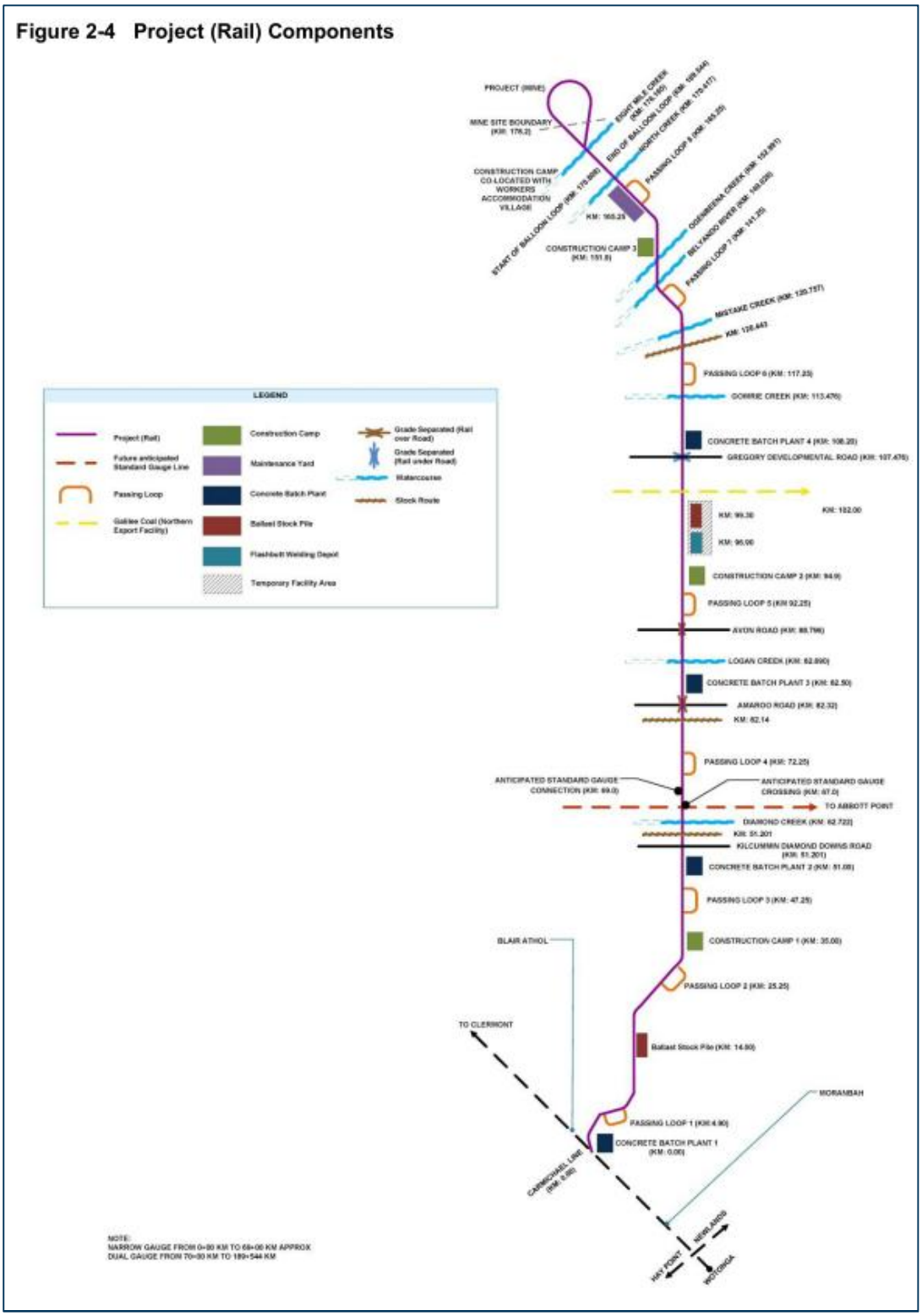


Figure 2: **General Location of Proposed Construction and Maintenance Facilities along Rail Corridor - Indicative Only (Source GHD)**

3.2 Legislative Status

The Project has been declared a Coordinated Project[1] for which an Environmental Impact Statement (EIS) is required under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) and as such, an Environmental Impact Statement (EIS) is required for the Project. The Project is also a 'controlled action' and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This development application had been prepared for inclusion with the Supplementary EIS document being submitted to the Coordinator General for the proposed Carmichael Coal Mine and Rail Project. The inclusion of the application within the Supplementary EIS submission will allow for the application to be assessed as part of this particular process. It is noted that the inclusion of the documents within the Supplementary EIS submission does not negate the need for the lodgement of a development application to Isaac Regional Council in the future. However, should the application be approved as part of the Supplementary EIS submission, the eventual application to Council will be afforded the benefits of the exemptions granted under Section 37 of the SDPWO Act. This section of the Act overrides certain components of the standard IDAS development application process.

3.3 Exemptions under the State Development and Public Works Organisation Act 1971

The SDPWO Act 1971 contains a number of sections pertaining to the IDAS process which acknowledge the high level assessment that is undertaken as part of the EIS approval process. The act contains sections which allow for the submission of development applications as part of the EIS process. Specifically, Section 37 of the SDPWO Act is relevant to this particular application and states the following:

37 Applications for material change of use or requiring impact assessment

(1) To the extent the application is for a material change of use, or requires impact assessment, under the Sustainable Planning Act, or both—

(a) the information and referral stage and the notification stage of IDAS do not apply to the application; and

(b) there are no referral agencies, under the Sustainable Planning Act, for the application; and

(c) a properly made submission about the EIS is taken to be a properly made submission about the application under IDAS; and

(d) despite paragraph (b), until the development approval applied for has effect—

(i) the Coordinator-General's report is taken to be a concurrence agency's response for the application under IDAS; and

(ii) the Coordinator-General may exercise any power of the entity that, other than for paragraph (b), would have been the concurrence agency for the application.

(2) Subsection (1)(c) does not apply if the application involves only a material change of use requiring code assessment under the Sustainable Planning Act.

The items (a) and (b) of Section 37 above are most relevant. These sections state that development applications (that are impact assessable) approved as part of the EIS process are not subject to the Information and Referral Stage and the Notification Stage of the IDAS process. This is a significant consideration in terms of preparation and assessment of the subject development application.

This proposal is subject to impact assessment as it is proposed to establish various uses within the Rural Zone of the Belyando Planning Scheme that are defined as being Impact Assessable under that particular zone of the scheme. It is for this reason that the development application for all of construction and

[1] previously referred to as a Significant Project

maintenance facilities is being included within the Supplementary EIS submission to the Coordinator General.

Given that this application is to be considered under Section 37 of the SDPWO Act, minimal information has been provided in regard to the jurisdiction of the Queensland Single State Referral Agency.

4 Context Analysis

4.1 Regional Context Analysis

This application relates to a large section of land located within the Central West Region of Queensland. All land included in this proposal is situated within the corridor of the proposed SP1 section of the Carmichael Coal Mine Railway Line. The line commences approximately 69km north-west of Moranbah and continues approximately 120km west to a location adjacent to the proposed Carmichael Coal Mine.

The SP1 section of the rail corridor traverses a relatively isolated area of Queensland dominated by cattle grazing uses. The region is devoid of any noteworthy urban development except for the regional centres of Clermont and Moranbah. These centres are both located a relatively large distance from the entire SP1 section railway corridor with separation from these centres increasing as the rail line moves west from its starting point at Diamond Creek. The lack of nearby regional centres and accommodation facilities is reflected in the fact that separate applications have been prepared for temporary workers accommodation at various locations along the proposed railway.

Isolated cattle stations represent the most common land use in the region in addition to extractive industries. The land is generally characterised as being isolated cattle grazing land with little or no urban development. As identified within the submitted EIS documents for the project, the closest homestead to the SP1 section of the line is located 2km from the proposed railway line.

Figure 3 below provides a high level illustration of the land through which the SP1 section of the railway line traverses showing Moranbah to the west and Clermont to the south.

Figure 3: Regional Overview of Line Location (Source – Google Earth)

4.2 Subject Site Analysis

4.2.1 Location and Real Property Description

The proposal incorporates a total of seven (7) separate allotments in which all of the proposed 68 sites will be located. In all cases, the allotments are comparatively large compared to the combined total area of the use that is proposed to occur within the land holding. The total area of the proposed uses within each allotment is only a small fraction of the total lot area and in some instances only a very small portion of the allotment is affected with the line only traversing a small corner of the property.

A summary of all allotments included in the application in order from west to east is as follows:

- Lot 662 on PH1491 (Moray Downs) - Adani Mining Pty Ltd
- Lot 3 on BL26 (Cassiopeia) - Graham Stanley Wilkinson & Zoe Ann Wilkinson
- Lot 637 on PH1980 (Elgin Downs) - Elgin Downs Pastoral Company Pty Ltd
- Lot 1 on SP147546 (Goodawa) -Edwin Francis Dennis & Patricia Robyn Dennis
- Lot 4 on SP116046 (Disney) - Paul Joseph Kirkwood, Margaret Agnes Kirkwood & Timothy John Kirkwood
- Lot 10 on BL49 (Avon Downs) - Richard Hugh Simmons and Robyn Jane Simmonds
- Lot 1 on SP118814 (Talki) - Stephen Peter Lund

A list of each allotment included in the proposal and the development proposed to occur on the land is contained in **Table 4** below. The description of the development occurring within each lot should be read in conjunction with **Figures 4-6** in Section 4.2.2 below.

Table 3: Summary of Development Occurring on Each Allotment

Land Holding and Description of Development	Proposed Type of Development
Lot 662 on CP PH1491 (Moray Downs) Summary The Moray Downs property is to contain the largest number of sites out of all land holdings included in the application. This is due to a significant portion of the SP1 rail line being located within this property. The proposed rolling stock maintenance facility and two concrete batching plants are contained within this allotment.	> Turning Circle Sites: 8 > Track Laydown Sites: 5 > Bridge Laydown Sites: 5 > Batching Plants: 2 > Maintenance Yard: 1 **Total Sites: 22**
Lot 3 on BL26 (Cassiopeia) Summary The proposed railway line traverses the north western corner of this property.	> Turning Circle Sites: 3 > Track Laydown Sites: 1 > Bridge Laydown Sites: 2 **Total Sites**: **6**
Lot 637 on PH1980 (Elgin Downs) A sizeable portion of the railway line traverses this property. The line passes through the northern and southern boundaries of the lot.	> Turning Circle Sites: 3 > Track Laydown Sites: 2 > Bridge Laydown Sites: 2 **Total Sites: 7**
Lot 1 on SP147546 (Goodawa) A small section of the line passes through the south-eastern corner of this lot and runs parallel to the lot's southern boundary.	> Turning Circle Sites: 1 > Track Laydown Sites: 1 > Bridge Laydown Sites: 2 **Total Sites: 4**
Lot 4 on SP116046 (Disney) This allotment contains the second largest number of sites and the railway line runs immediately adjacent to this allotment's southern boundary. This allotment contains the construction depot and a concrete batching plant.	> Turning Circle Sites: 5 > Track Laydown Sites: 4 > Bridge Laydown Sites: 3 > Batching Plants: 2 > Construction Depot: 1

Land Holding and Description of Development	Proposed Type of Development
	Total Sites: 15
Lot 10 on BL49 (Avon Downs) The line travels east to west through this site and the SP1 section of the line begins 1.5km from the eastern boundary of the property. It is noted that the corridor within this property is broken by a section which crosses through the northern extremity of the Talki property to the south.	> Turning Circle Sites: 5 > Track Laydown Sites: 5 > Bridge Laydown Sites: 2 > Batching Plants: 1 **Total Sites: 13**
Lot 1 on SP118814 (Talki) The line contained within the allotment is limited a small section crossing the northernmost section of the lot. The corridor enters and exits this allotment via Avon Downs.	> Turning Circle Sites: 1 > Bridge laydown Sites: 1 **Total Sites: 2**
	> Total Number of Sites - **68**

4.2.2 Location of Railway Corridor in Relation to Land Holdings

Figures 4-6 below provides an illustration of the proposed rail line in relation to the landholdings it will traverse. The figures are important in demonstrating that only very small portions of most allotments will be affected by the presence of the rail line and all sites proposed to be established as part of this application are focused around the proposed rail corridor.

Figure 4 below provides an illustration of the total extent of Lot 10 on BL49 and Lot 1 on SP118814 in relation to the approximate location of the proposed railway line.

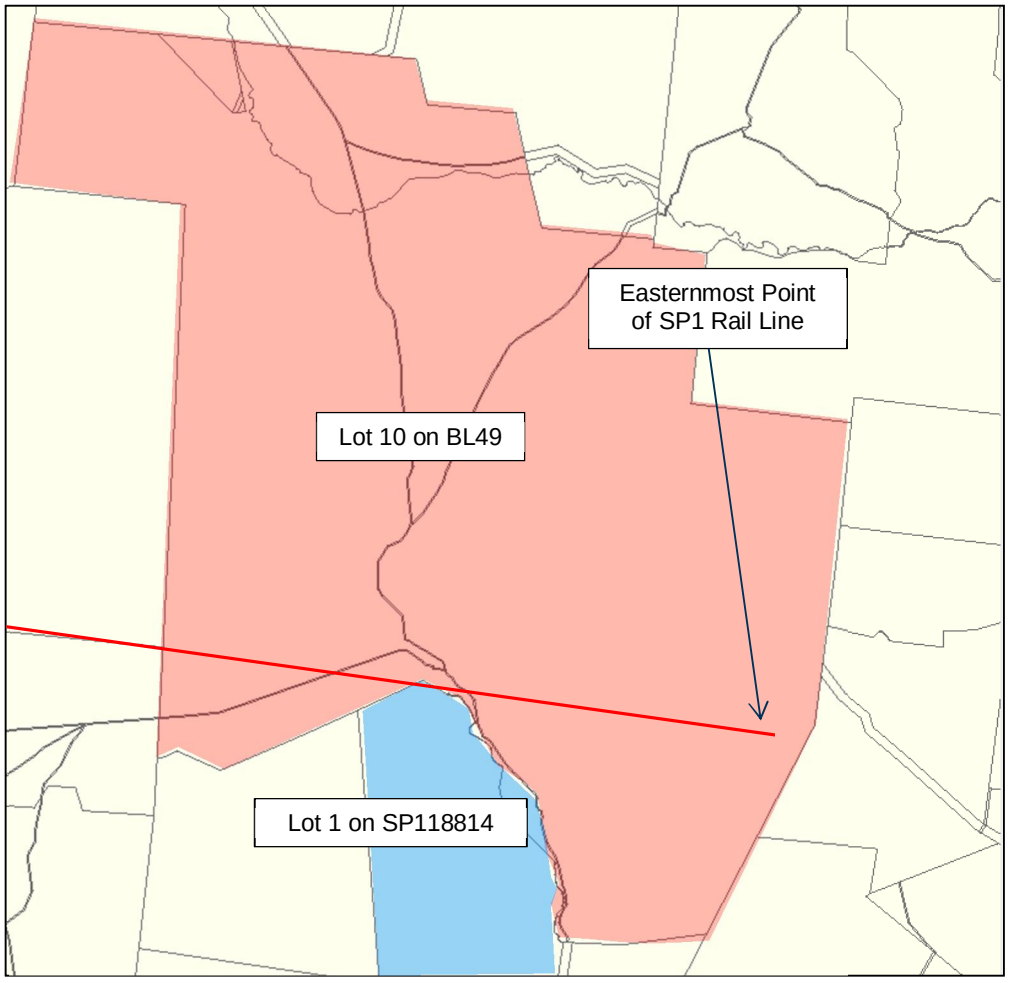


Figure 4: Cadastral Map of Proposed Rail Line (Map 1) – Source DNRM (cadastral base)

Figure 5 below provides an illustration of the total extent of Lot 4 on SP116046 in relation to the approximate location of the proposed railway line.

Figure 5: **Cadastral Map of Proposed Rail Line (Map 2) – Source DNRM (cadastral base)**

Figure 6 below provides an illustration of the total extent of Lot 1 on SP147546, Lot 637 on PH1980 and Lot 662 on PH1491 in relation to the approximate location of the proposed railway line.

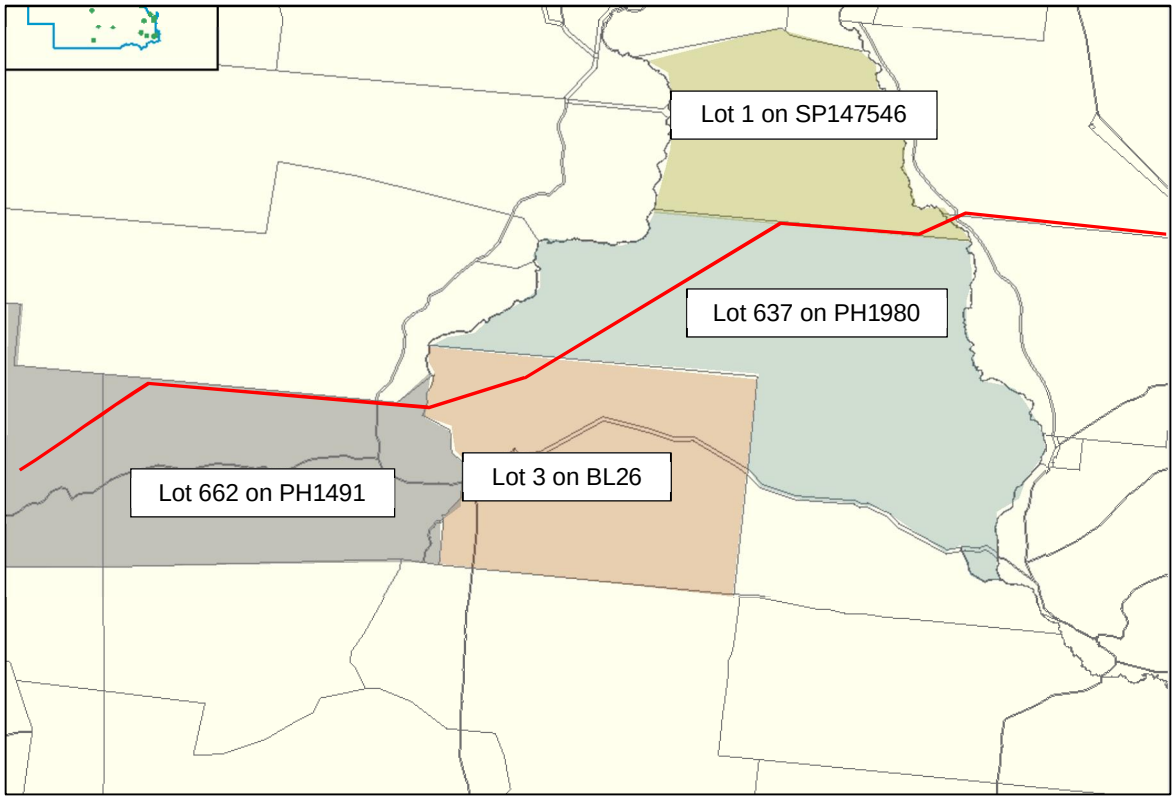


Figure 6: **Cadastral Map of Proposed Rail Line (Map 3) – Source DNRM (cadastral base)**

4.2.3 Existing Significant Vegetation

All sites included in the proposal have been located to ensure that impacts upon protected vegetation are minimised wherever possible. The proposed site locations have been primarily determined as part of the investigations undertaken as part of the submitted EIS documentation for the entire Carmichael Coal Mine and Rail Project and in particular, the studies undertaken to determine the location of the rail line itself. Consequently, a full assessment against the State vegetation mapping has not been undertaken for each individual site proposed as part of this application.

For further information in regard to vegetation issues please refer to the Ecological Report prepared by Saunders Havill contained in **Part 9** of the application package.

4.2.4 Flooding and Drainage

Please refer to the detailed Stormwater Management Strategies described in **Section 8** of this report and contained in **Part 4** of the application package for a full description of all flooding and stormwater related issues.

4.2.5 Agricultural and Strategic Cropping Value

As part of the preparation of the proposed rail corridor alignment, careful consideration was taken to ensure that minimal impacts on Strategic Cropping Land occurred. As illustrated in **Figure 7** overleaf, the alignment generally avoids areas of high value cropping land. It is noted that the Category 1 (red) designation corresponds with the State Mapping for Strategic Cropping Land. It is therefore evident that no laydown areas with the SP1 alignment are contained with high value strategic cropping land. Regardless of the designation, all sites are located within the scope of the rail corridor and strategic cropping land issues are to be considered as part of the assessment of the EIS submission.

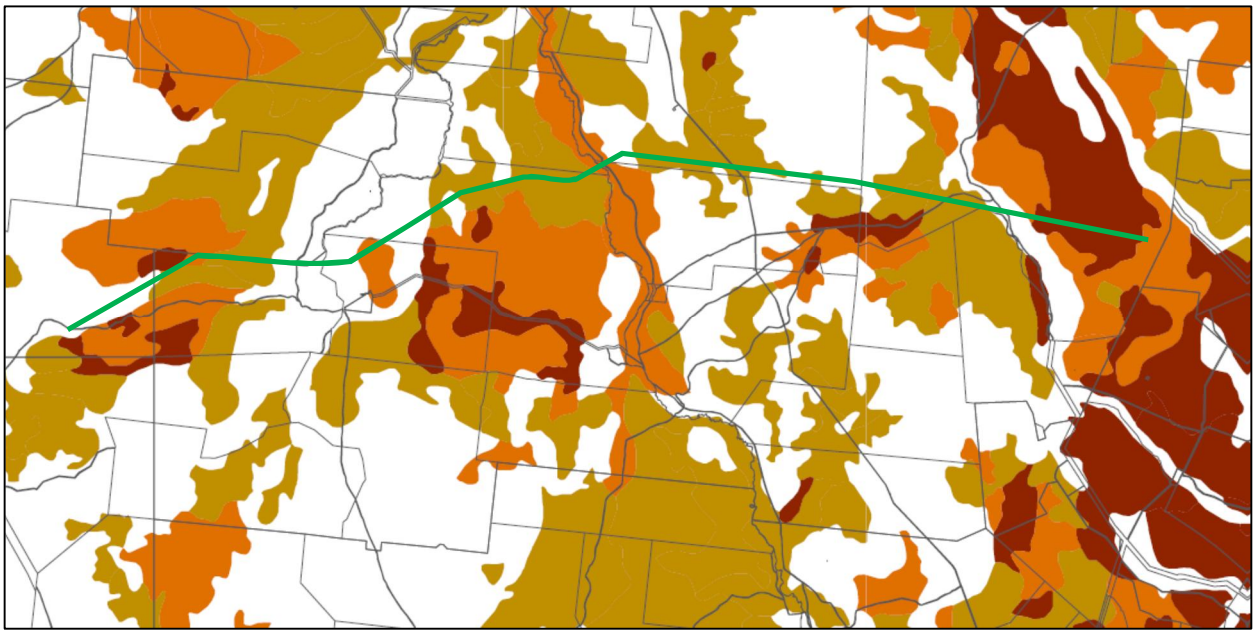


Figure 7: **Strategic Cropping Land Map from Belyando Planning Scheme**

4.2.6 Infrastructure

None of the sites included in this application are currently serviced by trunk infrastructure connections (other than some roads) such as electricity, water supply, sewerage treatment or telecommunications. The majority of the sites included in this application do not require any form of infrastructure to be provided given that they are temporary, open air storage facilities. All required infrastructure for the concrete batching plants, maintenance yard and construction depot will be provided on site in the form of a sewerage treatment plant and on-site electricity generators.

4.2.7 Proximity to Sensitive Receivers

As part of the EIS process for the entire project, a number of studies were undertaken in regard to the proximity of existing potential sensitive receivers to the proposed railway line. Reference is made to 'Volume 3, Section 9 – Noise & Vibration' of the submitted EIS which was prepared by GHD and investigates the potential sensitive receivers in the area. This report identified as total of nine (9) sensitive receivers (only seven relevant to the SP1 section of the line) which are identified as existing homesteads. **Figure 8** overleaf prepared by GHD identifies the location of the existing homesteads and their approximate distance from the proposed railway. The report identifies that all existing homesteads are located sufficient distance from the rail corridor to ensure that potential negative impacts are minimised.

Potential Receptors	Easting	Northing	Approximate Distance from the Project (Rail) (m)	Description/Comment
1	462027	7572602	3,300	Homestead
2	475674	7575617	3,000	Homestead
3	482139	7579957	3,000	Homestead
4*	494429	7589482	4,200	Homestead (Disney)
5	525174	7583086	2,000	Homestead
6	546218	7578704	1,600	Homestead
7	555680	7578811	3,000	Homestead
8*	561038	7577015	1,900	Homestead (Mullawa)
9	439688	7576039	6,700	Project (Mine) Mine Village

*Denotes monitoring location.

Figure 8: Table showing distance of potential sensitive receivers from proposed railway (Source – GHD)

The locations identified in GHD's table shown in **Figure 9** above are identified in the map contained in **Figure 10** below. Please note that sites 6, 7 and 8 are not relevant to this application as they are located adjacent to the SP2 section of the line.

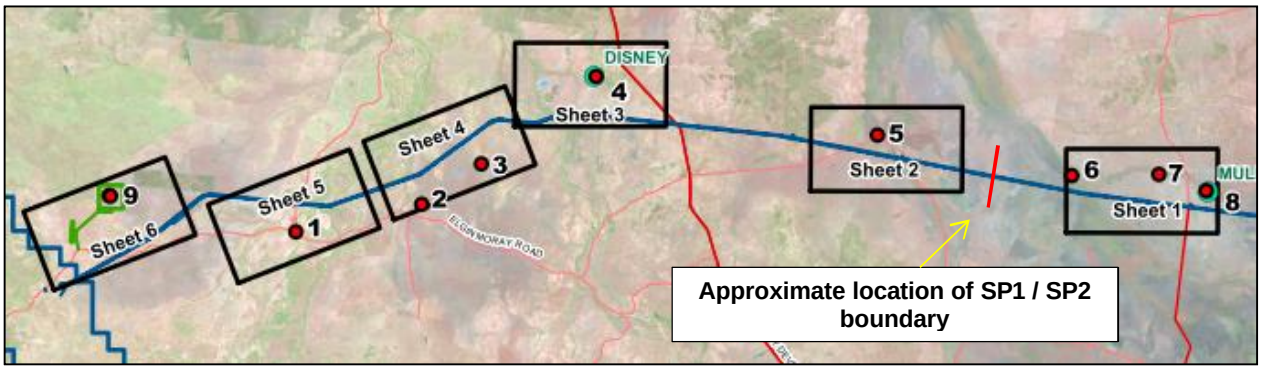


Figure 9: Map showing potential sensitive receivers (Source – GHD)

4.3 Referral Review

As outlined earlier in this report, this application has been prepared in accordance with the EIS document being submitted to the Coordinator General for the Carmichael Coal Mine and Rail Project. Should this development application be approved as part of the EIS process under Section 37 of the *State Development and Public Works Organisation Act 1971,* the Information and referral Stage of the IDAS process is not required to be undertaken and therefore referral to the Single State Assessment Referral Agency is not required. It is for this reason that this application package does not include a response to the recently implemented State Development Assessment Provisions (SDAP).

5 Proposal

5.1 Overview

The proposal seeks approval for the establishment of various facilities required for the construction and ongoing maintenance of the SP1 section of the proposed Carmichael Coal Rail Project. The proposal includes a mix of basic construction material laydown areas, concrete batching plants, construction yards and a permanent maintenance facility. All sites are essential to the construction of the Carmichael Coal Mine Railway Line and have been located to ensure minimum impacts upon the surrounding environment. The proposal does not seek approval for any part for the railway corridor itself. It only seeks to establish the infrastructure required to support the construction process and ongoing maintenance of the railway line.

The proposal involves a total of 68 sites of varying size, shape and purpose. The majority of the sites included in this application require minimal construction and are simply intended to facilitate the storage of construction materials. A small number of other sites involve the establishment of more significant facilities including concrete batching plants, construction depot and a rolling stock maintenance facility. The maintenance facility is proposed to be established for the life of the mine and is intended to allow for ongoing maintenance of the railway line and rolling stock.

This application is supported by a variety of specialist reports which cover the construction and operational requirement of all sites included in this application. The specialist information is contained within **Parts 4-7** of the application package and includes Stormwater Management Strategies, Site Based Management Plans, a Traffic Management Strategy and Civil Engineering Drawings.

The establishment of the proposed sites is essential to the viability of the proposed Carmichael Coal Mine and Rail project. Without the establishment of the sites include in this application, the construction of the railway line cannot occur and this is an essential component of the mine operation itself.

The proposed site locations and types have been anticipated as part of the Environmental Impact Statement that has been submitted to the Coordinator-General for the proposed Carmichael Coal Mine and Rail Project. Whilst the application does not rely on the information contained within the EIS, it should be noted that significant investigations have occurred in relation to the location of all proposed sites. The presence of protected vegetation and other environmental constraints was a significant factor in determining the proposed locations. This is reflected in the fact that a uniform spacing distance has not been adopted for certain site types such as turnaround facilities and track laydown areas.

The separation between the rail corridor and sensitive development is considered to be an advantage in that the potential for adverse impacts on the amenity of local residents are minor. The size of the sites in relation to the landholdings in which they are located also minimises the proposal's potential to adversely impact the rural amenity and agricultural production value of the region.

In summary, the proposed development is an essential part of an infrastructure project that has been deemed to be of State Significance. The proposed rail line is essential to the operation of the Carmichael Coal Mine and without the establishment of the sites included within this application, the construction of the rail line cannot occur.

5.2 Proposed Land Uses and their definitions

The proposed development will consist of a variety of different uses that will contribute to the efficient construction and ongoing maintenance of the proposed Carmichael Coal Rail Project. A review of the relevant definitions contained within the *Planning Scheme for the Shire of Belyando* has concluded that following definitions best categorise the variety of uses occurring as part of the proposed development:

Table 4: Proposed Land Uses

Use	Planning Scheme Definition
Industry	***"Industry"*** *– means "premises" used for:* *an industrial activity such as:* *a) a manufacturing process whether or not such process results in the production of a finished article;* *b) the breaking up or dismantling of any goods or article for trade, sale, or gain, or ancillary to any business;* *c) repairing, servicing and cleaning of articles, including vehicles, machinery; or* *d) an operation connected with the installation of equipment and services but not including on-site work on "premises"; and* *the following activities when carried out in connection with an industrial activity:* *e) the storage of goods used in connection with or resulting from an industrial activity;* *f) the provision of amenities for persons engaged in an industrial activity;* *g) the sale of goods resulting from but ancillary to an industrial activity; and* *h) any work of administration or accounting.*
Railway Activities	***"Railway activities"*** *– means "premises" used for the purposes of planning, construction, maintaining and operating rail infrastructure, facilities and rolling stock, including:* *(1) rail maintenance depots;* *(2) rail workshops; and* *(3) rail freight centres.*
Storage Facility	***"Storage facility"*** *– means "premises" used for the storage of goods, and may include the selling of those goods by wholesale. The term includes storage activities such as a builder's yard or construction contractor's yard, a truck, vehicle or plant parking depot. The term also includes the following activities when carried out in connection with a storage activity:* *(1) the work of administration or accounting; and* *(2) the garaging and routine servicing of vehicles associated with the conduct of the storage activity.*

An assessment of the proposed uses included in the application has resulted in the following breakdown of each site type in relation to the relevant planning scheme definition:

5.2.1 'Industry' Definition

The following use types are deemed to fall under the 'Industry' definition of the planning scheme;

- Concrete Batching Plants
- Construction Depot (Laydown Facility)

5.2.2 'Railway Activities' Definition

The following use types are deemed to fall under the 'Railway Activities' definition of the planning scheme;

- Rolling Stock Maintenance Yard

5.2.3 'Storage Facility' Definition

The following use types are deemed to fall under the 'Storage Facility' definition of the planning scheme;

- Turning Circle Areas
- Track Laydown Areas
- Bridge Laydown Areas
- Construction Depot (eastern portion only – See Section 3.6.3 below)

5.3 Types of Development Sites

The proposal involves a total of six different site types (as identified in **Sections 5.2.1 – 5.2.3 above**) of varying size and purpose. The following section provides a detailed description of the various site types included in this application.

5.3.1 Turning Circle Areas

The application proposes the establishment of turning circle areas that are intended to provide large vehicles with an area to safely and easily manoeuvre so as to allow for travel in the opposite direction. The turning circle areas are the most numerous and basic of all site types with **26** proposed to be established as part of this application.

The temporary turning circle areas are considered to fall within the definition of a Storage Facility under the planning scheme. It is possible that construction vehicles may be stored in these locations overnight and it is for this reason that they are considered to fall under this definition.

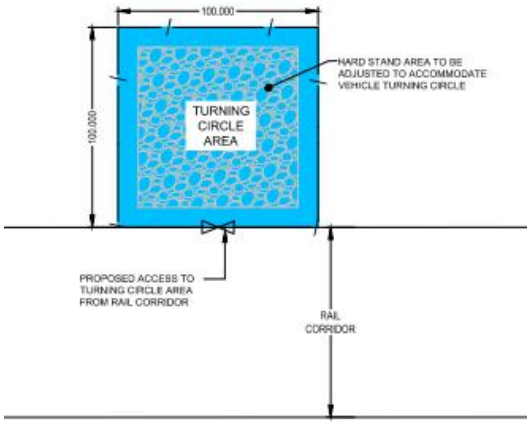
No buildings are proposed to be constructed within the turning circle areas and they will be provided with a hardened gravel surface and chain fencing.

A total of 26 turning circle areas are proposed and these will be square in shape with a total area of 1ha (100m x 100m).

The construction of the railway line will involve a large number of vehicles that will be delivering materials and goods along the rail corridor itself. Given the likely size of these vehicles, sufficient space will be required to allow for these vehicles to manoeuvre into the opposite direction.

In addition to providing a safe area for vehicles to manoeuvre, these sites are expected to reduce impacts on the local environment as they will discourage drivers from attempting to perform manoeuvres outside these designated areas which could result in the destruction of vegetation and increased erosion. During operation vehicles will be required to move within the rail corridor only.

Figure 10 below provides an illustration of a typical turning circle area.



PLAN VIEW

Figure 10: Typical Turning Circle Layout

5.3.2 Track Laydown Areas

The proposed track laydown areas will be used for the storage of rail construction materials. The track laydown areas are required for logistical reasons as it is not economically feasible to deliver track from an off-site location. A total of **18** track laydown areas are proposed to be established as part of this application.

The track laydown areas will allow for single large deliveries to be made and will also allow for track to be stored in the event of unforseen delays in the construction process. Given that these areas are to be exclusively used for the storage of materials, they are considered to fall under the definition of Storage Area under the planning scheme.

The track laydown areas will be generally rectangular in shape with a total area of 4.5ha (300m x 150m). No buildings are proposed to be constructed within the track laydown areas and they will be provided with a hardened gravel surface and chain fencing.

Figure 11 below provides an illustration of a typical track laydown area.

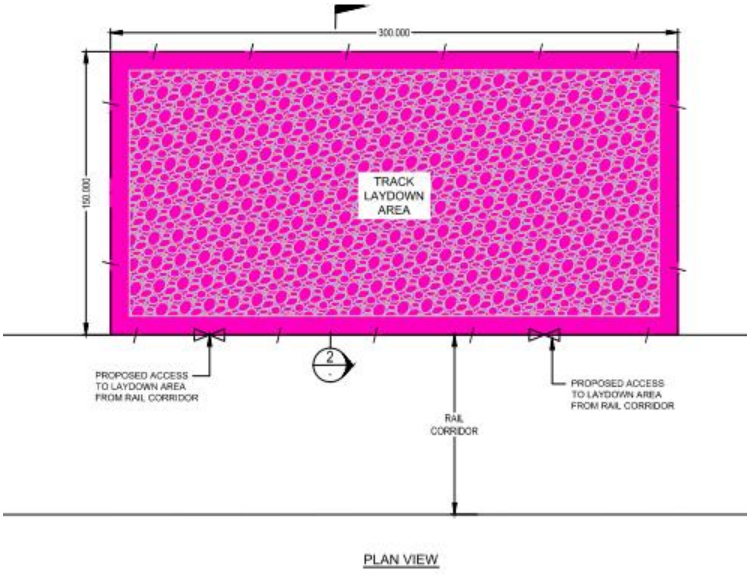


Figure 11: Typical Track Laydown Layout

5.3.3 Bridge Laydown Areas

The proposed bridge laydown areas will be used for the storage of sections of bridges and water crossings to be utilised within the immediate vicinity as part of construction process. The bridge laydown areas have been located as close to the nearest bridge construction site as practically possible in most cases. Unlike other laydown areas, the bridge sites are not required to be provided at any regular interval along the line and have simply been provided adjacent to locations which require the construction of a bridge crossing.

A total of **17** bridge laydown areas are proposed to be established as part of this application.

It should be noted that the bridge construction materials will only be stored at bridge laydown areas for the duration of bridge construction. As is the case with track laydown areas, these are considered to fall under the definition of Storage Area under the planning scheme as they will be used exclusively for the purposes of storing materials.

A total of 17 bridge laydown areas are proposed which will be generally rectangular in shape with a total area of 6ha (300m x 200m).

Figure 12 below provides an illustration of a typical bridge laydown area.

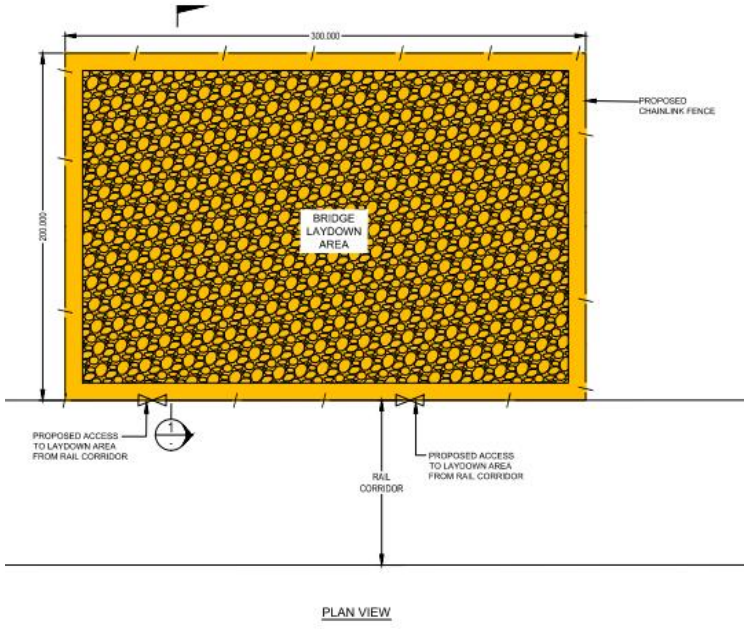


Figure 12: Typical Bridge Laydown Layout

5.3.4 Concrete Batching Plants

The proposal involves the establishment of a number of temporary concrete batching plants that are intended to supply the concrete required to form the railway sleepers and other construction materials. A total of five (5) batching plants are proposed to be constructed at semi regular intervals along the proposed line. Whilst it was intended that the plants be located equal distances apart, local environmental, hydraulic and topographic issue preclude this from occurring. The absence of the preferred uniform spacing between the sites demonstrates that careful consideration has gone into the location of each of the proposed plants.

Each concrete batching plant will be provided with a 60,000L diesel storage tank which is required to supply the fuel required to power a generator which is to supply electricity to the plant.

It should be noted that the proposed BP7 will have a total fuel storage volume of 120,000L as a 60,000L tank will be provided to fuel the generator with a second 60,000L provided for the purposes of refuelling vehicles.

A total of **five** concrete batching plants are proposed to be established as part of this application.

All of the proposed concrete batching plants will have a total area of 4.6ha with all five sites having dimensions of 300m x 200m.

The stand-alone concrete batching plants are proposed to produce approximately 11,520t/year.

Figure 13 below provides an illustration of a typical concrete batching plant.

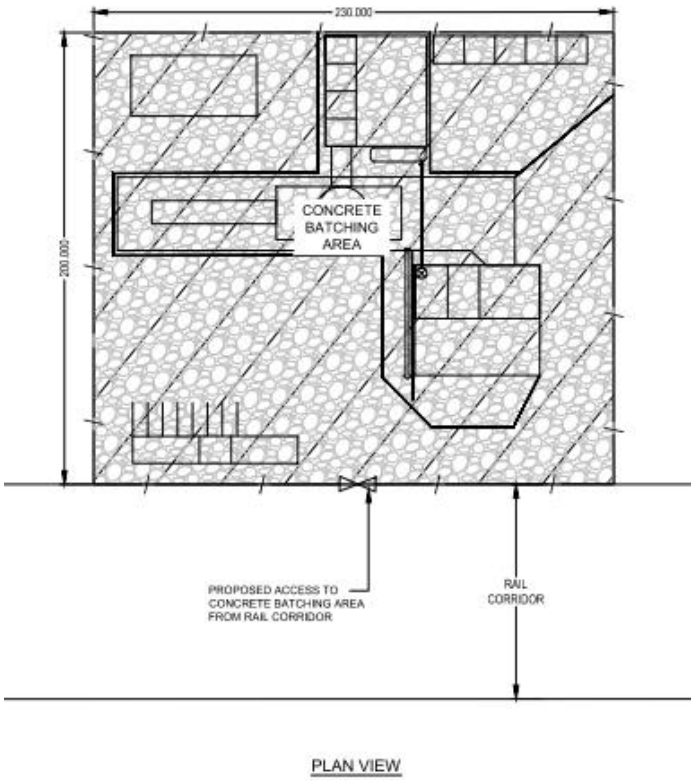


Figure 13: Typical Batching Plant Layout

5.3.5 Rolling Stock Maintenance Yard (Including ERA 8 – Chemical Storage)

The Rolling Stock Maintenance Yard component of this application relates to the construction of a rail maintenance yard that is intended to facilitate the ongoing maintenance of the rolling stock associated with the transport of coal along the proposed railway line. This site is located at the western end of the line at chainage 165.

The maintenance facility will have a maximum of 50 operational staff and footprint area of approximately 280ha and will include the following components;

- Traffic and workshop tracks;
- Locomotive provisioning;
- Train refuelling facility
- Locomotive and wagon maintenance; and
- Administration and train crew depot.

The train refuelling facility is proposed to include 1,050,000 litres of diesel fuel for the purposes of refuelling trains. The storage will consist of 10 diesel fuel tanks with a capacity of 105,000 litres each. The total fuel storage volume exceeds the identified threshold under the *Environmental Protection Regulations 2008* and therefore requires an application for ERA – Chemical Storage, which forms part of this application package.

The proposed maintenance yard is proposed to incorporate a sewage treatment plant to service the workers at this facility. However, the volume of treatment that is to occur does not trigger an ERA assessment.

For further information in regard to the proposed maintenance yard please refer to the 'Information in Support of ERA' reports contained in **Part 6** of the application package.

5.3.6 Construction Depot & Storage Area

The construction depot is the second largest site included in the application and is also the most important site in terms of facilitation of the construction process. Whilst the main purpose of this site is the establishment of the construction depot which falls under the definition of 'Industry', the overall area will also include a dedicated storage area to the east that is separate from the construction depot operation. The area to the east of the site (illustrated in **Figure 15**) is considered to fall under the definition of 'Storage Facility' under the planning scheme. The total combined area for the construction depot and storage area is 264.5ha

The site will contain a variety of uses that are all essential to the construction of the railway line. This site is temporary in nature and will only be present for approximately two years whilst the construction process is occurring.

A summary of the various components contained within this facility is as follows:

- bridge girder stacking area;
- pipe culvert segment stacking area;
- concrete batching plant;
- ballast stockyard;
- sleeper stacking area;
- chemical storage and refuelling areas;
- material and equipment laydown and storage; and
- on-site STP and effluent irrigation areas.

The Construction Depot is proposed to have a maximum of 100 personnel on site at any time during the construction process. This includes two 10 hour shifts at the welding plant.

The 113ha facility is proposed to be located immediately west of the Gregory Developmental Highway and will be irregularly shaped as illustrated in **Figure 14** below:

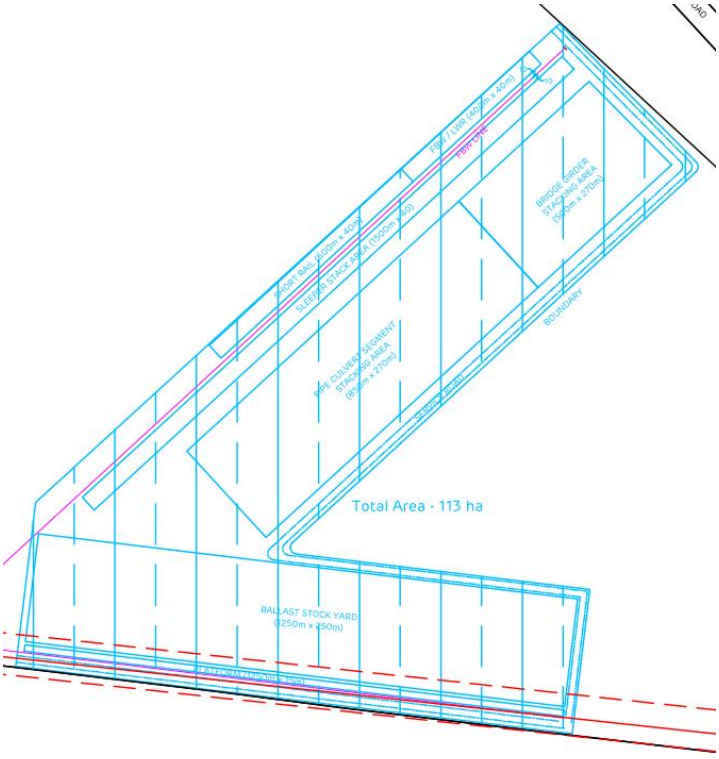


Figure 14: Construction Depot Layout

A summary of the more substantial components of the proposed depot is as follows:

Flash Butt Welding Facility

The flash butt welding facility is proposed to facilitate the welding and grinding of the rail girders. The flash-butt welding facility and surrounding related activities consist of storage of rail materials, welding and grinding of rail stock and maintenance of materials and equipment. The facility is likely to have an impervious (e.g. concrete or asphalt) hardstand.

The flash butt welding yard will have:

- Dedicated gantries for unloading short rail
- Automatic short rail feeder
- Power roller line for deeding the short rails to the flash butt welder and to grinding
- Inspection stations
- Long welded rail stockpile

Chemical Storage Area and Refuelling Facility

The proposed chemical storage area and refuelling facility will contain a bulk fuel storage tank for the refuelling of vehicles and the proposed on-site generator. The diesel storage tank proposed for the chemical storage area is anticipated to be an aboveground proprietary double lined tank manufactured by Transtank Pty Ltd or similar specification. It is proposed to establish 120,000L storage volume which will be facilitated through the establishment of two 60,000L tanks

Ballast Stock Yard & Siding

A ballast stockpile is proposed to be established within the Construction Depot which is to be 31.25ha in area. This stockpile area will have dimensions of 1250m x 250m and will be located along the southern boundary of the depot parallel to the proposed railway line.

The ballast is required for the construction of the base to the rail line itself and will be used in addition to other stockpiles along the line which will be determined at a later date.

For further information in regard to all activities please refer to report contained in **Part 6** of the application package.

Storage Area - Eastern Section

The area immediately east of the 'L' shaped construction depot is proposed to be utilised for storage purposes and is considered to fall under the definition 'Storage Facility'. This includes the storage of sections of rail, sleeper and other materials associated with the railway construction. It should be noted that this area is separate to the proposed ballast stockpile that is to be contained within the 199ha construction depot area.

The storage area is proposed to total 151ha and is separate from the construction depot operation which is considered to fall under the 'Industry' definition of the planning scheme.

Figure 15 overleaf provides a general illustration of the area adjacent to the construction depot that is proposed to be utilised for storage purposes.

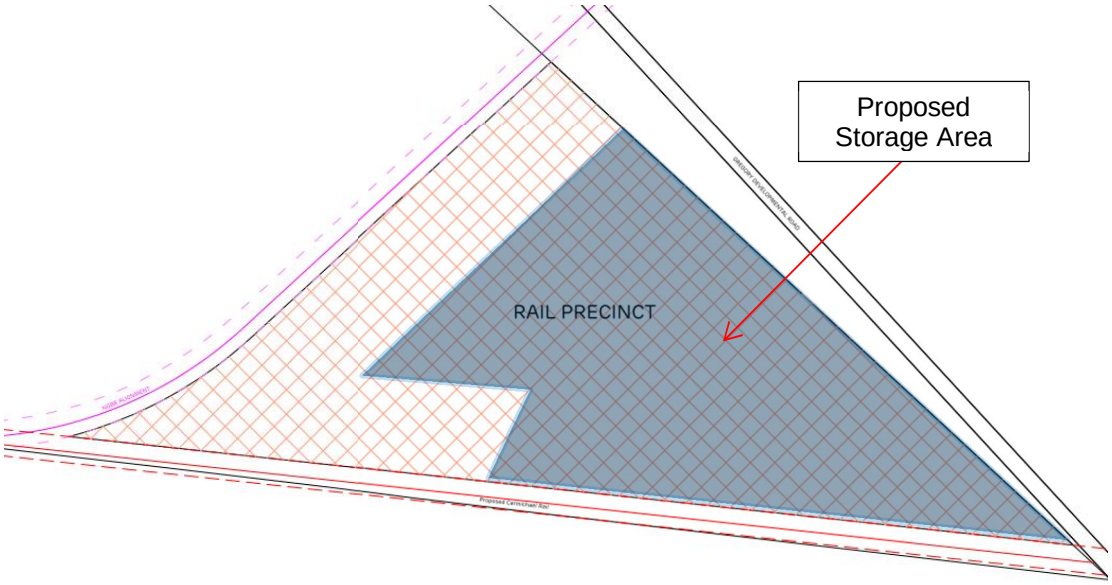


Figure 15: **Plan showing entire construction depot area with approximate storage location highlighted**

5.4 Location of Sites

5.4.1 Decision for Location of Various Sites

The proposed location for the all of the various laydown areas and maintenance facilities included within this application has been directly influenced by a combination of response to environmental constraints, proximity to potential construction sites and the need for uniform spacing between certain uses.

The relevant environmental constraints were identified in detail as part of the submitted Environmental Impact Statement (EIS) for the proposed Carmichael Coal Mine and Rail (December 2012). These constraints include the presence of protected vegetation and defined waterways.

The response to the identified environmental constraints is evidenced in the fact that there are a number of instances throughout the proposal where uniform spacing has not been achieved due to the need respond to local environmental conditions.

It should be noted that a small number of sites were required to be located in areas with potential flooding hazards in terms of being below the identified Q100 flood level. The need to locate these sites in such locations is due to operational requirements and the need for sites to be located within a certain distance of potential construction sites. In all instances where this has occurred the sites are temporary in nature, have appropriate management plans in place to ensure that safety for workers is achieved and have appropriate controls to ensure that adverse environmental impacts do not result.

5.4.2 Site Designation and Proposed Location for All Sites

Table 5 below provides a description of the allocated designation number for each site included within the application in addition to the exact location in relation to the chainage of the railway line. It is noted that the numbering of the sites runs from east to west and begins at the starting point for the SP2 section of line. It is for this reason that site numbering does not begin at one.

The information contained within this table should be read in conjunction with that contained within **Table 3** in **Section 4.2** of this report. It is also noted that all sites are located on the northern side of the proposed railway line unless otherwise noted in the table overleaf.

Table 5: Specific Location of All Proposed Site Types

Site Designation	Lot 662 on CP PH1491 (Moray Downs)	Other Allotment	Chainage
Turning Circle Laydown Areas			
TC19		Y	73500-74500
TC20		Y	75500-76500
TC21		Y	84500-86500
TC22		Y	87500-88500
TC23		Y	91500-92500
TC24		Y	95500-96500
TC25		Y	103500-104500
TC26		Y	107500-108500
TC27		Y	111500-112500
TC28		Y	115500-116500
TC29		Y	118500-119500
TC30		Y	123500-124500
TC31		Y	127500-128500
TC32		Y	131500-132500
TC33		Y	134500-135500
TC34		Y	140500-141500
TC35		Y	143500-144500
TC36		Y	147500-148500
TC37	Y		151500-152500
TC38	Y		155500-156500
TC39	Y		158500-159500
TC40	Y		164500-165500
TC41	Y		167500-168500
TC42	Y		171500-172500
TC43	Y		175500-176500
TC44	Y		183500-184500
Turning Circle Totals	**8**	**18**	**Total Sites - 26**
Track Laydown Areas			
TR11		Y	73500-74500
TR12		Y	77500-76500
TR13		Y	84500-85500
TR14		Y	89500-86500
TR15		Y	95500-96500
TR16		Y	101500-102500
TR17		Y	108500
TR18		Y	113500-114500
TR19		Y	119500-120500
TR20		Y	125500-126500

Site Designation	Lot 662 on CP PH1491 (Moray Downs)	Other Allotment	Chainage
TR21		Y	131500-132500
TR22		Y	137500-138500
TR23		Y	143500-144500
TR24	Y	Y	150500-151500
TR25	Y		155500-156500
TR26	Y		161500-162500
TR27	Y		167500-168500
TR28	Y		173500-174500
TR Totals	**5**	**13**	**Total Sites - 18**
Bridge Laydown Areas			
BR9		Y	76500-77500
BR10 (south)		Y	84000-84500
BR11		Y	110500-111500
BR12		Y	112500-113500
BR13		Y	117500-118500
BR14		Y	121500-122500
BR15		Y	122500-123500
BR16		Y	127500-126500
BR17		Y	146500-147500
BR18		Y	1480500-149500
BR19	Y		150500-151500
BR20 (south)	Y		150500-151500
BR21 (south)	Y		153500-154500
BR22	Y		169500-170500
BR23	Y		175500
BR24		Y	137500-138500
BR25		Y	84500-85500
Totals	**5**	**12**	**Total Sites - 17**
Batching Plant Sites			
BP4		Y	82500-83500
BP5		Y	100500-101500
BP6		Y	107500-108500
BP7	Y		151500-152500
BP8 (south)	Y		153500-154500
Totals	**1**	**2**	**Total Sites - 5**
Construction Depot (including Ballast Stockpile and Batching Plant)			
LF1		Y	110000
Totals		**1**	**Total Sites - 1**
Maintenance Facility			

Site Designation	Lot 662 on CP PH1491 (Moray Downs)	Other Allotment	Chainage
MY1 (south)	Y		164500-166500
Totals	**1**		**Total Sites – 1**
Overall Totals	**21 Sites on Moray Downs**	**47 Sites off Moray Downs**	**Total Sites - 68**

Figures 16-19 below a general illustration of the locations of the various sites types along the proposed railway corridor:

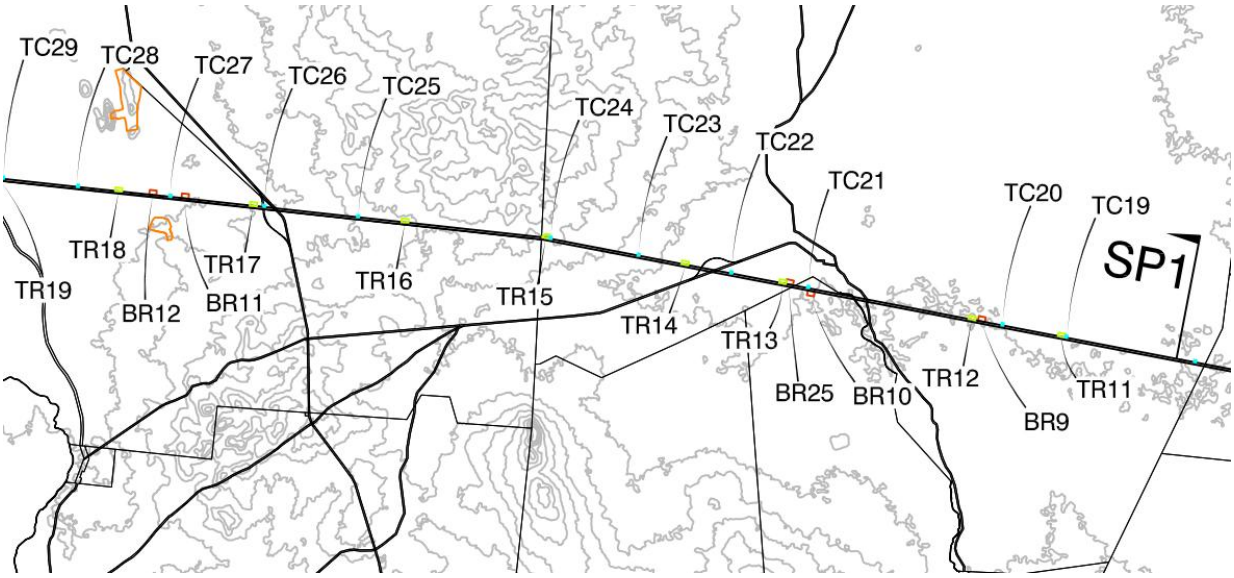


Figure 16: Plan showing proposed location of Laydown Areas (eastern half of SP1)

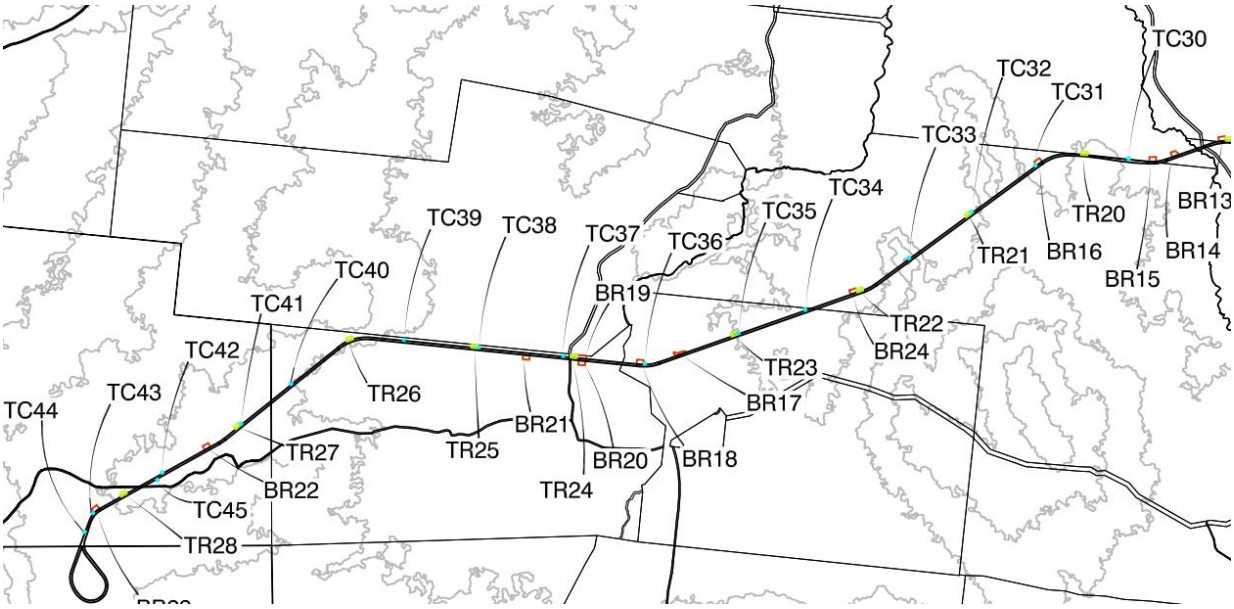


Figure 17: Plan showing proposed location of Laydown Areas (western half of SP1)

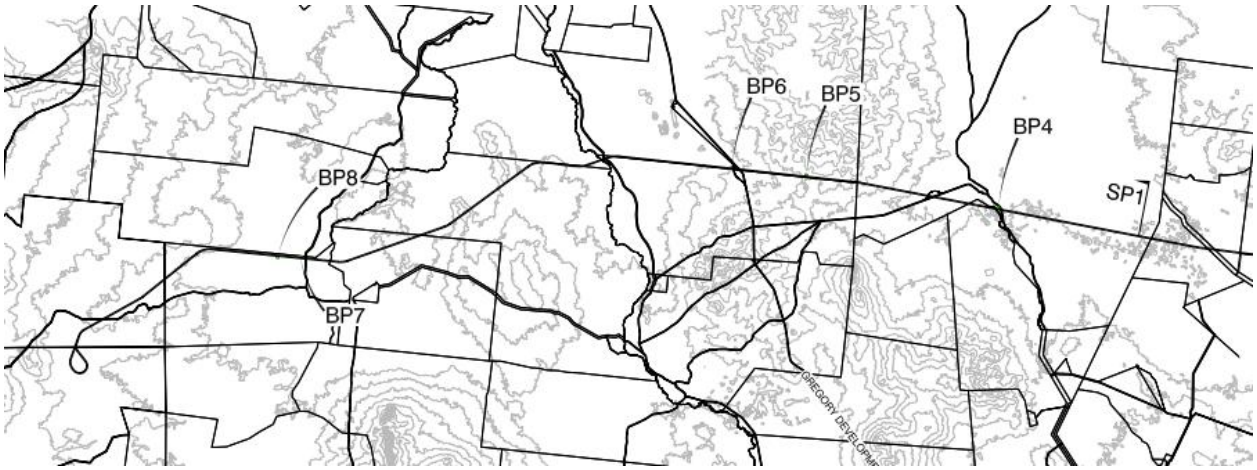


Figure 18: **Plan showing location of proposed concrete batching plants**

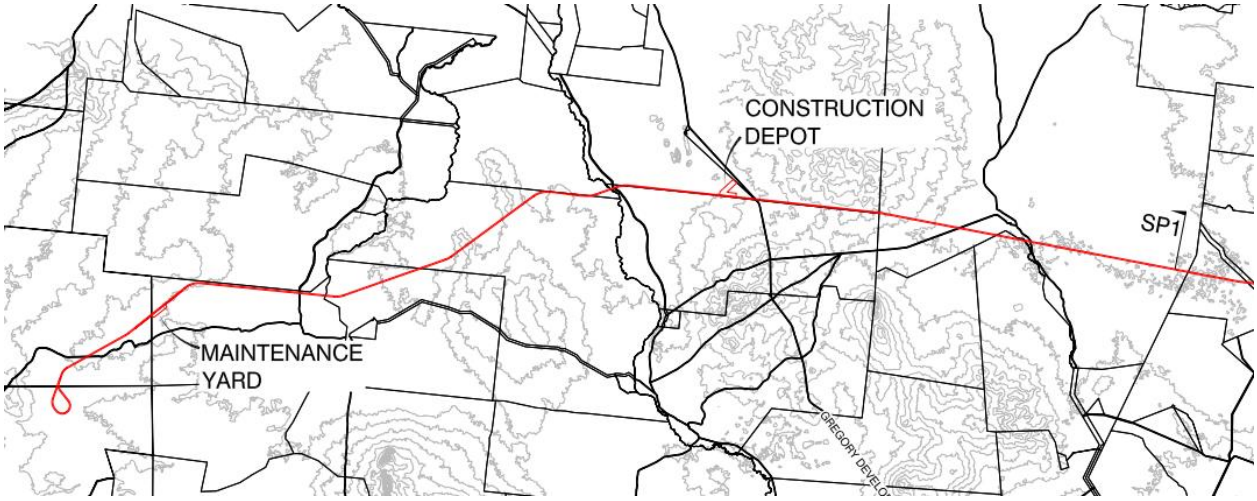


Figure 19: **Plan showing proposed location of construction depot and maintenance yard**

5.4.3 Location of Sites in Relation to Railway Line

All sites included in the proposal will be located immediately adjacent to the proposed railway line within the designated rail corridor identified within the submitted EIS document.

The vast majority of sites included in this application are to be situated on the northern side of the railway line. In the rare instances where a site is to be located on the southern side of the rail line, this is due to the presence of protected vegetation or some other form of environmental constraint.

It is noted that a total of four sites will be located on the southern side of the railway line. This includes three temporary bridge laydown areas and the permanent maintenance facility.

5.5 Description of Permanent and Temporary Facilities

The proposal involves a mix of permanent and temporary facilities. This is due to some sites only being required to be present during the construction process and other site being necessary to the ongoing maintenance and operation of the line. A summary of the expected lifespan of the facilities included in this application is as follows:

Temporary Facilities with expected lifespan of 2-3 years

Turning Circle Areas – 26 sites

Track Laydown Areas – 18 sites

Bridge Laydown Areas – 17 sites

Concrete Batching Plants – 5 sites

Construction Depot – 1 site

Total Temporary Sites - 67

Permanent Facilities

Maintenance Facility – 1 site

Total Permanent Sites – 1

5.6 Other Development Particulars

5.6.1 Vehicular Access

Vehicular access to all sites will be gained via a direct access road which travels along the entire length of the alignment. Vehicular traffic accessing each of the proposed sites will do so along the railway corridor road rather than via existing public roads.

All vehicles accessing the sites will enter via a single dedicated access point and will exit via a single designated exit point.

5.6.2 Sewage

All of the sites requiring employees to be present for substantial amounts of time will be provided with sewage disposal services. In most cases this will be provided in the form of temporary port-a-loo style facilities except for the proposed maintenance facility and construction depot. As there is no existing sewer infrastructure available to service the proposed maintenance facility, a new sewage treatment plant is proposed to be established in order to service the facility. As outlined in **Section 7** below and the ERA report contained within **Part 5** of the application package, the application seeks approval for ERA 63 as the facility will exceed the thresholds identified within the relevant legislation.

5.6.3 Stormwater Management

For further information in regard to stormwater please refer to **Section 7** of this report and **Part 4** of the application package. It is noted that detailed information has been provided in regard to the management of stormwater runoff within all sites included within this application.

5.6.4 Water Supply

Investigations have confirmed the availability of multiple water supply sources which will be able to service the water supply needs of the few sites that require a substantial water supply to be present.

For water sources, reference should be made to the 'Hyder Railway Construction Water Supply Study' contained in the EIS. Further information in regard to water supply will be supplied as part of the subsequent operational works applications.

5.6.5 Electricity Supply

The sites requiring an electricity supply (batching plants, construction depot and maintenance yard) will be equipped with diesel generators.

6 Environmentally Relevant Activities

This development application seeks approval for a total of two Environmentally Relevant Activities (ERAs) as defined by Schedule 2 of the *Environmental Protection Regulation 2008*.

A report addressing the relevant ERA application requirements has been prepared by Cardno and is contained within **Part 5** of the application package.

6.1 Environmentally Relevant Activity 8 – Chemical Storage

The proposed chemical storage areas include a bulk fuel storage tanks for both vehicle refuelling (including rolling stock) and the fuel supply for generators (Genset) at various locations along the railway line.

Fuel storage locations include all of the proposed concrete batching plants, the construction depot and the maintenance facility. All concrete batching plants are to have 60,000L of diesel fuel storage capacity except for BP7 which will have at total storage capacity of 120,000L which is achieved through the placement of two 60,000L tanks. The proposed construction depot will also have a total fuel storage capacity of 120,000L through two 60,000L tanks.

The maintenance facility is proposed to have a total storage capacity of 1,050,000L in order to allow for the refuelling of rolling stock. This will be achieved through the establishment of ten 105,000L tanks.

The above activities will involve the storage of fuel which is a volume greater in that specified in the thresholds identified within identified in Schedule 2 of the *Environmental Protection Regulation 2008* which states the following in regard to ERA 8:

*(1) Chemical storage (the **relevant activity**) consists of storing—*

a) 50t or more of chemicals of dangerous goods class 1 or class 2, division 2.3 in containers of at least 10m3; or

b) 50t or more of chemicals of dangerous goods class 6,division 6.1 in containers capable of holding at least 900kg of the chemicals; or

c) 500m3 or more of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3; or

d) the following quantities of other chemicals in containers of at least 10m3—

(i) 200t or more, if they are solids or gases;

(ii) 200m3 or more, if they are liquids.

6.2 Environmentally Relevant Activity 63 – Sewage Treatment

The proposed construction depot incorporates the establishment of a sewage treatment plant that will involve treatment of sewerage in greater volumes than that specified in the thresholds identified within identified in Schedule 2 of the *Environmental Protection Regulation 2008* which states the following in regard to ERA 63:

(1) Sewage treatment (the relevant activity) consists of—

(a) operating 1 or more sewage treatment works at a site that have a total daily peak design capacity of at least 21EP; or

(b) operating a sewage pumping station with a total design capacity of more than 40KL in an hour, if the operation of the pumping station is not an essential part of the operation of sewage treatment works to which paragraph (a) applies.

(2) The relevant activity does not include—

(a) carrying out works, other than operating a sewage pumping station mentioned in subsection (1)(b), involving only infrastructure for the collection of sewage, including for example, pipes; or

(b) carrying out works involving either of the following—

(i) operating or maintaining composting toilets;

(ii) treating or recycling greywater.

The sewage treatment and treated effluent irrigation activities proposed will be consistent with ERA 63 (1)(a) - operating 1 or more sewage treatment works at a site that have a total daily peak design capacity of at least 21 equivalent persons (EP) as defined in Schedule 2 of the *Environmental Protection Regulation 2008* (EP Reg).

7 Technical Assessment

7.1 Stormwater Management Strategies

This application is supported by a number of conceptual Stormwater Management Strategies (SWMS) which have been prepared by Cardno and are contained in **Part 4** of the application package. A total of three separate SWMS reports have been prepared with each focusing on a specific aspect of the development. The three different site types have that been identified for the purposes of stormwater assessment reporting are as follows;

- Laydown Areas (Turning Circle and Track Laydown sites)
- Concrete Batching Plants
- Maintenance Yard and Construction Depot

All three of the submitted reports provide detailed policies, performance criteria and procedures in order to minimise the proposal's impact on the environment. The assessments have been guided by the *'Queensland Water Quality Guidelines (2009)'* (QWQ guidelines), which provides a summary of design objectives for the management of stormwater quality and flow for the construction phase of developments in Queensland.

7.1.1 Emergency Flood Management Strategies

The SWMSs accompanying this application contain Emergency Flood Management Strategies given that the process of deciding the location for the facilities included in this application resulted in certain sites being partially inundated during a 50 year ARI storm event. In particular, a number of the proposed concrete batching plants were identified as having potential flood inundation issues.

The proposed management plans utilise a combination of gauge based and communication-based strategies to ensure safety is maintained during times of potential flooding. The need for a combination of flood management strategies relates to the lack of accurate gauges in some of the remote locations that do not have up to date gauge readings available at all times.

The strategies contain detailed recommendations in regard to access, evacuation, and storage of material that have the potential to cause harm.

It should be noted that all of the proposed site that may have potential flood inundation risks are temporary in nature and no permanent facility will be constructed with a potential flood risk. The temporary nature of the small number of sites with potential flood risk results in minimal ongoing risk to property and safety.

7.2 Environmentally Relevant Activity Reports

This application is supported by two separate 'Information in Support of Development Application' reports which have been prepared for the proposed construction depot and maintenance facility. The reports have been prepared in order to provide best environmental practice principles and management guidelines for all of the relevant sites in addition to providing the information necessary to obtain approval for the required ERAs.

The reports have been prepared by Cardno and are contained in **Part 5** of the Application Package. Specifically, the reports supplied as part of this application are as follows:

- Information in Support of Development Application – ERA63
- Information in Support of Development Application – ERA8

7.3 Traffic Impact Assessment

A Traffic Impact Assessment Strategy report has been prepared for the proposed development and is contained within **Part 6** of the application package.

The report aims to provide the following:

This assessment strategy aims to provide an assessment framework from which Adani, Council and TMR can discuss, in order to develop the final road management plan. It is noted that this strategy has been developed to reassure Council and TMR that a robust and appropriate framework is in place for the eventual management of the road network.

The assessment criteria covered in this strategy include road facilities, intersection design considerations, stock route crossings and level crossings.

An extract of the key findings and outcomes contained within this report is as follows:

This assessment strategy has aimed to provide a framework for assessment criteria between Adani and Isaac Regional Council once sufficiently detailed data is readily available to undertake a detailed analysis. As such, a high level assessment of the project has been undertaken, offering insight into relevant road parameters, intersection design and rail crossing treatments.

It is acknowledged that, due to the nature of the project, the majority of facilities impacting upon roads will be incurred at the construction stages. This means the road impacts brought about by the project will be temporary, and according to the client issued project description, will last for approximately two years.

As a result, the recommendations provided have accounted for the temporary nature of the impacts. As such, Adani will provide a make-good clause on all works. The information provided within this assessment strategy is based on a fit for purpose basis.

The overriding principles which guide this assessment strategy, adopted from the TMR Guidelines for Assessment of Road Impacts of Developments (GARID), are safety, efficiency and the future planning of the road network. GARID has advised that development impacts will be deemed significant if the traffic generated by the development will increase the existing traffic by 5% or more. If the impact is significant then appropriate analyses must be undertaken.

Best practice standards have been consulted and recommended, from industry publications including the Austroads guides and TMR Road Planning and Design Manual. These recommended standards cover the following areas:

- *Sealed traffic lane and shoulder width recommendations*
- *Intersection turn treatment warrants*
- *Sight distance requirements*
- *Stock crossing recommendations*
- *Level crossing treatment assessment methods*

It is noted that standards for unsealed roads are provided in Appendix A.

7.4 Civil Engineering and Earthworks

Civil Engineering Drawings depicting the layouts for the various site types have been prepared by Cardno and are contained within **Part 10** of the application package.

The following information summarises the civil works proposed to be undertaken as part of the proposal. It is noted that additional detail will be provided as part of the subsequent operational works applications that are to be lodged in the future.

The proposed laydown areas associated with this project are intended to be temporary sites provided during the construction phase to assist in managing various construction support facilities.

The earthworks concept proposal presented generally addresses the various issues associated with the Bridge Laydown, Track Laydown, Concrete Batching, Turning Circle and Typical Layouts for the construction and maintenance yard areas.

The intent of the concept plans provided is to ensure functional locations are provided for each facility with areas provided inside a security fence system installed along the perimeter of each laydown area. Security gates shall be located at selected locations in relation to the proposed

access points servicing the relevant sites. Access to the sites shall generally be from the adjacent rail corridor or access road.

The earthwork profiles proposed for the site depict various options to be constructed depending on the topography associated with the relevant site being addressed. The profiles presented are typical for the various proposed laydown areas intended for the project.

Basic parameters of each site are to ensure they are self-draining generally in accordance with the natural contours over the site. Where due to design or other extenuating circumstances this is not achievable, a suitable drainage system such as swale drains will be constructed around the perimeter of the site. This drainage system will ensure stormwater run-off from the site will disperse away from the site in a controlled manner through suitably designed sediment/erosion controlled detention basins before discharging to the natural drainage system. The support draining system shall be designed in relation to the site conditions encountered are in accordance with the associated storm water strategies presented.

Once the basic earthworks have been completed for each site, it is intended to cover the relevant working areas of the sites with a prepared road base cover with suitably designed pavement thickness to ensure each site has the capacity to support the particular vehicle / equipment movements for the laydown area.

Removal and rehabilitation of the disturbed areas and associated infrastructure shall be undertaken following completion of this Project.

8 Planning Framework and Assessment

8.1 Assessment Framework

As described within Section 314 of the *Sustainable Planning Act 2009:*

(2) The assessment manager must assess the part of the application against each of the following matters or things to the extent the matter or thing is relevant to the development—

(a) the State planning regulatory provisions;

(b) the Regional Plan for a designated region, to the extent it is not identified in the Planning Scheme as being appropriately reflected in the Planning Scheme;

(c) if the Assessment Manager is not a Local Government — the laws that are administered by, and the policies that are reasonably identifiable as policies applied by, the assessment manager and that are relevant to the application;

(d) State Planning Policies, to the extent the policies are not identified in—

(i) any relevant Regional Plan as being appropriately reflected in the Regional Plan; or

(ii) the Planning Scheme as being appropriately reflected in the Planning Scheme;

(e) a temporary local planning instrument;

(f) a Preliminary Approval to which Section 242 applies;

(g) a Planning Scheme;

(h) for development not in a Planning Scheme area—any planning scheme or Temporary Local Planning Instrument for a Planning Scheme area that may be materially affected by the development;

(i) if the Assessment Manager is an infrastructure provider—an adopted infrastructure charges resolution or the Priority Infrastructure Plan.

In accordance with Section 314 of the *Sustainable Planning Act 2009,* in determining this Impact Assessable planning application, the Assessment Manager (i.e. Isaac Regional Council or the Coordinator General) must also have regard to:

(a) the common material;

(b) any development approval for, and any lawful use of, premises the subject of the application or adjacent premises;

(c) any referral agency's response for the application.

On this basis, the planning framework and associated provisions that are applicable in this assessment include:

> Mackay, Isaac and Whitsunday Regional Plan;

> Single State Planning Policy (where applicable)

> State Regulatory Planning Provisions (where applicable); and

> the whole of the *Planning Scheme for Belyando Shire (Version July 2008)*

8.2 Mackay, Isaac and Whitsunday Regional Plan

All sites included in the proposal are contained within the Rural Landscape and Rural Production designation of the Mackay, Isaac and Whitsunday Regional Plan (MIWRP) as illustrated in **Figure 20** below.

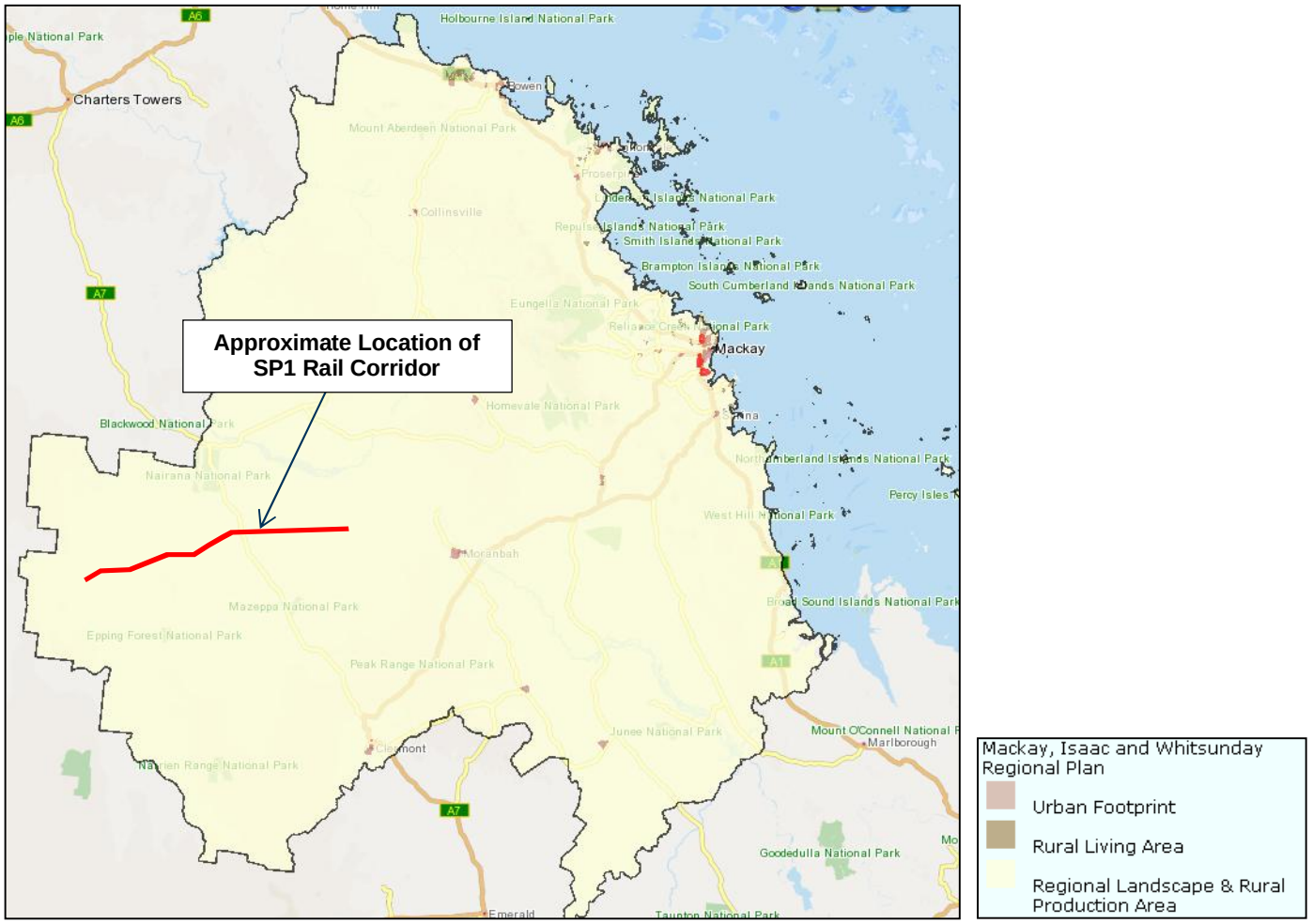


Figure 20: **Extract from Mackay, Isaac and Whitsunday Regional Plan Mapping**

8.2.1 Intent of Rural Designation of Mackay, Isaac and Whitsunday Regional Plan

The intent for the Rural Living and Regional Production Area (RLRPA) of the MIWRP states the following:

> *The RLRPA identifies land with regional landscape, rural production or other non-urban values. It protects this land from inappropriate development, particularly urban or rural residential development. The RLRPA also includes lands which are considered unsuitable for development for the life of the plan, based on the regional plan principles to consolidate urban growth.*
>
> *These areas support the lifestyle and wellbeing of the regional population, whom are mostly located in the Urban Footprint.*

The proposed development meets the above intent as it does not involve any form of residential accommodation and is therefore not considered to represent inappropriate development for the region. The majority of the sites are small and temporary in nature. Given that all sites are located within the bounds of the rail corridor area, the proposal is not expected to adversely affect the production value of the regional landscape. The proposal is ancillary to the development of a mining project and will allow for the construction of an important piece of infrastructure (being a new rail corridor) to occur. Given that the proposal is ancillary to this major infrastructure development, high level assessment against the Mackay, Isaac and Whitsunday Regional Plan will occur as part of the EIS process. Nevertheless, a response to the relevant outcomes of the MIWRP is contained in the section below.

8.2.2 Relevant Desired Regional Outcomes of MIWRP Regional Plan

Based on the location and nature of the proposed development, the following, the following regional policies are relevant in the assessment of the proposed development:

As outlined in the response to the policies below, the proposal is directly related to the much larger proposal for the Carmichael Coal Mine and Rail Project. When viewed in isolation, the proposal has minimal relevance to the applicable Desired Regional Outcomes. However the proposal is essential to the viability of the Carmichael Coal Mine and Rail Project and is therefore seen to be directly linked to the potential benefits this project can offer the region as a whole.

Table 6: Desired Regional Outcomes

Desired Regional Outcome 2 – Regional Landscapes	
Principle	**Comments**
2.1 Regional landscape values	
Policies > 2.1.2 Plan, design and manage development, infrastructure and other activities to manage and enhance regional landscape values	The location of the proposed sites has been undertaken in conjunction with the planning for the proposed railway corridor which has been located to ensure minimal impacts upon regional landscape values. None of the proposed sites are situated in locations deemed to be of regional significance in terms of amenity. The sites are also located a sufficient distance (see **Section 4.2.7** of this report) from any existing homesteads ensuring that the regional landscape amenity of existing residents remains largely unaltered.
2.2 Regional landscape areas Optimise multiple community benefits through coordinated planning, management and investment in regional landscape areas.	
Policies > 2.2.2 Regional landscape areas are managed to optimise economic, social, recreational and ecosystem services to the region. > 2.2.3 Inter-urban breaks are protected from development that diminishes their function.	The proposal will represent an economic benefit to the area as part of the construction of the Carmichael Coal Mine and Rail Project. The proposal will facilitate the construction and ongoing maintenance of a vital component of infrastructure essential to the mine. The proposal does not involve any form of residential development and will therefore have no impact upon inter-urban breaks within the region.

Desired Regional Outcome 3– Environment	
Principle	**Comments**
3.1 Biodiversity The region's natural assets, biodiversity values and ecological services are protected, managed and enhanced to improve their resilience to the anticipated effects of climate change and other threats.	
Policies > 3.1.2 Development in non-urban areas maintains the integrity of areas with significant biodiversity values. > 3.1.3 In urban areas, impacts from development on areas with significant biodiversity values, where they cannot be avoided, are offset in accordance with established policies, codes and frameworks. > 3.1.4 The values of regional biodiversity networks are protected for the long-term through improved ecological connectivity, enhanced habitat extent and	The proposed laydown and maintenance facilities have been designed and located to ensure minimal impacts upon ecological processes. The relatively small size of the sites combined with the area in which they will be located ensures minimal impacts upon biodiversity values. The proposed sites will have no significant impact upon the local ecological connectivity and the total combined footprint of all sites is comparatively small given the size of the habitat areas in the region. The site is located within an existing cattle grazing area and is not considered to possess any significant environmental values that cannot be fully restored when

Desired Regional Outcome 3– Environment	
condition, and rehabilitation of degraded areas.	the temporary uses included within this proposal eventually cease. The proposal is not expected to have negative impacts upon the local ecological connectivity and the immediate habitat given the relatively small footprint area and impact associated with the rail line itself.

Desired Regional Outcome 4– Natural Resource Management	
Principle	**Comments**
4.1 Natural Resource Management The management and use of natural resources enhance community, economic and landscape values.	
Policies > 4.1.2 Adverse impacts on the region's natural resources are avoided or minimised through the location, design and management of development. > 4.1.3 Natural resource management, planning, investment, monitoring and reporting is coordinated to improve the quality and contribution of the resource to the region.	The sites have been located to ensure that there are no adverse impacts upon the region's natural resources. Investigations undertaken as part of the rail corridor location study ensured that existing and proposed natural resource extraction operations were not prejudiced due to the proposed line and associated laydown areas. The relatively small combined footprint and temporary nature of the majority of the sites ensures that there will be no ongoing significant negative impacts upon the region's natural resources. It should be noted that the proposal is directly linked to a major natural resource extraction operation being the Carmichael Coal Mine and Rail Project
4.3.1 Mineral, petroleum and extractive resources are managed for current and future use, and their extraction, processing, transport and downstream value-adding continue to contribute to the economy.	
Policies > 4.3.2 Identified valuable mineral and extractive resource areas within the region are protected from development that might adversely affect current or future extraction. > 4.3.3 The operation of extraction and processing activities does not compromise human health, current and future resource use opportunities, regional landscape value or ecosystem function and services, and must minimise its impact on primary production. > 4.3.4 Once extraction ceases, former mining resource areas are rehabilitated to facilitate multiple end-uses of sites, ensuring their continuing contribution to the economic, social and environmental values of the region. > 4.3.5 Innovative practices are encouraged, including local processing and value-adding activities for mineral and extractive resources, to maximise eco-efficiencies.	The proposal is not expected to adversely affect current or future extraction of identified valuable and mineral resource areas. Previous studies undertaken as part of the EIS process for the proposed mine have ensured that future mineral extraction within the region will be able to proceed unhindered as a result of the proposal. It is possible that the rail line to which this application relates will eventually be utilised by third party operations within the region. The proposal does not involve the extraction of any minerals and such issues have been addressed as part of the EIS process.

Desired Regional Outcome 6– Strong Economy	
Principle	**Comments**
6.2 Integrated economic, land-use and infrastructure planning Suitable land, infrastructure and facilities are available and managed to enable sustainable economic and employment growth in the region.	
Policies > 6.2.2 Employment needs and enterprise land	The proposal is part of a larger proposal to develop a new rail corridor that will significantly enhance economic development within the region. The rail corridor is

Desired Regional Outcome 6– Strong Economy	
requirements are identified to inform future planning decisions. > 6.2.4 Identify, maintain and protect sites and corridors (including disused corridors) for infrastructure that supports economic development. > 6.2.5 Strategically located land and facilities are protected from incompatible development for future economic uses. > 6.2.6 Attract new rail, port and aviation service providers that support and facilitate existing and proposed industry and provide new services in the region. > 6.2.7 Establish and maintain links between town centres, business precincts and key transport, communication networks and other associated infrastructure. > 6.2.8 Facilitate the expansion of existing business precincts and key industry sectors such as aviation, manufacturing, aquaculture, agriculture, tourism, mining, extractive industries, bulk exports and mineral processing and marine industry sectors. > 6.2.9 Facilitate the provision of world-class infrastructure, including advanced telecommunications, to enhance economic competitiveness.	intended to service the proposed Carmichael Coal Mine which will eventually employ large numbers of persons and will involve the creation of a new permanent settlement for mine workers. The proposal will assist in attracting new rail and port providers as it is directly related to the construction of new railway infrastructure that will eventually connect to a seaport. This will generate the need for an intensification of port facilities and an increase in employment within the rail sector. The proposal is related to what is considered to be a world class infrastructure project that will enhance existing rail and extractive industry related businesses within the region and the State.
6.3 Resilient and Sustainable Economy The economy grows through increasing levels of human-capital, knowledge-capital and natural-capital and is resilient to external factors through multiple strong industry sectors that provide diverse employment opportunities.	
Policies > 6.3.2 Attract and retain a diverse workforce to meet current and future needs of the economy. > 6.3.3 Identify and protect areas of economic importance(e.g. agriculture centres, industrial areas, port areas, mineral resources and tourism) and support new and continued production in these areas. > 6.3.4 Encourage the diversification of industry sectors to facilitate an efficient, resilient and strong economy. > 6.3.5 Facilitate the development of high value-added and knowledge-based economic activities unsuitable locations. > 6.3.6 Maximise opportunities for the development of supply chains to capitalise on economic development within and external to the region. > 6.3.7 Identify and protect sites for the development of innovative business and knowledge precincts, and promote the development of world-class facilities.	The proposal will contribute to the levels of human capital within the region and contribute to both the short term and long term employment opportunities within the region. The proposed laydown and maintenance facilities will generate short term employment as part of the construction process and long term employment will eventually be generated by the mine operation and its ancillary facilities. The proposed development will not adversely impact existing areas of economic importance and will contribute to the establishment of new areas for economic development.
6.5 Resource sector Manage mining and extractive resources to maximise economic opportunities and other community benefits, while minimising negative environmental and social impacts for present and future generations.	
Policies > 6.5.2 Identify and protect key strategic mineral, energy and extractive resources and haul routes from incompatible development. > 6.5.3 Identify and support new sectors that have the potential for future growth associated with the resource sector such as mine rehabilitation and	The proposed development is linked to the construction of a new rail corridor that is directly associated with a proposed mining operation. The proposed development is essential to the efficient liberation and supply of minerals. The proposal is part of a larger project that will add value to the local economy through an increase in income and residents.

Desired Regional Outcome 6– Strong Economy	
carbon dioxide emissions capture. > 6.5.4 Support and develop growth of specialised technology and research-based sectors (tertiary industries) which value-add to the resource sector. > 6.5.5 Minimise adverse impacts of resource development on valuable environmental and other economic resources, and ensure appropriate rehabilitation of affected landscapes. > 6.5.6 Ensure sufficient supply of minerals, gas and extractive resources are available for future use, and their extraction, processing, transport and downstream value-adding contribute to the local economy.	

In view of the above assessment, the proposed development is consistent with the intent of the Mackay, Isaac and Whitsunday Regional Plan. Therefore, the proposed development is viewed as being consistent with the main planning principles contained within this particular document.

8.3 State Planning Policies

Section 314 of the *Sustainable Planning Act 2009* details that when assessing an Impact Assessable application; the assessment manager must have regard to:

…

(d) State planning policies, to the extent the policies are not identified in—

(i) any relevant regional plan as being appropriately reflected in the regional plan; or

(ii) the planning scheme as being appropriately reflected in the planning scheme;

…

With respect to the current State Planning Policies and their applicability to the site and proposed development, the following is noted:

Table 7: State Planning Policies

Policy Number	Current State Planning Policy	Commencement date	Expiry Date	Applicable to Proposed Development
Temporary SPP 2/12	Planning for Prosperity	24 Aug 2012	24 Aug 2013	No
SPP1/12	Protection of Queensland's Strategic Cropping Land	30 Jan 2012	30 Jan 2022	No (refer to **Section 4.2.6** of this report)
SPP4/11	Protecting Wetlands of High Ecological Significance in Great Barrier Reef Catchments	25 Nov 2011	25 Nov 2021	No
SPP3/11	Coastal Protection	3 Feb 2012	3 Feb 2022	No
SPP3/10	Acceleration of Compliance Assessment	3 Dec 2010	3 Dec 2020	No
SPP2/10	South East Queensland Koala Conservation	31 May 2010	31 May 2020	No
SPP2/07	Protection of Extractive Resources	3 Sept 2007	N/A	No
SPP1/07	Housing and Residential Development	29 Jan 2007	29 Jan 2017	No
SPP1/03	Mitigating the Adverse Impacts of Flood, Bushfire and Landslide	1 Sept 2003	1 Sept 2013	No The planning scheme does not contain natural hazard

Policy Number	Current State Planning Policy	Commencement date	Expiry Date	Applicable to Proposed Development
				management area mapping
SPP2/02	Planning and Managing Development Involving Acid Sulfate Soils	18 Nov 2002	18 Nov 2014	No
SPP1/02	Development in the Vicinity of Certain Airport and Aviation Facilities	3 Aug 2002	3 Aug 2013	No

On the basis of the above, it is evident that there is no specific State Planning Policy applicable to the proposed development.

8.4 State Planning Regulatory Provisions

State planning regulatory provisions are planning instruments that the Planning Minister can introduce. State Planning Regulatory Provisions affect the operation of a planning scheme. They provide a single overarching planning instrument that can be applied in a range of circumstances, with the ability to regulate and prohibit development.

The table below shows the current State Planning Regulatory Provisions. State Planning Regulatory Provisions developed under the *Integrated Planning Act 1997* remain current under the *Sustainable Planning Act 2009*.

Table 8: State Planning Regulatory Provisions

Policy Number	Current State Planning Regulatory Policy	Applicable to Proposed Development
July 2012	State Planning Regulatory Provisions (adopted charges)	No
Nov 2011	Draft Particular waste management activities on existing landfills	No
July 2010	State Planning Regulatory Provisions (Adult stores)	No
Feb 2010	South East Queensland Koala Conservation State Planning Regulatory Provisions	No
Dec 2009	Guragunbah State Planning Regulatory Provision	No
July 2009	South East Queensland Regional Plan 2009-2031 State Planning Regulatory Provisions	No

On the basis of the above, it has been determined that there are no State Planning Regulatory Provisions that are relevant to this particular application.

8.5 Belyando Planning Scheme

The Planning Scheme for Belyando Shire (version July 2008) is the current, applicable document for planning assessment of applications on the subject site. For the purposes of the current application, the following elements will be assessed:

> Desired Environmental Outcomes (DEOs) and Strategic Directions; and

> Provisions of the Rural Zone Code.

The following sections of this report detail this assessment of the proposed development in relation to the Planning Scheme.

8.5.1 Desired Environmental Outcomes

Section 778 of the SPA establishes that the Desired Environmental Outcomes ("DEOs") of the existing planning scheme are taken to be strategic outcomes for the planning scheme area. DEOs provide the foundation of the scheme from which all other elements derive and they:

> represent what is wanted or sought to be achieved through the Scheme; and

> relate to the 'environment' which is defined broadly in the SPA to cover matters and conditions relating to the natural, built and human environments.

The Planning Scheme for Belyando Shire (version July 2008), identifies three separate DEOs that are applicable to development within the Shire. The assessment of the proposal against these relevant DEOs is provided below.

Table 9: DEOs and Strategies from the Belyando Planning Scheme

Natural Environment and Cultural Heritage
DEO *In Belyando Shire, ecological systems, the natural environment (including natural features and unique habitats such as Peak Range National Park, Mazeppa National Park, Narrien Range National Park, Epping Forest National Park, Wilandspey Conservation Park, Doongmabulla Springs Important Wetland and the declared catchment), and items and places of cultural and heritage significance are protected such that biodiversity, cultural heritage values and existing or intended landscape character are maintained.* **STRATEGIES** *(a) Development is regulated to minimise any adverse impacts on air and water quality, to prevent land degradation, loss of unique habitat and biodiversity and to maintain the integrity of riparian areas, ridgelines and escarpments.* *(b) Development is regulated to be compatible with the environmental, habitat, biodiversity and landscape values and historic significance of protected areas (including Peak Range National Park, Mazeppa National Park, Narrien Range National Park, Epping Forest National Park, Wilandspey Conservation Park, Doongmabulla Springs Important Wetland and the declared catchment) and areas, local items and places of cultural significance (including areas along water courses).*
Comments
All of the proposed laydown and maintenance facilities have been designed and located to ensure minimal impacts upon air and water quality, unique habitat and biodiversity within the region. None of the proposed sites are located within close proximity to any of the national parks or conservation parks identified within this particular DEO. Various reports and studies undertaken as part of the submitted EIS process have demonstrated that the rail corridor is not situated in an area of high biodiversity value or cultural significance. As evidenced in the submitted development application documentation, the land upon which the sites are located will not result in the loss of unique habitat, riparian vegetation. In addition, none of the sites are located on a significant ridgeline or escarpment. The various management plans provided as part of this application demonstrate that external impacts on the environment will be minimised through careful management of all operations. Strict guidelines will be implemented for all proposed uses and all operations will meet current legislative requirements. In summary, the proposal accords with the strategies of the 'Natural Environment and Local Heritage' DEO as all sites are appropriately located, will have minimal impact on the amenity of the immediate area and will control all forms of waste and emissions. In addition, none of the proposed site are within proximity to any of the protected area identified within this particular DEO.
Economic Development
DEO *The viability of the mining industry is protected, while the economy of Belyando Shire is diversified in a manner that supports the intended land use structure and character of the urban centres of Clermont and Moranbah and the rural parts of the Shire.* *Activities that do not require a rural location are consolidated within the towns of Clermont and Moranbah, so that investment in the towns is maximised. Moranbah's role as the primary service centre for the northern Bowen Basin mining industry is enhanced.* *Town centres in each of the Shire's urban communities form vibrant and compact commercial and community cores. Industrial nodes in Clermont and Moranbah are consolidated. Natural resources (including land, water and mineral resources) are used sustainably.* **STRATEGIES** *(a) The planning scheme reinforces the roles of Clermont and Moranbah as the principal places for administrative services, business, industry, retail, education and community services and transport services within the Shire.* *(b) Sufficient and suitable areas are identified for urban development, and key transport infrastructure are identified and protected.* *(c) Residential activities (with minor exceptions) are required to be located within the towns of Moranbah and Clermont.* *(d) Commercial activities are limited (with minor exceptions) to identified centres in the towns of Clermont and*

Economic Development

Moranbah.

(e) Confidence in investment in the Shire's towns and in its major industries is maintained by identifying clear development intentions.

(f) Urban and other sensitive forms of development are regulated to avoid or minimise potential conflicts with existing or future mining operations.

(g) Productive rural land, rural industries and unique natural features (including mineral and extractive resources and tourist resources such as national parks, conservation parks and wetlands) are protected to preserve their continued economic potential and viability.

(h) Industrial activities are directed to identifiable industrial nodes in the towns of Moranbah and Clermont

Comments

The proposed development is essential to the ongoing viability of the mining industry as it will facilitate the construction of the proposed rail corridor that is intended to service the proposed Carmichael Coal Mine.

A response to each of the applicable strategies is as follows:

(a) The proposal does not involve the establishment of any of the identified services outside Clermont and Moranbah. It is noted that the industry component of this application is directly linked to the proposed rail corridor and cannot be reasonably located within either of the identified centres.

(b) The proposal is not considered to be residential development.

(c) The proposal does not involve residential activities.

(d) The proposal does not involve commercial activities. None of the proposed sites will involve the sale of goods and all sites are directly associated with a proposed mining development.

(e) The proposal is directly linked to a major infrastructure investment in the region.

(f) The proposal is directly linked to a future mining operation and does not involve urban development.

(g) The proposal will not have significant adverse impacts upon productive rural land.

(h) It is not feasible to locate the industry components of this application within existing industrial nodes as they must be located within close proximity to the rail line which they are serving.

In summary, the proposal accords with the strategies of the Economic Development DEO as it will contribute to the economy through increased spending within the region and through the construction of transport infrastructure that is essential to the operation of a large scale infrastructure project.

Community Wellbeing

DEO

Moranbah and Clermont provide a wide range of government and community services and employment opportunities. Moranbah continues to have a significant role as the primary service centre for the northern Bowen Basin mining industry.

The towns of Moranbah and Clermont accommodate strong, connected and vibrant communities, well supported by recreational and other community facilities, highly accessible by walking and cycling. Town centres provide a clear community focal point.

Moranbah and Clermont are characterised by a strong and growing permanent resident population. A wide range of affordable housing types is available and all housing is designed to contribute to the quality of the urban environment. Dwelling units providing for permanent accommodation are predominant, with a significantly smaller proportion of other forms of accommodation intended for temporary residents.

The rural amenity and productive capacity of other parts of the Shire is maintained.

STRATEGIES

a) The planning scheme seeks to ensure that people are connected to public spaces (including recreational areas) and community services through an appropriate land use structure and the provision of infrastructure within the towns of Clermont and Moranbah.

(b) Increased opportunities are created for a larger proportion of the mining (and related) workforce and their families to permanently reside in the Shire's towns through:

- *the designation of sufficient urban land to accommodate expected population growth;*
- *the encouragement of medium density, small lot and other forms of permanent housing to increase housing choices available within the Shire's towns; and*
- *limitations on the size of accommodation facilities for non-resident workers.*

(c) The planning scheme seeks to ensure all residential activities (with minor exceptions) are located within the towns of Clermont and Moranbah.

(d) All forms of "residential activities" (including accommodation intended for visitors and temporary residents) are

Community Wellbeing
required to be designed to integrate with the surrounding urban environment and be of a high quality urban design. *(e) Development is regulated to protect the health and safety of people.* *(f) Infrastructure reflects community expectations and needs, meets appropriate engineering and environmental standards and is provided in an orderly and logical sequence to ensure cost effectiveness.* *(g) Rural communities are protected from incompatible forms of development, and rural residential development is not supported by the planning scheme.*
Comments
The proposal will ensure that Moranbah continues to have a significant role in the northern Bowen Basin mining industry. It is noted that the proposed development does not involve any form of residential activity. Given the unique construction requirements associated with building a rail corridor through isolated country, it is not feasible or cost effective to store all materials away from the railway corridor nor is it feasible for concrete batching to be undertaken a significant distance away from the railway corridor. The size of the sites is not considered to be excessive. These have all been designed based on specific construction and maintenance requirements associated establishing a high quality rail corridor capable of accommodating coal trains of significant volumes. The isolated location of all sites ensures that the health and safety of residents is not adversely affected and the lack of nearby rural communities ensures that the development cannot be viewed as 'incompatible'. In summary, the proposed sites are consistent with this DEO and are considered to accord with the strategies for 'Community Wellbeing'. All aspects of this proposal are directly related to the construction of the proposed Carmichael Coal Mine and Rail Project and will not have any negative impact upon the role of existing urban centres within the region.

It is concluded that the proposed construction and maintenance facilities is consistent with, and does not conflict with the DEOs for the Planning Scheme for Belyando Shire.

8.5.2 Rural Zone

As identified in **Figure 21** (below), all of the sites included within the application are contained within the Rural Zone of the Planning Scheme for Belyando Shire.

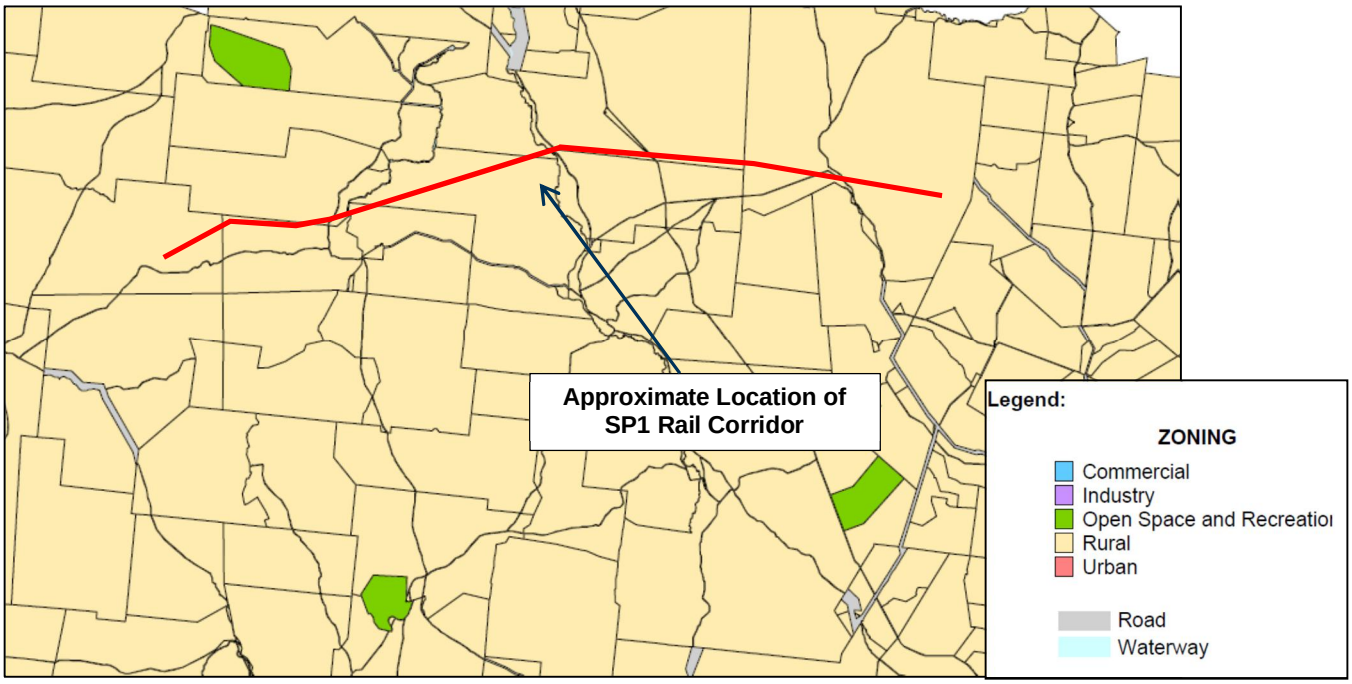


Figure 21: Extract from Belyando Planning Scheme Zone Map

The purpose of the Rural Zone is as follows:

(1) The Rural "Zone" retains its viability as an area of primary production and natural resource use, including mining.

Response –The proposal accords with this statement as it is directly associated with a proposed natural resource use. The proposed sites will allow for the construction and ongoing maintenance of the railway line that is essential to the operation of the proposed Carmichael Coal Mine. There will be no significant impacts upon the primary production value of the Rural Zone and the sites are not considered to possess any significant rural production value.

(2) "Rural activities" and mining are appropriately located within the Rural "Zone" and are not prejudiced by inappropriate development.

Response – The proposal accords with this statement as all sites are appropriately located to ensure that existing rural activities are not inappropriately prejudiced by the development. The overall impacts of the laydown and maintenance facilities are extremely minor in relation to the size and scale of the rural properties in which they are located.

(3) *Within the Rural "Zone", "development":*

a) maintains the environment, including soil, air and water, compatible with healthy natural systems and ensures public health and safety;

b) protects good quality agricultural land (GQAL) from fragmentation, alienation or encroachment of incompatible land "uses" in accordance with State Planning Policy 1/92 – Development and Conservation of Agricultural Land;

c) is located, designed and operated in a manner that protects and enhances the predominant rural scale, intensity, form and character;

d) maintains the rural amenity;

e) does not prejudice or impact adversely on other "uses", particularly "sensitive land uses", including those within other "zones";

f) does not prejudice or unduly impact on mineral resources or their extraction;

g) has an appropriately designed access to the road network, and traffic generated by the development does not impact adversely on the local road network;

h) does not adversely impact on areas and sites of conservation importance, including cultural and high landscape values;

i) is located and designed in ways that minimise the need for flood and landslide mitigation, and to protect people and premises from such natural events;

j) has water supply, stormwater disposal, sustainable effluent and waste disposal and power, to appropriate standards, adequate for the "use"; and

k) does not impact adversely on infrastructure.

Response –The proposal meets the above requirements for development within the Rural Zone. As demonstrated by the various specialist reports submitted as part of this development application, it is evident that the proposal will protect the environment and ensure that public safety is maintained.

The proposal will not result in the fragmentation of Good Quality Agricultural Land and will not adversely impact upon other rural land uses within the area. The application does not seek approval for the rail line itself.

The proposal is designed and will be operated in a manner that protects the predominant rural scale and character. Each of the individual sites is comparatively small in relation to the size of the rural holdings on which they are located and it is not expected that they will have a noticeable impact upon the intensity in which these uses can operate.

The isolated location and relatively small footprint of each site ensures that the rural amenity will not be adversely impacted upon and the location of each site ensures that other 'sensitive' land uses will not be prejudiced.

The proposal will assist in facilitation a major mineral resource development and will not unduly prejudice any other existing extractive industry uses within the region.

Access to each of the sites will be gained via the rail corridor itself and the proposal is not expected to have any long term adverse impacts upon the road network within the region. The traffic impacts associated with this proposal are considered to be extremely minor compared to the mine itself. A detailed traffic assessment has been undertaken as part of the submitted EIS for the Carmichael Coal and Rail Project (EIS Volume 4).

The sites are not located on or adjacent to sites with high conservation, cultural or landscape value.

The proposal will have adequate stormwater, effluent and waste disposal systems in place that are adequate for the use and the proposal will not adversely affect any existing infrastructure within the area.

4) Within the Rural "Zone", the following are appropriate "uses":

a) "agriculture" and "grazing";

b) "intensive animal industries" and "extractive industries", where they are located and operated so as to ensure no unacceptable detrimental impact on surrounding "uses" or on the environment;

c) limited industrial "uses", where it can be demonstrated those "uses" are associated with rural production or natural resource use and cannot reasonably be established in the Industrial "Zone";

d) "bed and breakfast premises" and "home business" where they are of a small scale and are compatible with surrounding "uses";

e) "caravan or relocatable home park" for the purposes of tourist accommodation where it is: of a small scale; compatible with the amenity and character of surrounding uses; and directly and primarily associated with rural production, the natural environment or cultural resources in the surrounding area; and

f) "caravan or relocatable home park" or "accommodation building" for the purposes of accommodating workers, where the use is: directly and primarily associated with rural production or a natural resource related industry on the same site or on an immediately adjoining site; compatible with the amenity and character of the surrounding uses; intended to be established only for a defined period; and cannot reasonably be located in the Urban "Zone".

Response –The proposal is considered to be for an appropriate use within the rural zone. The use accords with item (c) of the above statements as it for the purpose of an industrial use and it is primarily associated with a natural resource related industry and cannot be reasonably located within the Industry Zone.

8.5.3 Overlay Provisions

The Planning Scheme for Belyando Shire contains two overlay maps that have the potential to affect the development of the subject site. These maps include the 'Land Characteristics Map' and the 'Good Quality Agricultural Land Map'. As illustrated in **Figure 22** below, the site is not contained within any specific designation of either of these overlay maps.

The Land Characteristics Map illustrated in Figure 21 below does not identify any specific features within proximity to the proposed rail corridor. It should be noted that the rail line itself crosses a number of small waterways. None of the sites included in this application will have an adverse impact on any of the waterways identified on the mapping.

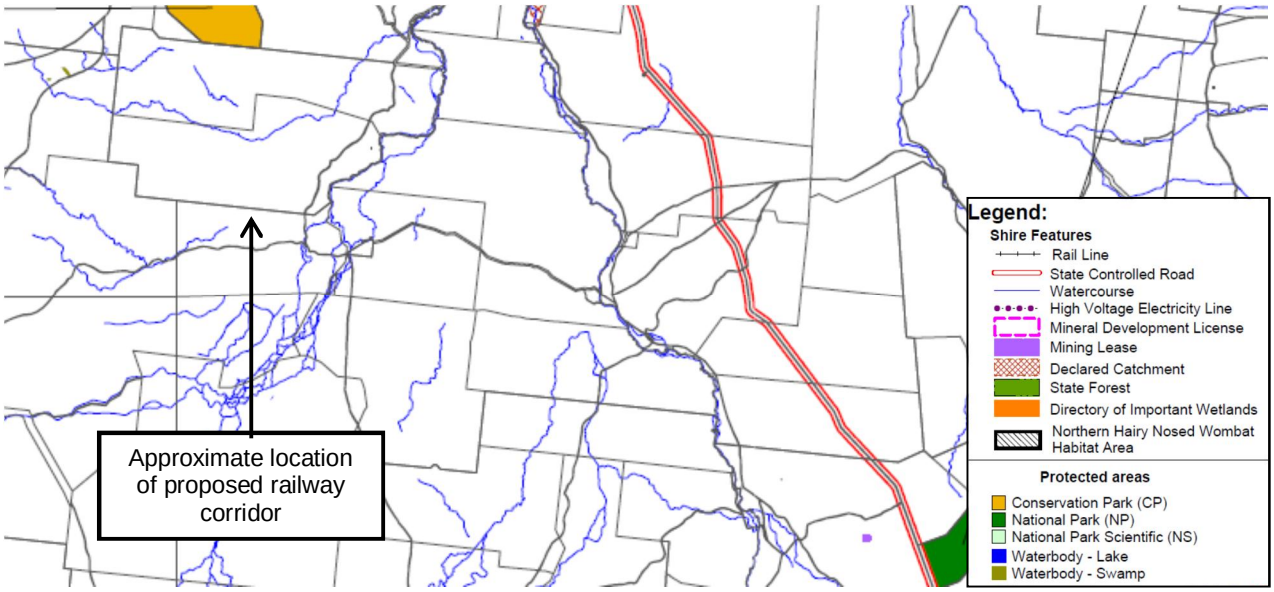


Figure 22: Extract from Land Characteristics Map of Belyando Planning Scheme

8.5.4 Table of Assessment

The Table of Assessment for the Rural Zone lists uses that are defined as being Self Assessable or Code Assessable. Consequently, any use not identified within the table is subject to the provisions of Impact Assessment.

As illustrated within **Figure 23** below, the three proposed use definitions are not contained within the Table of Assessment for the Rural Zone and the proposal is therefore defined as being Impact Assessable. It is noted that all proposed industrial uses will have a total use area in excess of 150m² and are therefore Impact Assessable.

"Use"	Assessment Category	Applicable Code
"Agriculture"	**Self Assessment** where complying with the applicable acceptable solutions in the Rural "Zone" Code **Code assessable** if any applicable acceptable solution is not met	Rural "Zone" Code Rural "Zone" Code
"Bed and breakfast premises"	**Self Assessment** where complying with the applicable acceptable solutions in the Rural "Zone" Code **Code assessment** if any applicable acceptable solution is not met	Rural "Zone" Code Rural "Zone" Code
"Caretaker's residence"	**Self Assessment** where complying with the applicable acceptable solutions in the Rural "Zone" Code **Code assessment** if any applicable acceptable solution is not met	Rural "Zone" Code Rural "Zone" Code
"Commercial premises" where involving a change of use from an existing "commercial premises" or "shop"	**Self Assessment** where: (a) complying with the applicable acceptable solutions in the Rural "Zone" Code; and (b) not involving "building work" other than "minor building work". **Code assessment** if: (a) any applicable acceptable solution is not met; and (b) not involving "building work" other than "minor building work". **Impact assessment** otherwise	Rural "Zone" Code Rural "Zone" Code
"Detached house"	**Self Assessment** where complying with the applicable acceptable solutions in the Rural "Zone" Code **Code assessment** if any applicable acceptable solution is not met	Rural "Zone" Code Rural "Zone" Code
"Grazing"	**Self Assessment** where complying with the applicable acceptable solutions in the Rural "Zone" Code **Code assessment** if any applicable acceptable solution is not met	Rural "Zone" Code Rural "Zone" Code
"Home business"	**Self assessment** where complying with the applicable acceptable solutions in the Rural "Zone" Code **Code assessment** if any applicable acceptable solution is not met	Rural "Zone" Code Rural "Zone" Code
"Industrial activities"	**Code assessment** where having a "total use area" less than 150m² **Impact assessment** otherwise	Rural "Zone" Code
"Shop" where involving a change of use from an existing "commercial premises" or "shop"	**Self Assessment** where: (c) complying with the applicable acceptable solutions in the Rural "Zone" Code; and (d) not involving "building work" other than "minor building work". **Code assessment** if: (c) any applicable acceptable solution is not met; and (d) not involving "building work" other than "minor building work". Impact assessment **otherwise**	Rural "Zone" Code Rural "Zone" Code
All other "uses"	**Impact assessment**	

Figure 23: Rural Zone Material Change of Use Table

8.5.5 Public Notification

As identified in **Section 3** of this report, public notification is not required to be undertaken for a development application that is included within an EIS approval granted by the Coordinator General under Section 37 of the *State Development and Public Works Organisation Act 1971.*

8.6 Relevant Planning Scheme Codes

A review of the report and details of the proposed development indicates that the following codes are to be addressed in relation to the proposal:

- Rural Zone Code

The assessment of the proposed development against the above mentioned code is contained within **Part 5** of this Application Package.

The response to this code has identified a number of instances where compliance with the acceptable solution cannot be achieved. In the majority of cases this is as a result of proposing to establish a non-rural use within the Rural Zone. However, in all instances sufficient information has been provided to demonstrate compliance with the relevant performance criteria. A detailed response to all applicable performance criteria has been provided in **Section 9** of this report.

9 Key Planning Matters

The following section discusses the key planning matters that have been identified from the assessment of the relevant development codes. Given that all of these matters present an alternate solution to address the relevant Performance Criteria, compliance with the purpose of the code and ultimately with the planning scheme is demonstrated.

9.1 PC1 – PC5 - Establishment of Non – 'Rural Activities' within the Rural Zone

Performance Criteria PC1 to PC5 of the Rural Zone Code relate to the establishment of non-rural activities within the Rural Zone. As outlined in the response to the Rural Zone Code contained **Part 5** of the application package, the proposed uses are considered to be acceptable for the sites in which they are proposed and will not adversely impact upon the amenity of the rural locality or the ongoing viability of the region's rural production ability. Each site has been specifically located to ensure that impacts upon the local environment are minimised and that the rural production capacity of the region is not prejudiced. This is evidenced in the non-uniform spacing of the various laydown area types which has been adopted due to the presence of protected vegetation and environmental constraints in various locations.

PC1 to PC5 of the Rural Zone Code deal with two key planning matters: 'location' and 'amenity'. In all instances, it has been demonstrated that the proposed development has no significant impact upon amenity of the region as a direct result of site location choices.

A response to each of the applicable performance criteria is as follows:

PC1 specifically deals with **location** and states the following;

> *Non-"rural activities" are located in the Rural "Zone" only where those activities:*
>
> *(a) do not unduly impact on the character and amenity of the locality;*
>
> *(b) are directly and primarily associated with rural activities, a natural resource related industry or natural or cultural resources;*
>
> *(c) cannot reasonably be located in another more appropriate zone;*
>
> *(d) do not prejudice the existing or future productive capacity of rural land or other natural resources; and*
>
> *(e) do not adversely affect the landscape values and scenic qualities of the locality.*

As outlined in the response to PC1-5 in the code response template contained in **Part 5** of the application package, the proposal is not expected to unduly impact upon the character and amenity of the locality for a number of reasons. These reasons include the temporary nature of the majority of sites and the minimal impact upon the surrounding environment.

The majority of sites included in this proposal do not involve the construction of any buildings, incorporate minimal earthworks and result in a relatively minor amount of land disturbance. All of the sites are located directly adjacent to the proposed rail corridor and this ensures that any disturbance directly associated with a particular site is relatively minor compared that associated with the larger infrastructure proposal in the immediate vicinity. It is therefore contended that the proposal will not prejudice the existing or future productive capacity of the rural land in the region and there is no other practical alternative location for the proposed uses.

All of the proposed sites are directly associated with a natural resource related industry and are essential to the construction and ongoing maintenance of a project deemed to be of 'State Significance'. The proposal is therefore seen to be part of a larger project within the region and is not intended to be a typical 'industry' or 'storage facility' development that should be located within the Urban Zone or Industry Zone as identified in the Planning Scheme.

All sites including the laydown areas, concrete batching plants and maintenance facilities cannot be reasonably located within a more appropriate zone of the Planning Scheme as the travel distances for the transport of materials from existing centres to construction locations along the rail corridor are significant.

None of the proposed locations are considered to possess any specific or significant scenic values given the locality in which it is proposed. This is reflected in the fact that none of the sites are identified as containing significant features on the Land Characteristics Map of the Planning Scheme. Regardless of the environmental significance of each particular site, the proposal is supported by appropriate measures to reduce environmental impacts, involves minimal earthworks and most sites can easily be restored to their current state upon completion of this particular section of the rail corridor.

In summary, based on the above assessment and that contained within the detailed assessment against the planning scheme codes located within **Part 5** of the application package, the proposal is considered to meet the objective of PC1 of the Rural Zone Code for the following reasons:

> The proposed uses are directly related to the proposed railway line and cannot reasonably be located within another zone of the scheme;

> The majority of the proposed sites are temporary in nature and will not have a long lasting impact on the locality;

> The relatively compact nature of the majority development ensures that impacts on the landscape are minor;

> The permanent locations included within this application are located immediately adjacent to the railway line and have been situated to ensure that they do not prejudice the production value of the region or the scenic qualities of the location;

> The sites on which the proposal is located do not possess significant environmental features nor are they located on a prominent ridgeline or escarpment; and

> The proposal is essential to the construction of infrastructure associated with a project deemed to be of 'State Significance'.

PC 2 to PC4 relate to **amenity** and state the following:

> *PC 2 Non-"rural activities" are of a scale that is consistent with the amenity and character of the locality and do not prejudice the operation and viability of other "uses" or activities in the Rural "Zone" or other "zones".*
>
> *PC3 Non-"rural activities" are operated so as to ensure that the activities and the operation of equipment occur at appropriate times to protect the amenity of the locality.*
>
> *PC4 The loading and unloading of goods in connection with non- "rural activities" occurs at appropriate times to protect the amenity of the locality.*

The proposal is not expected to result in a significant and permanent impact upon the amenity of the localities in which the sites are located. In addition, the development is not expected to prejudice the viability of other activities within the rural zone. It is noted that the sites are situated in relatively isolated locations that do not possess a high level of scenic amenity. Impacts associated with the presence of the proposed railway line itself are considered to be far greater than any of the impacts associated with each of the proposed sites which are ancillary to this infrastructure. It is therefore contended that the laydown areas, in isolation, will not prejudice the operation and viability of other uses within the Rural Zone.

In the event that the hours of operation for the proposed concrete batching plants, maintenance facility and laydown facility are extended, the lack of nearby sensitive receivers in this isolated locations ensures resident's amenity will not be impacted upon.

As outlined within the submitted EIS, the railway line is located a sufficient distance from any of the nearby homesteads (which represent the only sensitive receivers in the area) to cause nuisance.

It is also unlikely that the delivery of goods will occur outside the appropriate daylight hours given the isolated location and lack of lighting on the access roads. However, as is the case with operating hours for the

proposed facilities, the rail line is located in an isolated location where the loading and unloading of goods would not impact upon the amenity of any nearby residents.

In summary, the proposal meets the objective of PC2-PC5 of the Rural Zone Code for the following reasons:

- The proposal will not have a lasting impact upon the rural amenity and will not prejudice the operation and viability of other activates within the zone;
- None of the sites currently possess a high level of scenic amenity;
- The isolated location of the railway corridor ensures that there will be minimal impacts associated with the operation of equipment at various times;
- It is unlikely that goods will be delivered outside normal business hours however the location of the sites is not expected to result in adverse impacts on residents should deliveries occur at inappropriate times.

9.2 Car Parking

Acceptable Solution AS19.1 of the Rural Zone Code states that car parking must be provided in accordance with the requirements set out in Schedule 1, Division 2 of the scheme. This particular section of the scheme identifies car parking number requirements for defined uses. In regard to 'Industry' and 'Storage Facility' uses, the scheme stipulates a rate of 1 space per 100m² of total use area.

The unique nature of the development make results in a situation where the rate identified in the scheme is clearly not relevant to the development that is occurring. This is due to the fact that the small number of sites in which permanent works will be based do not allow for the private travel of workers to the location.

Regardless of the above, performance criteria PC19 is applicable to the proposal. PC 19 states the following:

> *Vehicle parking and service vehicle provision is adequate for the "use" and ensures safe and functional operation for motorists and pedestrians*.

The proposal is considered to meet the above criteria as outlined the traffic report prepared by Cardno contained in **Part 6** of the application package. The proposal is for isolated sites that will largely be access via private buses and mine vehicles. The operation of the sites will be undertaken in accordance with strict operational guidelines that ensure that all vehicle parking and service provision is safe and functional.

In summary, the proposal is considered to meet the requirements of PC 19 for the following reasons:

- The proposed number of car parking spaces has been determined based on the maximum number of vehicles that is likely to be present on the site at any given time and the rates identified within the planning scheme are not relevant to this particular proposal;
- Adani has undertaken detailed studies to ensure that sufficient parking is provided on the site;
- The majority of workers accessing the site will do via busses and not by private vehicle; and
- The sites are not intended to accommodate the private vehicles of workers.

10 Statement of Sufficient Grounds

Section 326 of the *Sustainable Planning Act 2009* requires that the Assessment Manager's decision must not conflict with a relevant instrument unless —

(a) the conflict is necessary to ensure the decision complies with a State planning regulatory provision; or

(b) there are sufficient grounds to justify the decision, despite the conflict; or

(c) the conflict arises because of a conflict between —

(i) 2 or more relevant instruments of the same type, and the decision best achieves the purposes of the instruments;

(ii) 2 or more aspects of any 1 relevant instrument, and the decision best achieves the purposes of the instrument.

Our assessment has established that the proposed development does not conflict with the planning scheme or any other relevant instrument. However, even on an alternative view, there are sufficient grounds to justify the approval despite any conflict, namely:

> The proposal forms an essential part of a project that is of State Significance which will contribute to the economy of the region;

> The proposal does not cut across the planning intent for the former Belyando Shire, as that intent is expressed in the relevant planning instruments;

> The sites cannot be reasonably located elsewhere within the region;

> The sites will allow for the efficient construction and ongoing maintenance of a significant infrastructure project; and

> The proposal makes efficient use of suitable land that is adjacent to the proposed rail corridor.

11 Conclusion

This planning report has been prepared on behalf of Adani Mining Pty Ltd, the proponents of the development proposed to be undertaken on the subject site.

This planning report has provided a town planning assessment under the provisions of the Mackay, Isaac and Whitsunday Regional Plan and the Shire of Belyando Planning Scheme in respect to the proposed development.

A full assessment of the proposal has been made against the relevant Planning Scheme Code and the conclusion of this assessment is that the proposed development is capable of achieving compliance with the relevant Acceptable Solutions and / or Performance Criteria contained within the applicable code. Where warranted, Alternate Solutions have been fully demonstrated having regard to the Planning Scheme's stated Performance Criteria and Intent Statements.

The proposal is considered to be appropriate for the sites based on the following justification;

- The proposal accords with the relevant provisions of the Mackay, Isaac and Whitsunday Regional Plan;
- The proposal accords with the higher order provisions of the Planning Scheme including DEOs and Planning Strategies as identified in the report;
- The proposal accords with the relevant acceptable solutions and/or performance criteria of the Rural Zone Code;
- The sites cannot be reasonably located within another zone of the planning scheme;
- The proposal is an essential component of a project deemed to be of State Significance;
- All sites are required to facilitate an efficient construction process;
- The proposed location is appropriate and all sites have been located to ensure minimal disruption to the rural amenity of the area;
- The proposed locations have been decided based on careful consideration of the environment and local biodiversity; and
- The proposal will contribute to the economy of the region through an increase in employment.

PART

3

PROPOSAL PLANS

> Proposal Plans prepared by Cardno

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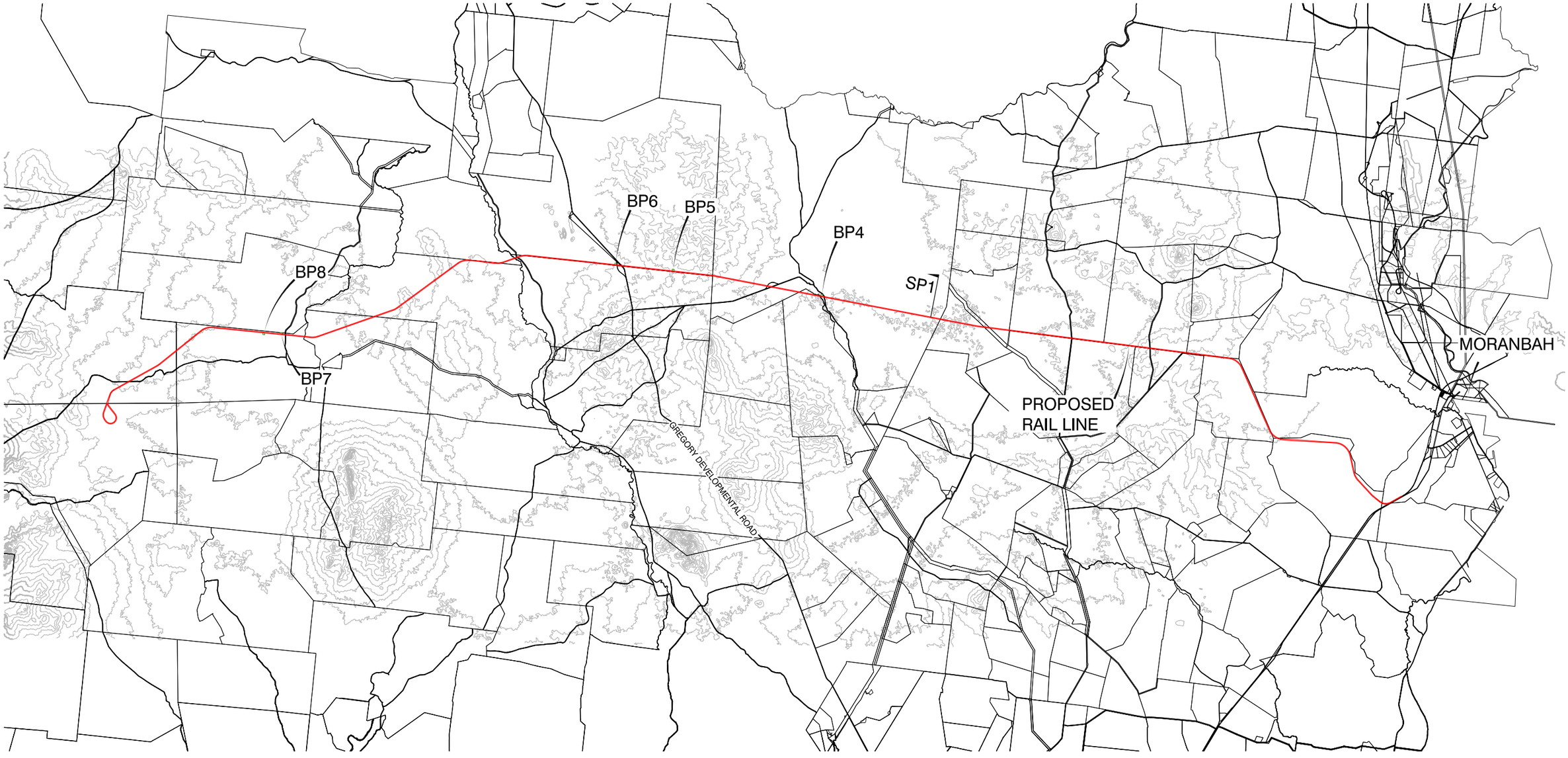
PO Box 391, Carrara, Qld 4211
Tel:07 5539 9333 Fax:07 5538 4647
Email: GCO@cardno.com.au Web: www.cardno.com.au

Cardno
Shaping the Future



-10 -5 0 5 10 15 20km
SCALE @ A3 1:500,000

Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Locality Plan for the Concrete Batching Plant Locations

Date: April 2013
Drawing Number: Sketch 721769 - 001
Revision: C

DATE PLOTTED: 12 July 2013 11:17 AM
CAD FILE: P:\721769 Adani\03 Design\Cad\03 Sketches\721769 Sk01-03 Locality Plans.dwg

Cardno (Qld) Pty Ltd | ABN 57 051 074 992
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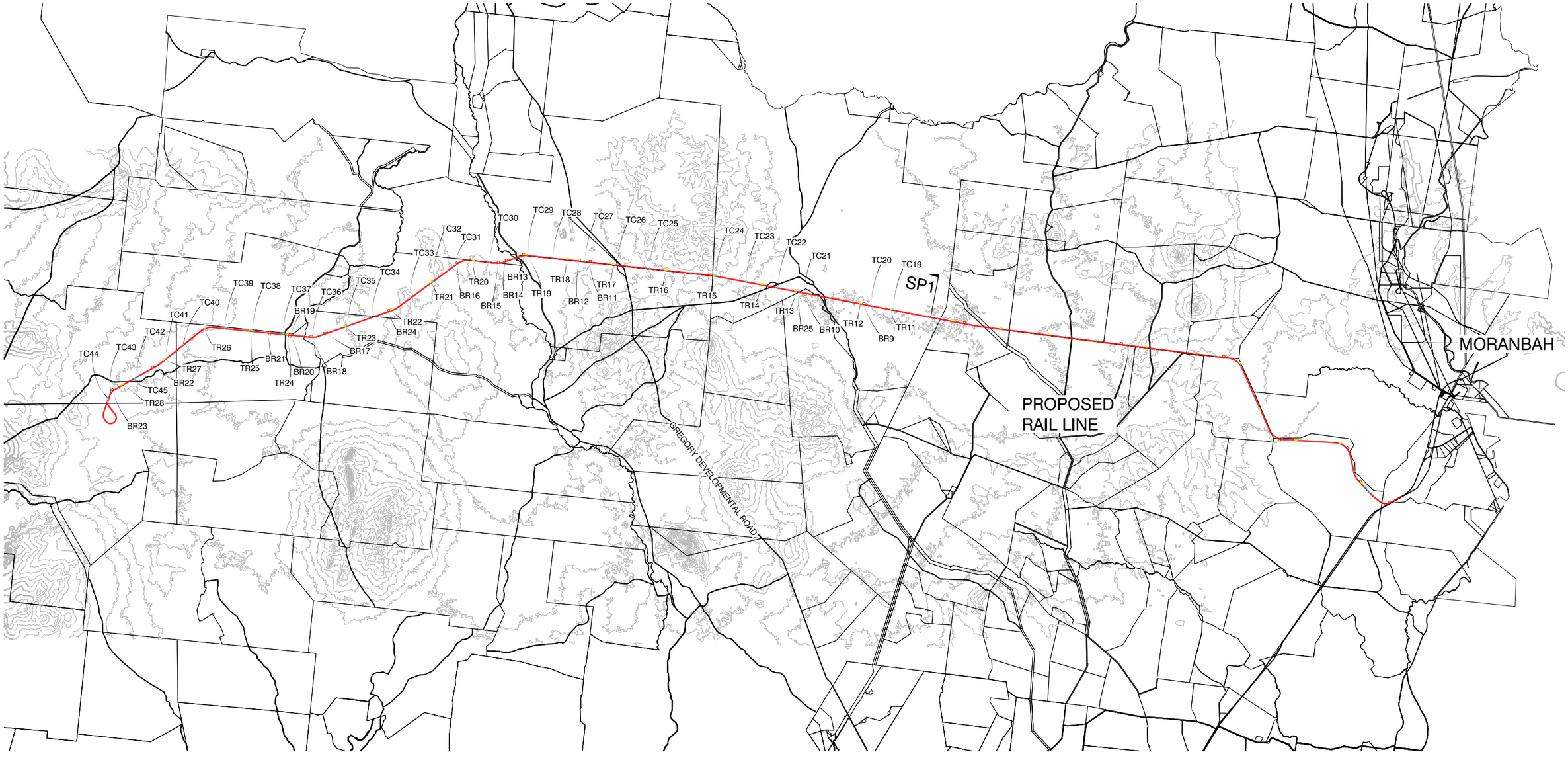

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SCALE @ A3 1:500,000

Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Locality Plan for the Laydown Area Locations

Date: April 2013
Drawing Number: Sketch 721769 - 003
Revision: B

DATE PLOTTED: 12 July 2013 11:19 AM
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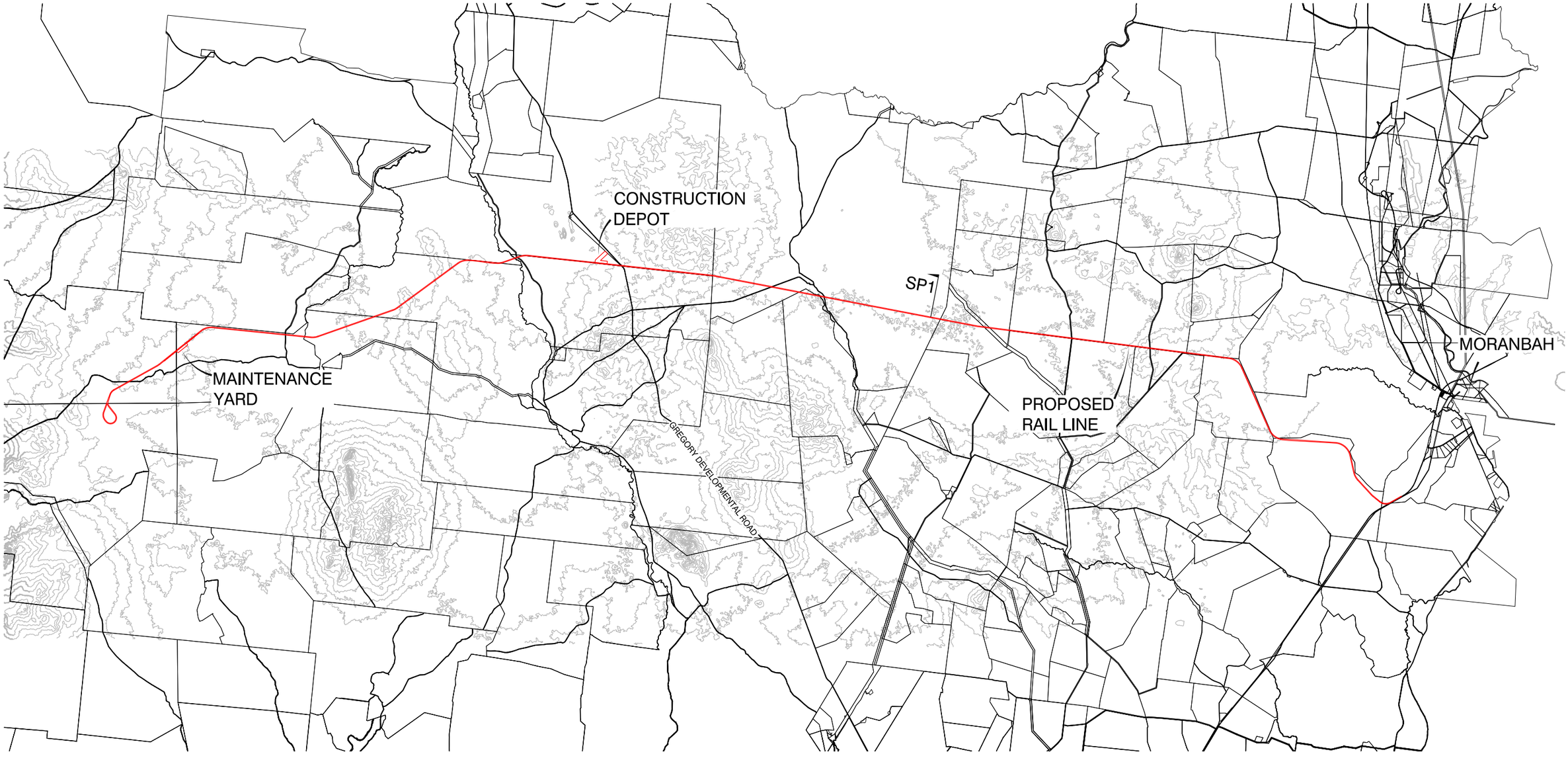

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Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Locality Plan for the Maintenance Yard and Construction Depot

Date: April 2013
Drawing Number: Sketch 721769 - 002
Revision: B

DATE PLOTTED: 12 July 2013 11:18 AM
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PART 4

CODES

> Planning Scheme for the Shire of Belyando - Rural Zone Code

Material Change of Use		
Performance Criteria	**Acceptable Solution**	**How does the proposal comply with the Acceptable Solution or Performance Criteria?**
Location		
PC1 Non-"Rural Activities" - Locational Criteria Non-"rural activities" are located in the Rural "Zone" only where those activities: (a) do not unduly impact on the character and amenity of the locality; (b) are directly and primarily associated with rural activities, a natural resource related industry or natural or cultural resources; (c) cannot reasonably be located in another more appropriate zone; (d) do not prejudice the existing or future productive capacity of rural land or other natural resources; and (e) do not adversely affect the landscape values and scenic qualities of the locality.	No acceptable solution is prescribed.	**Complies with Performance Criteria** a) The proposed non-rural activities will not unduly impact upon the character and amenity of the locality. The sites are directly related to the proposed rail line associated with a project deemed to be of 'State Significance' that will be entirely located within the Rural Zone of the planning scheme . Given the site's proximity to the rail line, they are not expected to result in any additional impact upon the Rural Zone compared to that associated with the rail line itself. b) The uses are directly associated with a natural resource related industry. c) The sites cannot be reasonably located within another zone of the scheme given that they must be located immediately adjacent the rail line which is entirely located within Rural Zone. d) Given the relatively small size of the sites in relation to the land holdings in which they are located, the proposal will not prejudice the future productive capacity of the rural area. e) The proposal will not adversely impact the scenic qualities of the area given the rail line's isolated location and the fact that the impact associated with the various laydown and maintenance sites will not be greater than the impacts of the rail line itself. For further information in regard to the establishment of the proposed use within the Rural Zone please refer to **Section 9** of the submitted Planning Report.
Amenity		
PC2 Non-"Rural Activities" - Scale Non-"rural activities" are of a scale that is consistent with the amenity and character of the locality and do not prejudice the operation and viability of other "uses" or activities in the Rural "Zone" or other "zones".	**AS2** The "total use area" is less than 150m2 .	**Complies with Performance Criteria** The proposed laydown and maintenance sites are more than 150m². However, they will not prejudice the operation and viability of other uses within the Rural Zone. This is reflected in the appropriate location of each site taking into account environmental constraints and the comparatively small footprint in relation to the total lot size. For further information in regard to the establishment of the proposed use within the Rural Zone please refer to **Section 9** of the submitted Planning Report.
PC3 Non-"Rural Activities" - Operating Hours	**AS3** Non-"rural activities" are operated	**Complies with Performance Criteria** The isolated nature of each of the proposed sites is not expected to result in adverse impact on the local

Non-“rural activities” are operated so as to ensure that the activities and the operation of equipment occur at appropriate times to protect the amenity of the locality.	only between the hours of 7:00am and 6:00pm.	amenity as a result of after-hours construction activities which are expected to occur 24 hours a day seven days a week where possible. It is noted that issue relating to impacts associated with hours of operation have been address in Part 3 of the submitted planning report and within the submitted EIS document. For further information in regard to the establishment of the proposed use within the Rural Zone please refer to **Section 9** of the submitted Planning Report.
PC4 Non-“Rural Activities” - Delivery of Goods The loading and unloading of goods in connection with non- “rural activities” occurs at appropriate times to protect the amenity of the locality.	**AS4.1** Loading and unloading occurs only between the hours of: (a) 7:00am and 6:00pm, Monday to Friday; and (b) 7:00am and 12:00 (noon) on Saturdays. **AS4.2** No loading and unloading occurs on Sundays and public holidays.	**Complies with Performance Criteria** The isolated location of the sites will ensure that loading activities do not result in negative impacts to local residents. For further information in regard to the establishment of the proposed use within the Rural Zone please refer to **Section 9** of the submitted Planning Report.
PC5 “Residential Activities” Land within the Rural “Zone” is maintained for rural activities.	For “caretaker’s residences”: **AS5** No more than 1 (one) “caretaker's residence” per lot. For all other “residential activities”: No acceptable solution is prescribed.14	**Not Applicable** No residential activities are proposed as part of this application.
PC6 Height The height of “buildings” and “structures” does not impact adversely on the amenity of the locality and is consistent with the predominant rural form.	**AS6** “Buildings” and “structures” other than those within 100 metres of the boundary of an “airport”15 are not more than: (a) 8.5 metres; and (b) 2 (two) storeys, at any point above natural ground level. (Except where establishing in an existing “building” and no “building works” are being undertaken for that existing “building”,	**Complies with Performance Criteria** The Maintenance Yard and Construction Depot will exceed 8.5m in height. However, given the isolated location the structures will not adversely impact upon the amenity of the area. The proposed construction depot is at least 4.2km from the nearest homestead and is a temporary structure that will not have a permanent impact upon the amenity of the area. The proposed maintenance facility site is well within the bounds of the Moray Downs property and will therefore not impact upon any nearby properties including the existing exploration village which is more than 6km away from the proposed maintenance facility. The expansion village is the closest potential sensitive receiver to the proposed maintainence facility,

	and excluding windmills, silos and other rural operational equipment).	
PC7 Setbacks and Boundary Clearances "Buildings" and "structures" are located to ensure the rural amenity is maintained.	**AS7.1** "Buildings" and "structures" have a setback of not less than 20 metres from any road frontage other than a State Controlled Road as identified on Land Characteristics Map – Features Map. **AS7.2** "Buildings" and "structures" have side and rear boundary clearances of not less than 15 metres from property boundaries (except where establishing in an existing "building" and no "building works" are being undertaken for that existing "building").	**Complies with Acceptable Solution** All buildings contained within the proposal will be setback in excess of 20m from any road frontage. **Complies with Acceptable Solution** All buildings and structures are setback in accordance with this requirement.
PC8 Transport Movements Transport movements associated with the use protect the amenity of the locality.	For "rural activities" and "industrial activities": **AS8** Transport movements do not occur through residential areas. For all other "uses": No acceptable solution is prescribed.	**Complies with Performance Criteria** As identified in the submitted traffic assessment, the transport movements associated with the development will not significantly impact upon the amenity of the locality. This is primarily due to the isolated nature of the site, the lack of homesteads within close distance to the site and the proposed transport routes.
PC9 "Building" and "Structure" Design "Buildings" and "structures" are designed such that the amenity of the locality is protected and maintained.	No acceptable solution is prescribed.	**Complies with Performance Criteria** The proposed buildings are low set and will not adversely impact upon the amenity of the locality. In most cases development only involves the fencing of a portion of land with no actual structure proposed.
PC10 Ridgelines and Escarpments Ridgelines and escarpments are maintained in a	No acceptable solution is prescribed.	**Complies with Performance Criteria** All of the proposed laydown and maintenance sites have been situated to ensure that there will be no negative impact upon ridgelines or escarpments.

natural state to protect rural character, landscape values, and visual amenity.		
PC11 Landscaping and External Activity Areas Landscaping and external activity areas are provided on-site to: (a) contribute to a pleasant and functional rural built form; (b) provide positive sun and breeze control; (c) make provision for recreation areas; and (d) contribute to the positive visual qualities of the locality.	No acceptable solution is prescribed.	**Will Comply** Given the non-residential nature of the proposed development, the nature of the use occurring within each site and the isolated locations, the provision of landscaping and external activity areas is not considered necessary for the majority of sites included in this application. The proposed maintenance facility and construction depot which will support staff on a daily basis will include external activity areas. The proposed maintenance facility will include landscaping as it is a permanent facility. The provision of landscaping is not considered necessary at any of the temporary sites. It is requested that Council condition the provision of detailed landscape plans at a later date.
PC12 Lighting The design of lighting does not prejudice the amenity of the locality through poorly directed lighting, lighting overspill or lighting glare.	**AS12** Direct lighting or lighting does not exceed 8.0 lux at 1.5 metres beyond the boundary of the site.	**Complies with Performance Criteria** The isolated location of the sites ensures that there will be no adverse impacts associated with the proposed lighting should the proposal result in lighting exceeding the threshold identified in the acceptable solution. The lack of residential development or other sensitive receivers within proximity to the sites ensures that any proposed lighting will not impact upon the amenity of nearby residents.
PC13 Separation of Incompatible Land Uses Separation distances are provided to ensure: (a) the future viability of surrounding "uses"; (b) infrastructure items are protected from incompatible "development"; (c) an appropriate standard of amenity and public safety; and (d) conflict arising from incompatible "uses" is minimised.	For "sensitive land uses" and "rural activities" other than "intensive animal industries": **AS13.1** Minimum separation between "sensitive land uses" and "rural activities" are as stated in Schedule 2, Division 1: Separation Distances – Agricultural and Residential Uses For "sensitive land uses" and "intensive animal industries": **AS13.2**	**Complies with Performance Criteria** The site has sufficient separation from any potential sensitive uses including intensive animal industries and existing extractive industries. The isolated location of the site and the rail line in general ensures that there is little or no risk associated with public safety nor is there a significant risk of conflict arising from incompatible uses.

	Minimum separation distances between “sensitive land uses” and “intensive animal industries” are as stated in Schedule 2, Division 2: Separation Distances – Intensive Animal Industries, Section 2.1. For “grazing”: **AS13.3** Pens and yards maintain a minimum separation distance of 300 metres to “sensitive land uses” not associated with the “grazing”. For “uses” other than “sensitive land uses”16 and “extractive industries”: **AS13.4** “Buildings”, “structures” and “outdoor activity areas” maintain a minimum separation distance to “extractive industries” as stated in Schedule 2, Division 3: Separation Distances – Extractive Industries, Section 3.1. For all “uses”: **AS13.5** “Buildings”, “structures” and “outdoor activity areas” maintain a minimum separation distance to petroleum and gas pipelines and refuse tips as stated in Schedule 2, Division 5: Separation Distances – Infrastructure Items, Section 5.1.	
Infrastructure		

PC14 Water Supply All "premises" have an adequate volume and supply of water for the "use".	**AS14.1** "Premises" are connected to Council's reticulated water supply system. **or** **AS14.2** "Premises" are connected to an approved water allocation as provided by the relevant agency. **or** For "detached houses" or "caretakers residences": **AS14.3** "Premises" are connected to a rain water tank with a minimum capacity of: (a) 45, 000 litres where not in a reticulated water supply area; (b) 22, 000 litres where in a reticulated water supply area.	**Complies with Performance Criteria** The proposal will have adequate water supply to service the needs of the development. It is noted that all sites are unable to connect to a reticulated service and the water will be obtained off site and treated appropriately within the bounds of the site. At this stage it is proposed to obtain water either through harvesting of overland flow or through the use of local bores.
PC15 Effluent Disposal All "premises" provide for the treatment and disposal of effluent and other waste water to ensure the protection of public health and environmental values.	**AS15.1** "Premises" are connected to Council's reticulated sewerage system. **or** **AS15.2** "Premises" not in a sewered area have an on-site effluent disposal system in accordance with Schedule 1, Division 4: Standards for Sewerage Supply, Section 4.2.	**Complies with Performance Criteria** All sites are unable to connect to a Council reticulated system and proposal provides for the treatment and disposal of all effluent and other waste water on site. It is noted that it is only the maintenance yard and construction depot locations require any substantial form of sewage treatment. This is reflected in the proposed temporary sewage treatment plants (and associated ERA application) that are included in this application for these site. Please refer to the report prepared by Cardno contained in **Part 6** of the application package for further information in regard to waste water treatment.
PC16 Stormwater Stormwater is collected and discharged so as to: (a) protect the stability of buildings or the use of	**AS16** Stormwater is collected and discharged in accordance with Schedule 1, Division 5: Standards for Stormwater	**Complies with Performance Criteria** All stormwater will be appropriately collected and discharged to ensure the stability of the buildings (if proposed) and the use of the adjacent land is protected. For further information please refer to the Stormwater Management Report prepared Cardno contained in

adjacent land; and (b) protect and maintain environmental values.	Drainage, Section 5.1.	**Part 4** of the application package.
PC17 Electricity "Premises" are provided with an adequate supply of electricity for the "use".	**AS17** All "premises" have a supply of electricity.	**Complies with Acceptable Solution** All sites requiring electricity supply will have an adequate supply of electricity produced via an on site generator. This includes the concrete batching plants, construction depot and the maintenance facility.
PC18 Vehicle Access Vehicle access is provided to ensure the safe and functional operation for motorists and pedestrians.	For all self assessable uses: **AS18.1** All "premises" have vehicle access to a formed road. Access is designed and constructed in accordance with Schedule 1, Division 2: Standards for Roads, Carparking, Manoeuvring Areas and Access, Section 2.3(2). For all other "uses": **AS18.2** All "premises" have vehicle access to a formed road. Access is designed and constructed in accordance with Schedule 1, Division 2: Standards for Roads, Carparking, Manoeuvring Areas and Access, Section 2.3(1).	**Complies with Performance Criteria** The site has safe and functional vehicular access. It is noted that no person will be accessing the site by foot and all persons entering the site will do so by vehicle. For further information please refer to the submitted Traffic Report contained in **Part 7** of the application package. More detailed information in regard to road and intersection design will be provided as part of the future operational works applications.
PC19 Vehicle Parking and Service Vehicle ***Provision*** Vehicle parking and service vehicle provision is adequate for the "use" and ensures safe and functional operation for motorists and pedestrians.	**AS19.1** All "uses" provide vehicle parking in accordance with Schedule 1, Division 2: Standards for Roads, Carparking, Manoeuvring Areas and Access, Section 2.2(1)(a). **AS19.2** Car parking, service vehicle parking and manoeuvring areas are designed and constructed in accordance with	**Complies with Performance Criteria** The provision of formalised car parking spaces is considered necessary. For further information relating to traffic and car parking please refer to **Section 7** of the submitted Planning Report and the submitted Traffic Report prepared by Cardno contained in **Part 7** of the application package.

	Schedule 1, Division 2: Standards for Roads, Carparking, Manoeuvring Areas and Access, Section 2.2(1)(b).	
PC20 Roads Adequate all-weather road access is provided between the "premises" and the existing road network.	**AS20** Roads are designed and constructed in accordance with Schedule 1, Division 2: Standards for Roads, Carparking, Manoeuvring Areas and Access, Section 2.1(1).	**Complies with Performance Criteria** The proposal involves adequate 'all weather' access between the sites and the existing road network. It is noted that the majority of traffic accessing all sites will travel along the access road being constructed along the length of the railway corridor. For further information in regard to access please refer to the Traffic Assessment contained in **Part 6** of the application package.
PC21 "Electricity transmission line easement" - **Vegetation** Transmission lines within an "electricity transmission line easement" are protected from vegetation.	**AS21.1** Planted vegetation within an "electricity transmission line easement" has a mature height not exceeding 2.5 metres as shown in Schedule 2, Division 4: Powerline / Electricity Easements, Section 4.2 Diagram 3. **AS21.2** No part of planted vegetation, at its mature size, is located closer than 2.5 metres to an electricity transmission line as shown in Schedule 2, Division 4: Powerline / Electricity Easements, Section 4.2 Diagram 3.	**Not Applicable** No vegetation is proposed to be established within an electricity easement.
PC22 "Electricity transmission line easement" – **Vegetated Buffers** Vegetated buffers adjoining an "electricity transmission line easement" are maintained to provide: (a) a visual buffer to the easement; and (b) a separation distance from the easement.	**AS22** Existing vegetation, comprising trees and/or shrubs, shall be retained within 20 metres of an "electricity transmission line easement" as shown in Schedule 2, Division 4: Powerline / Electricity Easements, Section 4.2 Diagram 4.	**Not Applicable** None of the proposed sites are within close proximity to an electricity easement.

PC23 "Electricity transmission line easement" - **Separation Distance** "Habitable buildings" and "child oriented uses" are located to ensure community safety.	**AS23** "Habitable buildings" and "child oriented uses" maintain a minimum separation distance from the most proximate boundary of an "electricity transmission line easement" in accordance with Schedule 2, Division 4: Powerline / Electricity Easements, Section 4.1 (1) and Section 3.1 Diagram 1.	**Not Applicable** None of the proposed sites are within close proximity to an electricity easement.
Environmental		
PC24 "Watercourses" and "Lakes" "Development" ensures the maintenance of riparian areas and water quality including protection from offsite transfer of sediment.	**AS24** A minimum 50 metre wide buffer area is provided extending out from the "defining bank" of any "watercourse" or "lake". *Note: See diagrammatic representation of a "defining bank" in Schedule 3.*	**Complies with Performance Criteria** A small number of the temporary sites are located within 50m of a defining bank of the Belyando River. However, as demonstrated in the submitted Stormwater Management Strategies, these sites will be managed to ensure that riparian areas will be maintained and to ensure that water quality within this watercourse is maintained.
PC25 Vegetation Retention "Development" retains vegetation for the: (a) protection of scenic quality; (b) protection of general habitat; (c) protection of soil quality; and (d) establishment of open space corridors and networks.	**AS25** Vegetation comprising 20% of each regional ecosystem type is retained within each lot with retained vegetation made up of woody remnant, regrowth or replanted natural species, excluding deep-rooted crops and clear fell plantation forestry. The shade lines are a minimum of 10 metres in width; clumps have an area greater than 2 hectares.	**Complies with Performance Criteria** All of the proposed sites have been located to ensure that scenic quality and general habitat is protected. The relatively small size of the sites and their proximity to the railway line itself ensures that they will not have significant impacts upon the scenic quality, habitat, soil quality and the establishment of open space corridors.
PC26 Cultural Heritage "Development" ensures the protection and maintenance of places and items of	**AS26.1** A minimum separation distance of 50 metres is provided to the "defining bank" of "watercourses"	**Complies with Acceptable Solution** The site is not located within 50m from the defining bank of a watercourse, cemetery or burial site.

cultural heritage.	and “lakes”. *Note: See diagrammatic representation of a “defining bank” in Schedule 3.* **AS26.2** A minimum separation distance of 50 metres is provided to cemeteries and burial sites as identified in Schedule 2, Division 7: Places and Items of Cultural Heritage, Section 7.1.	
PC27 Air Emissions Air emissions from “premises” do not cause environmental harm or nuisance to adjoining properties or “sensitive land uses”. 17	No acceptable solution is prescribed.	**Complies with Performance Criteria** The proposal is not expected to generate any significant environmental harm as a result of air emissions. Nevertheless, the isolated location and lack of sensitive receivers within proximity to any of the sites ensures that adverse impacts in relation to air emissions are not an issue. Therefore, the provision of an environmental report detailing the exact nature of air emissions is not considered to be necessary for the proposal.
PC28 Noise Emissions Noise emissions from “premises” do not cause environmental harm or nuisance to adjoining properties or “sensitive land uses”.18	No acceptable solution is prescribed.	**Complies with Performance Criteria** The proposal is not expected to cause any environmental harm or nuisance as a result of noise emissions. Due to the isolated location and lack of sensitive receivers, a full acoustic assessment has not been provided as part of this application. Should Council have any concerns in regard to potential noise emissions from any of the proposed sites, the Noise Assessment submitted as part of the EIS document contained as detailed assessment for the overall project.
PC29 Water Quality The standard of effluent and / or stormwater run-off from “premises” ensures the quality of surface and underground water is suitable for: (a) the biological integrity of aquatic ecosystems; (b) recreational use; (c) supply as drinking water after minimal treatment; (d) agricultural use; or (e) industrial use. 19	No acceptable solution is prescribed.	**Complies with Performance Criteria** The proposal involves adequate stormwater management and waste water treatment to ensure that the quality of surface and underground water is suitable for environmental, recreation, supply and agricultural use. The proposal is not expected to have any harmful impact upon the local environment given the standard of treatment proposed. For further information in regard to stormwater please refer to the submitted Stormwater Management Plan within **Part 4** of the application package and Information in Support of Proposed ERAs contained within **Part 5** of the application package.
PC30 Excavation or Filling	**AS30.1**	**Complies with Acceptable Solutions**

Excavating or filling of land: (a) ensures safety and amenity for the users of the "premises" and nearby land; (b) minimises soil erosion and instability of surrounding areas; and (c) does not degrade the environmental values of receiving waters.	Batters have a maximum slope of 25%, are terraced at every rise of 1.5 metres and each terrace has a minimum depth of 750mm. **AS30.2** Excavation or filling within 1.5 metres of any site boundary is battered or retained by a wall that does not exceed 1 metre in height. **AS30.3** The extent of filling or excavation does not exceed 40% of the site area or 500m2 whichever is lesser. **AS30.4** Filling and excavation is not greater than 1 metre in height or depth. **AS30.5** Only clean uncontaminated fill is used (i.e. no building waste, concrete, green waste or contaminated material etc. is used as fill). **AS30.6** The site is not on the contaminated land register **AS30.7** Any excavation or filling occurs more than 25 metres from the "defining bank" of any "watercourse" or "lake". *Note: See diagrammatic representation of a "defining bank" in Schedule 3.* **AS30.8** Excavation or filling is undertaken in accordance with Schedule 1, Division 1: Standards for Construction Activities, Section 1.1.	The proposal does not involve significant amounts of earthworks and the proposal does not involve any of the following works at any of the proposed sites: • batters with grades exceeding 25%; • excavation or filling of more than 40% of the site area; and • filling or excavation of more than 1m in height or depth. Any fill placed on the site will be uncontaminated and none of the sites are listed on the Contaminated Land Register. No filling or excavation is proposed within 25m of a defining bank of an existing watercourse or lake. For further information relating to excavation and filling please refer to the submitted civil drawings prepared by Cardno contained within **Part 8** of the application package.

PC31 Construction Activities Erosion control measures and silt collection measures ensure that environmental values are protected during construction activities.	**AS31** During construction soil erosion and sediment is controlled in accordance with standards contained in Schedule 1, Division 1: Standards for Construction Activities, Section 1.1.	**Complies with Acceptable Solution** All construction activities will be appropriately managed in accordance with the IECA (2008) Best Practice ESC Guideline.
Constraint		
PC32 "Development" in the vicinity of "Airports" "Development" in the vicinity of "airports": (a) protects the operation of the "airport"; (b) is designed and located to achieve a suitable standard of amenity for the proposed activity; and (c) does not restrict the future operational requirements of the "airport".20	**AS32** "Buildings" and "structures" within 100 metres of the boundary of an "airport" are less than 7.5 metres in height at any point above natural ground level. (Except where establishing in an existing "building" and no "building works" are being undertaken for that existing "building".)	**Not Applicable** None of the sites are located within the vicinity of an airport.
PC33 Good Quality Agricultural Land Areas Good quality agricultural land areas as identified on the Land Characteristics Map – Good Quality Agricultural Land are conserved and managed for the longer term and protected from development that may lead to its alienation or diminished productivity.21	No acceptable solution is prescribed.	**Complies with Performance Criteria** The proposal will not have an impact upon the productivity of good quality agricultural land. The site are all located directly adjacent to the railway line and therefore their agricultural value has already been restricted. Nevertheless, the site has been located to ensure that they have minimal impact upon the agricultural production value of the region.
vcPC34 Flooding "Premises" are designed and located so as: (a) not to be adversely impacted upon by flooding;	No acceptable solution is prescribed.	**Complies with Performance Criteria** All sites have been located to ensure that flooding risks are mitigated. In the rare number of instances where sites have potential flooding issues, specific management plan have been prepared to ensure that the strategies are put in place to minimise the risk of harm.

(b) to protect life and property; and (c) not to have an undesirable impact on the extent or magnitude of flooding.22		Please refer to the submitted Stormwater Management plan prepared by Cardno contain in **Part 6** of the application package.
PC35 Protected Areas "Development" is undertaken to ensure areas of significant biodiversity and habitat value and high scenic quality are protected.	**AS35** A minimum separation distance of 100 metres is provided to protected areas as identified on Land Characteristics Map – Features Map.	**Complies with Acceptable Solution** None of the sites are located within 100m of an area defined as a protected area on the Land Characteristics Map.
PC36 Sloping Land "Development" is undertaken to ensure: (a) vulnerability to landslip, erosion and land degradation is minimised; and (b) safety of persons and property is not compromised.	**AS36** "Development" is not undertaken on slopes greater than 15%.	**Complies with Acceptable Solution** None of the development sited have a slope greater than 15%.
PC37 Transport Infrastructure Separation distances are provided to ensure: (a) transport infrastructure items are protected from incompatible "development"; and (b) an appropriate standard of amenity and public safety is provided to adjoining "uses".	**AS37** "Buildings" and "structures" maintain a minimum separation distance to rail lines and State controlled roads (as identified on Land Characteristics Map – Features Map) as stated in Schedule 2, Division 5: Separation Distances – Infrastructure Items, Section 5.1).	**Complies Performance Criteria** The proposed construction depot is located a short distance from the Gregory Developmental Highway. However, the site is located a sufficient distance from the road to ensure that there will be no negative impacts upon traffic utilising this road and safety along this road will be maintained. It should be noted that the construction depot is a temporary facility and there will be no permanent impact upon the Gregory Developmental Highway due to the operation. As part of the submitted EIS and Supplementary EIS, significant investigations into the impacts of traffic and transport associated with this proposal were investigated and appropriate mitigations and upgrades have been recommended.
PC38 Aviation Facilities Aviation facilities are protected from physical obstructions and electromagnetic emissions that may adversely affect their function.	**AS38.1** "Development" is not undertaken within 150 metres of the NDB as identified on Land Characteristics Map – Aviation Facilities and in	**Complies with Acceptable Solution** The proposed development sites are not located within proximity to the NDB identified on the Land Characteristics Map.

	accordance with Schedule 2, Division 8: Sensitive Areas for Aviation Facilities, Diagram 1. For “development” between 150 metres and 500 metres of the NDB: **AS38.2** “Buildings” and “structures” do not intersect the 3° plane extending from the NDB as identified on Land Characteristics Map – Aviation Facilities and in accordance with Schedule 2, Division 8: Sensitive Areas for Aviation Facilities, Diagram 1.	
“Use”		
PC39“Airport” “Airport” activities: (a) do not adversely impact on the amenity of surrounding residents; (b) ensure the safe operation of aeronautical and support activities; and (c) ensure the safety of surrounding “Premises”. 23	No acceptable solution is prescribed.	**Not Applicable** The proposal does not involve airport activities.
PC40 “Bed and Breakfast Premises” “Premises” used for a “bed and breakfast premises” are of a scale and are operated in a manner so as not to impact adversely on the amenity of the locality.	**AS40.1** Provision is made for no more than 6 (six) paying guests to be accommodated at any one time. **AS40.2** “Premises” contains not more than 3 (three) “accommodation units” for guest accommodation purposes.	**Not Applicable** The proposal does not involve a bed and breakfast premises.
PC41 “Extractive Industry” “Premises” used for “extractive	No acceptable solution is prescribed.	**Not Applicable** The proposal does not involve an extractive industry use. It is noted that the use is directly related to the

industries": (a) do not impact adversely on the amenity of other "uses" in the Rural "Zone" or other "zones"; (b) are designed and operated to ensure the protection and maintenance of environmental values; (c) are rehabilitated to provide for future re-use of the land and to prevent ongoing risk of adverse impacts on the local environment and amenity; and (d) are designed and operated so that the safety of persons and property is not compromised.		construction of a rail line that will service an extractive industry. However, approval for this use is obtained separately.
PC42 "Home Business" "Premises" used for a "home business" are of a scale and are operated in a manner so as not to impact adversely on the amenity of the locality.	**AS42.1** No more than 1 (one) person other than the residents of the "premises" is employed in the "home business". **AS42.2** No more than 150m2 of "total use area" is used for the purposes of a "home business". **AS42.3** No more than 2 (two) clients normally attend the "premises" at any one time. **AS42.4** No goods or products produced by other businesses are displayed for sale in any window or outdoor area. **AS42.5** Operate only between the hours of	**Not Applicable** The proposal does not involve a home business.

	7:00am and 6:00pm.	
PC43 "Intensive Animal Industries" "Intensive animal industries": (a) do not impact adversely on the amenity of the Rural "Zone", and surrounding areas; (b) are designed and operated to ensure the protection and maintenance of environmental values; and (c) are rehabilitated to provide for future re-use of the land and to prevent ongoing risk of adverse impacts on the local environment and amenity.	No acceptable solutions prescribed.	**Not Applicable** The proposal does not involve an intensive animal industry.
PC44 "Caravan and Relocatable Home Park" or "Accommodation Building" (a) Development for the purposes of accommodating workers is: on the same site as, or is immediately adjoining, the rural production or natural resource related industry with which it is associated; and is established only for a defined period; and (b) Development for the purposes of accommodating tourists is of a small scale.	No acceptable solutions prescribed.	**Not Applicable** The proposal does not involve a 'Relocatable Home Park' or an 'Accommodation Building'.

PART

5

STORMWATER AND HYDRAULICS

- Stormwater Management Strategy for Laydown Areas prepared by Cardno
- Stormwater Management Strategy Concrete Batching Plants
- Stormwater Management Strategy for the Maintenance Yard and Laydown Facility prepared by Cardno

Stormwater Management Strategy

Carmichael Coal Rail SP1 Laydown Areas

721769

Prepared for
Adani Mining Pty Ltd

19/07/2013

Cardno
Shaping the Future

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Table of Contents

Appendices

Tables

1 Introduction

This conceptual Stormwater Management Strategy (SWMS) report has been prepared on behalf of Adani Mining Pty Ltd for the proposed Carmichael Coal Rail Project laydown areas located along the proposed SP1 rail allignment (the subject site).

The intent of this strategy is to provide an overview of the stormwater management aspects to support the Material Change of Use application for the laydown areas required as part of the rail construction. This SWMS report includes detailed policies, performance criteria and procedures to minimise the impact of the development on the physical and social environment.

This SWMS intends to address the operational phase of the work sites that are expected to have a design life of approximately 2 years.

2 Existing Site and Proposed Development

2.1 Existing Site Description

There are sixty proposed laydown areas (consisting of bridge and track laydown areas and turning circles) along the Carmichael Coal Mine Rail route, located between approximately 90km and 160km west of Moranbah, Queensland in the Isaac Regional Council. There are three different laydown area types; turn-around areas, track laydown areas and bridge laydown areas. Approximate levels for each of the sites have been obtained from a review of available aerial contour information. A summary of the location and details of each of the sites is included in **Tables 2-1** to **2-3** below.

Table 2-1 Turn-around Laydown Area Location Details

Plant	Area	Lot number	Chainage along Track	Site Elevation (RL)	Approximate Grade
TC19*	1.0 ha	10BL49	Ch 73600	206.5m	< 0.5%
TC20*	1.0 ha	10BL49	Ch 76300	208m	< 0.5%
TC21*	1.0 ha	1SP118814	Ch 84700	206m – 206.5m	0.5%
TC22*	1.0 ha	10BL49	Ch 88000	204m – 204.5m	0.5%
TC23*	1.0 ha	10BL49	Ch 92000	207.5m – 208.5m	1%
TC24	1.0 ha	10BL49	Ch 95800	219m – 220.5m	1.5%
TC25	1.0 ha	4SP116046	Ch104000	216.5m – 218m	1.5%
TC26	1.0 ha	4SP116046	Ch 108000	210m – 211m	1%
TC27	1.0 ha	4SP116046	Ch 112000	194.5m – 196m	1.5%
TC28	1.0 ha	4SP116046	Ch 116000	194m – 194.5m	0.5%
TC29*	1.0 ha	4SP116046	Ch 119100	190.5m	< 0.5%
TC30*	1.0 ha	1SP147546	Ch 124000	192.5m – 194m	1.5%
TC31	1.0 ha	1SP147546	Ch 128300	196m – 196.5m	0.5%
TC32	1.0 ha	637PH1980	Ch 131800	196.5m – 197m	0.5%
TC33	1.0 ha	637PH1980	Ch 135300	212m – 214.5m	2.5%
TC34*	1.0 ha	637PH1980	Ch 140650	194m	< 0.5%
TC35*	1.0 ha	3BL26	Ch 143800	196.5m	< 0.5%
TC36*	1.0 ha	3BL26	Ch 148300	197.5m	< 0.5%
TC37*	1.0 ha	662PH1491	Ch 152000	199.5m	< 0.5%
TC38*	1.0 ha	662PH1491	Ch 155800	204m – 204.5m	0.5%
TC39*	1.0 ha	662PH1491	Ch 159200	205m - 205.5m	0.5%
TC40*	1.0 ha	662PH1491	Ch 164950	207.5m	< 0.5%
TC41*	1.0 ha	662PH1491	Ch 167800	211m	< 0.5%
TC42*	1.0 ha	662PH1491	Ch 172000	215m	< 0.5%
TC43*	1.0 ha	662PH1491	Ch 175600	215m	0.5%
TC44*	1.0 ha	662PH1491	Ch 176700	215m	0.5%
TC45*	1.0 ha	662PH1491	Ch 172400	215m – 215.5m	0.5%

Table 2-2 Track Laydown Area Location Details

Plant	Area	Lot number	Chainage along Track	Site Elevation (RL)	Approximate Grade
TR11*	4.5 ha	10BL49	Ch 73800	206.5m	< 0.5%
TR12*	4.5 ha	10BL49	Ch 77600	208m – 208.5m	< 0.5%
TR13*	4.5 ha	10BL49	Ch 85800	206.5m – 207.5m	< 0.5%
TR14*	4.5 ha	10BL49	Ch 90000	203.5m – 204m	< 0.5%
TR15*	4.5 ha	10BL49	Ch 96000	220m – 221.5m	2%
TR16	4.5 ha	4SP116046	Ch 102000	224m – 226.5m	< 1.0%
TR17	4.5 ha	4SP116046	Ch108500	207.5m – 209.5m	< 1.0%
TR18*	4.5 ha	4SP116046	Ch 114200	193m – 193.5m	< 0.5%
TR19*	4.5 ha	4SP116046	Ch 119300	190m – 190.5m	< 0.5%
TR20	4.5 ha	1SP147546	Ch 126000	199m – 200m	< 1.0%
TR21	4.5 ha	637PH1980	Ch 132000	195.5m – 197m	< 0.5%
TR22*	4.5 ha	637PH1980	Ch 138000	194m – 195m	< 0.5%
TR23*	4.5 ha	3BL26	Ch 144000	196.5m – 197.5m	< 0.5%
TR24*	4.5 ha	2SP119925	Ch 151500	196m – 198m	< 0.5% - 1.5%
TR25*	4.5 ha	662PH1491	Ch 156000	204m – 204.5m	< 0.5%
TR26	4.6 ha	662PH1491	Ch 161700	209m – 211m	1.0%
TR27*	4.5 ha	662PH1491	Ch 168000	211m – 212m	< 0.5%
TR28*	4.5 ha	662PH1491	Ch 174000	215m	< 0.5%

Table 2-3 Bridge Laydown Area Location Details

Plant	Area	Lot number	Chainage along Track	Site Elevation (RL)	Approximate Grade
BR9*	6.0 ha	10BL49	Ch 77200	208m – 208.5m	< 0.5%
BR10*	6.0 ha	1SP118814	Ch 84500	206.5m – 207.5m	< 0.5%
BR11	6.0 ha	4SP116046	Ch 111400	198m – 200.5m	< 1.0%
BR12*	6.0 ha	4SP116046	Ch 112800	192m – 194m	< 1.0%
BR13*	6.0 ha	4SP116046	Ch 119600	191.5m – 192m	< 0.5%
BR14*	6.0 ha	1SP147546	Ch 121800	189m – 190m	< 0.5%
BR15*	6.1 ha	1SP147546	Ch122900	190.5m – 193.5m	< 1.0%
BR16	6.1 ha	1SP147546	Ch 128100	195.5m – 196m	< 0.5%
BR17*	6.0 ha	3BL26	Ch 146600	196m – 197.5m	< 1.0%
BR18*	6.1 ha	2SP119925	Ch 148500	197m – 198m	< 1.0%
BR19*	6.0 ha	2SP119925	Ch 151200	197m – 198m	< 0.5% - 1.6%
BR20*	6.0 ha	662PH1491	Ch 151200	198.5m – 199m	< 0.5%
BR21	6.0 ha	662PH1491	Ch 153700	203m – 206m	1.3%
BR22*	6.0 ha	662PH1491	Ch 169700	213m – 214.5m	< 0.5%
BR23*	6.0 ha	662PH1491	Ch 175500	215m	< 0.5%
BR24*	6.0 ha	637PH1980	Ch 138300	194m – 195m	< 0.5%
BR25*	6.0 ha	10BL49	Ch 85500	206.5m – 207.5m	< 0.5%

*Based on the regional hydraulic analysis undertaken by Calibre Operations Pty Ltd and summarised in the Drainage Design Report (Ref. No. CARP12033-REP-C003), these sites may be partially or fully inundated during a 50 year ARI storm event. Refer to Section 8 for possible emergency flood management strategies for these sites.

Refer to Cardno Sketch 721769 SK03 (Appendix B) for the locality plan showing an indicative location of the various laydown areas and Cardno Sketch numbers 721769 SK09 to SK13 (Appendix B) for typical layout plans of each of the various types of laydown areas.

2.2 Developed Site Description

It is proposed to establish the laydown areas to support the construction of the proposed railway linking the Carmichael Coal Mine with the port terminals situated to the east. The developed sites will contain temporary structures, storage areas and a basic road network with minimal sealed areas.

As minimal bulk earthworks are anticipated in order to construct each of the laydown areas, the developed condition site topography is expected to generally resemble the existing conditions.

Refer to Cardno Sketch numbers 7903/44/001/SK001, SK002 and SK004 (Appendix A) for a typical development layout of each of the laydown area types.

3 Performance Criteria

The establishment and operation of the laydown areas has been considered as a construction site for the lifetime of the rail construction project, which is expected to be 2 years. Based on this, the construction and operational phases of the laydown areas will be governed by the same performance criteria as outlined below.

The *'Queensland Water Quality Guidelines (2009)'* (QWQ guidelines) (which is referenced by the *Environmental Protection (Water) Policy (2009)*, a subordinate document of the *Environmental Protection Act (1994)*) provides a summary of design objectives for the management of stormwater quality and flow for the construction phase of developments in Queensland. This summary provided in Table 8.2.1 of the QWQ guidelines outlines design objectives for a number of pollutants including sediment, nutrients, litter and hydrocarbons.

Based on the above information, the release criteria for controlled runoff events or pumped discharges from any construction site is to be as shown in **Table 3-1** below.

Table 3-1 Controlled Discharge Performance Criteria

Parameter	Release Criteria	Criteria Type
Total Suspended Solids	< 50 mg/L	Maximum
Coarse Sediments	To be retained on site	Descriptive
Turbidity (NTU)	< 10% above receiving water	Maximum
Nutrients (N and P)	Manage through Sediment Control	Descriptive
pH	6.5-8.5	Range
Litter	No visible litter washed from site	Descriptive
Hydrocarbons	No visible sheen on receiving water	Descriptive
Dissolved Oxygen	> 6 mg/L	Minimum
Stormwater drainage/flow management	Peak flows for 1-year and 100-year ARI event to match the pre-development condition of the site	Maximum

For the management of sediments, Table 8.2.1 of the QWQ guidelines outlines the following:

> Testing of suspended solids and pH within any temporary sedimentation basins is to occur prior to any controlled discharges.

> Testing of turbidity within the temporary sediment basins and the receiving waters is to be performed before the controlled discharging of the sediment basins. If the turbidity of the sediment basin is greater than 10% above the receiving waters, further dosing with gypsum or a suitable alternative is required until acceptable levels are reached (refer to *Table B17 – Characteristics of Various Flocculating Agents, Appendix B of IECA's 'Best Practice Erosion and Sediment Control',* (2008)).

4 Stormwater Management Strategy

4.1 Stormwater Quality

Based on the limited lifespan of the laydown areas and the sites' proximity to the adjacent railway corridor construction area, the primary objective of the proposed stormwater quality management strategy will be to control soil erosion on site and minimise sediment discharge to the downstream receiving local water courses using appropriate best management practices.

Refer to Cardno Sketch numbers 721769 SK09 to SK13 (Appendix B) for indicative layouts of the stormwater quality management measures proposed to be adopted to treat the contributing local catchment areas of each of the laydown area types.

4.1.1 Available Management Practices

A wide range of stormwater quality improvement devices are available to achieve the best practice stormwater management of runoff from a developed site. **Table 4-1** lists the common stormwater quality improvement devices, including their treatment efficiencies and the constraints of their use.

Table 4-1 Stormwater Management Practices

Treatment Technique	Pollutant Removal Efficiency (1)							Scale (2)	Constraints
				Nutrients					
	Litter & Debris	Coarse Sediment	Fine Sediment	Dissolved	Particulate	Metals	Hydrocarbons		
Litter baskets / racks	L-M							Local	Requires frequent maintenance
Sediment basins	L	M-H	L-M		L	L	L	Regional	Aesthetic and safety issues
Gross pollutant traps	H	H	L		L	L	L	Local/ Regional	Requires regular maintenance
Filter strips / buffer strips	L	M	L-M	L	L-M	L-M	L	Lot/Local	Requires flat terrain
Grass / vegetated swales	L	M-H	L-M	L	L-M	L-M	L	Local	Requires flat terrain
Extended detention basins	M	H	L-M	L	M	M	L	Regional	Requires pre-treatment, Large land area required
Infiltration trenches	L	M-H	M	L-M	M	M	M	Local	Requires pre-treatment
Bio-retention systems	L	M-H	M	L	M	M	L-M	Local	Requires pre-treatment
Porous pavements		L-M	L-M	L	M	M	M	Local	Not appropriate for steep sites and heavy traffic

Treatment Technique	Pollutant Removal Efficiency (1)							Scale (2)	Constraints
	Litter & Debris	Coarse Sediment	Fine Sediment	Nutrients: Dissolved	Nutrients: Particulate	Metals	Hydrocarbons		
Constructed wetlands	M-H	H	M	H	H	M-H	M	Regional	Requires pre-treatment, Not appropriate for steep sites, Large land area required
Community education								Regional	Community participation

Information Source: Queensland Urban Drainage Manual Table 11.05.4 (Typical pollutant removal efficiencies of treatment systems (2007). Benefit Ranking: L = Low Benefit, M = Medium Benefit, H = High Benefit.

Notes:

(1) Removal rates are provided for information only with the efficiency rating subject to adequate design. The actual removal rates used for detailed water quality modelling purposes should be in accordance with *MUSIC Modelling Guidelines Version 1.0 – 2010* prepared by Water by Design.

(2) Scales: Lot – less than 1 ha; Local – 1 to 10 ha; Regional – greater than 10 ha.

Given the features of the subject sites, a number of the measures listed in **Table 4-1** above would not be considered appropriate to be incorporated into the stormwater treatment train for the laydown areas.

Provided below is information on a number of the listed stormwater quality improvement devices including the suitability of these devices to be incorporated into the development of the subject site to treat stormwater runoff from the proposed laydown areas.

Litter Baskets/Racks

Litter baskets and trash racks are generally located upstream of other treatment measures such as extended detention basins or constructed wetlands. They are primarily used as a pre-treatment device for stormwater runoff, removing litter, debris and other gross pollutants from the runoff before it discharges into other secondary and tertiary treatment devices located downstream.

Litter baskets are generally incorporated into the pipe drainage system. Due to the relatively flat grades expected across the sites, the incorporation of pipe drainage within the laydown areas is expected to be limited. Therefore it is not intended to use litter baskets within the laydown areas.

In the event that high levels of gross pollutants are being generated from the laydown areas, trash racks could be incorporated at the locations where concentrated surface flows are discharging into the sediment basins to provide some pre-treatment.

Gross Pollutant Traps (GPT) / Oil & Grit Separators

GPT / Oil and Grit Separators incorporated into the stormwater treatment train can contribute to the effective removal of solid pollutants, sediments and hydrocarbons from stormwater runoff from roadways and other hardstand areas of proposed developments.

Generally GPTs and Oil and Grit Separators shall be designed to treat flows generated by the 3 month Average Recurrence Interval (ARI) rainfall event.

As the incorporation of pipe drainage within the sites is expected to be limited, it is not intended to use GPT's / Oil & Grit Separators within the laydown areas.

Sediment Basins

During the construction phase of the development sediment loads are expected to be higher due to areas being cleared and exposed for the construction of roads and holding areas as well as the placement of machinery. It is recommended that as part of the erosion and sediment control plan prepared for the construction phase of the development some form of sediment basin will be utilised to help manage sediment transport off-site.

The use of sediment basins is considered appropriate for the laydown areas.

Vegetated Filter Strips / Buffer Strips

Filter / buffer strips can be either areas of planted vegetation or strips of retained vegetation left in its natural state. These vegetated areas may provide both an effective way of reducing peak flows and improving stormwater runoff quality. During the construction phase of the development the retention of existing vegetation in-conjunction with other erosion control measures can assist to stabilise exposed areas. In the case of the proposed development areas that grade away from proposed pipe drainage networks, buffer strips are considered one of the key stormwater management techniques, particularly where no other stormwater treatment techniques are possible. Upon completion of the laydown area construction works any exposed, non-trafficable areas should be turfed, seeded, landscaped or stabilised as soon as possible to reduce the risk of erosion.

It should be noted that in order for buffer strips to be effective, flow must be overland, and not concentrated. Therefore, flow spreaders may be required in conjunction with buffer strips to ensure optimal performance, particularly for those areas which drain away from proposed pipe drainage networks.

The use of vegetated filter / buffer strips is considered appropriate for this development.

Grassed / Vegetated Swales

Grassed / vegetated swales are designed to treat stormwater runoff by ensuring sufficient detention time to allow the removal of nutrients and fine sediments. This is achieved through filtration and infiltration. Hydrocarbon removal will also be achieved through filtration and attachment to vegetation where biological breakdown of the hydrocarbons can occur.

Swale lengths and widths can vary dependent on the site conditions, however to operate most effectively swales need to be located on relatively flat grades no steeper than 4-5%. The use of vegetated swales is limited in steep slope areas, unless suitable scour protection measures are incorporated.

Due to the relatively flat grades expected across the sites, the use of grassed / vegetated swales is considered appropriate for the treatment and conveyance of surface flows within the laydown areas.

Infiltration Trenches

Infiltration trenches are predominantly dry shallow grassed areas that trap the first flush runoff. The trapped runoff then infiltrates through the filtration medium removing fine sediment and nutrients. The base of the infiltration trench should be lined with an adequately designed sub-surface perforated pipe drainage network to convey filtered runoff to the trench outlet before discharging to the downstream receiving environment.

The use of infiltration trenches is considered appropriate for these sites subject to the availability of appropriate filter media and the ability to be properly drained.

Bio-retention Systems

Similar to vegetated swales, bio-retention systems are designed to treat stormwater runoff by ensuring sufficient detention time to allow the removal of nutrients and fine sediments. This is achieved through filtration, plant uptake, adsorption and biological degradation. Hydrocarbon removal will also be achieved through filtration and attachment to vegetation where the biological breakdown of hydrocarbons can occur.

Bio-retention systems contain an infiltration filter media, typically filled with sandy loam. All runoff collected within the system for the design storm event must pass through this filter. The filter media must be capable of sustaining vegetation growth as the vegetation is responsible for much of the uptake of nutrients within the system. The base of the bio-retention systems should be lined with an adequately designed sub-surface perforated pipe drainage network to convey the filtered runoff to the system outlet before discharging to the receiving system.

Bio-retention systems can be used in both flat areas and in steeper areas by stepping the system. Bio-retention systems can also be incorporated into the base of detention basins combining both stormwater quality and quantity into one area.

As the vegetation in the basins takes around 2 years to properly establish, the use of bio-retention systems is not considered appropriate for these sites.

Porous Pavements

Porous pavements vary with design, but generally incorporate a surface material consisting of a grid / lattice system, modular clay / concrete blocks, or open-graded asphalt / concrete pavements with much of the fine aggregate material omitted. The surface material is bedded on a coarse sand filter layer constructed over a gravel drainage layer. The use of porous pavements can assist in the removal of fine particulate matter, hydrocarbons, nutrients and soluble pollutants from stormwater runoff.

Porous pavements are suited most to areas of low traffic volume and low runoff volume. Porous pavements are most effective when used at grades of less than 5%. Because of this, porous pavements are recommended to be used in the parking areas only.

Due to the high levels of sediments expected to be generated from the laydown areas, the use of porous pavements is not considered appropriate for these development areas.

Rainwater Tanks

In addition to providing a low cost supply of water to assist in reducing demand on water supply, rainwater tanks can also provide a reduction in peak flow rates from rainfall events with the provision of additional storage volume.

As there are no roofed areas proposed within the laydown areas, the use of rainwater tanks is not considered suitable for the laydown areas.

Level Spreader Devices

For roof area drainage that cannot be connected to a piped drainage network the concentrating of roof water runoff at a single discharge outlet can lead to erosion and scour problems. By utilising a level spreader at the outlet to disperse the overflows over a larger area, the flows will be less concentrated and velocities will be reduced, reducing the risk of erosion and the incidence of re-suspension of sediments. Level / flow spreaders should be located away from high pedestrian traffic areas and be directed towards vegetated buffer strips or other landscaped areas.

As there are no roofed areas proposed within the laydown areas, the use of level spreaders is not considered suitable for the laydown areas.

Constructed Wetlands

Constructed wetlands are a water quality treatment system comprising of an inlet pond to remove coarse sediments, and a macrophyte zone to remove fine particulates and soluble pollutants. Additionally, constructed wetlands also provide landscape value, passive recreation, wildlife habitat and flood control.

Wetlands are particularly useful on sites constrained by water and environmental sensitivity as they can be incorporated as an upstream component of existing waterbodies and environmentally sensitive aquatic features.

The dominant feature of the wetland is the macrophyte zone which comprises of vegetated marshes, shallow and deep pools.

Wetlands require reasonably large flat areas of land. Currently, bio-retention systems provide superior performance with a reduced footprint compared to wetlands. Given the relatively low rainfall and high evaporation that occurs in the region, there are also concerns in relation to constructed wetlands being dry for prolonged periods. Therefore this type of treatment device is not considered appropriate for the laydown areas.

4.1.2 Adopted Strategy

Based on the site constraints the following stormwater quality improvement devices and management practices are considered appropriate to be incorporated in the development of the laydown areas:

Vegetated Swales

As grades across the sites are generally less than 2% the use of vegetated swales for stormwater treatment is considered appropriate. As noted above, due to the relatively flat grades across the subject site vegetated swales may be used for conveyance purposes throughout much of the site as an alternative to conventional piped drainage which is expected to be limited by depth.

Sediment Basins

As the primary target of this stormwater management strategy is to control soil erosion and minimise sediment transport from the laydown areas, this type of device is considered the most appropriate control device for the laydown areas.

With the lifespan of the sites anticipated to be approximately 2 years, the use of alternative devices such as bio-retention basins are limited as these types of devices generally take a period of approximately 2 years to appropriately establish.

The flexibility in the shape of sediment basins combined with the efficient pollutant retention rates for sediments that these systems provide make sediment basins ideal for the sites.

In addition to the above listed stormwater management practices, other principals of water sensitive urban design that can be incorporated into the development of the sites include:

> Retention of existing drainage features, where possible;

> Protection of natural systems by limiting development to non-sensitive areas and providing adequate buffers between development and natural systems;

> Non-worsening of peak flow rates from site.

It should be noted that this stormwater management strategy has been based on preliminary layouts. Although stormwater treatment practices have been recommended for use in certain areas throughout the subject site, a number of treatment measures may be appropriate and the key principles of the stormwater management strategy will remain applicable despite potential layout changes.

Should the detailed design bring about changes to the proposed layout, Section 4.1.1 of this stormwater management strategy provides a list of alternative treatment practices that may be suitable for the site and could potentially be designed to meet the nominated water quality objectives. The key aim of this stormwater management strategy is that the practices listed as suitable for the site should be used in a manner which results in best practice stormwater management measures being incorporated into the development.

4.2 Stormwater Quantity

The intent of this stormwater quantity strategy for the laydown areas is to manage runoff generated from the local contributing catchment area (i.e. the subject site area) only. Based on this, it is proposed to construct perimeter bunds along the upstream boundaries of the subject sites to divert the local external contributing catchment areas around the sites.

A regional hydrologic and hydraulic assessment of the railway corridor was undertaken by Calibre Operations Pty Ltd, with the outcomes of this investigation documented in their Drainage Design report (Ref. No. CARP12033-REP-G-100 Rev 0, dated Dec 2012).

The purpose of this stormwater quantity management strategy is to avoid impacts on the downstream receiving properties and infrastructure, by ensuring that the peak flows discharging from the developed condition laydown areas are equivalent to, or less than the peak flows expected from the existing condition site. It is proposed to incorporate an on-site detention basin into each of the sites to control the developed condition peak flows discharging from the subject site for rainfall events up to and including the 100 year ARI event for the local catchment.

To control the peak rates of discharge from the proposed detention basins it will be necessary for the outlet arrangements to be designed to maintain peak flows equivalent to the existing condition peak discharges. It is noted that where a free draining piped outlet cannot be provided to drain the proposed detention basin within the footprint of the laydown areas, a pump system may need to be provided if a free draining outlet cannot be provided external to the sites.

The proposed detention basin will also be utilised as a sediment retention basin for water quality purposes. All water trapped within the sediment / detention basin is to be tested for compliance with the release criteria outlined in **Table 3-1** prior to a controlled release from the site or alternatively the water could be used for dust suppression or irrigation.

Due to the flat nature of the sites, not all stormwater runoff generated will be able to be conveyed to the proposed on-site detention basins with the use of a conventional pit and pipe drainage system. As a result it is proposed to use drainage swales to convey runoff to the nominated detention basin location.

An indicative location and typical minimum size of the basin for each of the proposed laydown area types is shown on Cardno Sketch numbers 721769 SK09 to SK13 (Appendix B). Calculations for the typical sizing of detention basins can be found in Section 6 of this report.

5 Stormwater Quality Assessment

As outlined above, the lifespan for the laydown areas is anticipated to be only approximately 2 years and therefore has been considered as a construction site for the lifetime of the rail construction project.

The works to be carried out on the sites have the potential to increase the level of sediment laden runoff discharging from the site for the lifespan of the construction project. Based on this, a typical assessment for each laydown area type has been undertaken to determine the on-site sediment retention storage requirements that will be necessary to retain the expected soil loss generated. Refer to Cardno Sketch numbers 721769 SK09 to SK13 (Appendix B) for the typical site local catchment areas adopted for the preliminary stormwater quality assessment.

5.1 Soil Loss Calculations

Data obtained from the Australian Soil Resource Information System on the 12th October 2012 indicated that the soils on the subject sites are expected to be medium clays with an approximate clay content of 40 – 50%. The data obtained was from the national soil grid. This soil type is considered to be a dispersive soil (type D) and based on the Revised Universal Soil Loss Equation (RUSLE) the typical predicted soil loss rate has been estimated for each of the disturbed catchment areas.

Typical catchment parameters for the disturbed areas of the subject site were based on contour information typical of the various laydown area sites. These catchment parameters have been summarised in **Table 5-1** below.

Table 5-1 Catchment Parameters

Laydown Area	Typical Catchment Area (ha)	Adopted Average Site Slope (%)
Turnaround Area	1.0	1.0
Track laydown Area	4.5	1.0
Bridge Laydown Area	6.0	1.0

The results of the typical soil loss assessment using the revised soil loss equation are summarised in **Table 5-2** below. For more detailed information refer to the sediment loss calculations provided in Appendix C of this report.

Table 5-2 Soil Loss Parameters

Catchment	Rainfall Erosivity Factor (R)	Soil Erodibility Factor (K)	Slope Length / Gradient Factor (LS)	Erosion Control Practice Factor (P)	Ground Cover (C)	Soil Loss (A) (t/ha/yr)	Sediment Storage Volume (m^3)
Turnaround Area	2411	0.02	0.17	1.3	1.0	10.7	1.4
Track Laydown Area	2411	0.02	0.17	1.3	1.0	10.7	6.2
Bridge Laydown Area	2411	0.02	0.17	1.3	1.0	10.7	8.2

Based on the information above, the typical soil loss within each of the disturbed areas has been estimated to be equivalent to Soil Loss Class 1 (0 to 150 tonnes/ha/yr), which classifies the sites as very low erosion risks, as outlined in Table 3.1 of the 'Best Practice Erosion and Sediment Control (2008)' guidelines prepared by the International Erosion Control Association – Australasia.

5.2 Sediment Basin Calculations

In conjunction with the above information, calculations for the typical total sediment basin volumes have been carried out and shown in **Table 5-3** below.

Table 5-3 Sediment Basin Calculations

Basin	Volumetric Runoff Coefficient (Cv)	Catchment Area of Basin (A)	5 day total rainfall depth (R) [85%ile, 5day	Settling Zone Volume (10xCvxAxR)	Total Basin Volume (m^3)
Turnaround Area	1.0	1.0	32.5	325	326
Track Laydown Area	1.0	4.5	32.5	1463	1469
Bridge Laydown Area	1.0	6.0	32.5	1950	1958

A comparison of the typical total storage volumes required for sediment retention and for on-site detention will be carried out in Section 6 of this report. This comparison will be made to determine which design conditions will be considered as the critical case.

6 Stormwater Quantity Assessment

The local catchment peak discharges from the laydown areas are expected to increase in comparison to the existing condition peak flows as a result of the proposed developments. This expected increase in peak discharge is the result of the increase in the percentage of impervious area and the reduction in flow travel time post development. Based on this, the following assessments of the pre-development and post development local catchment flows for each site has been undertaken to determine if there is an increase in post development flows from the subject sites, and estimate the on-site detention storage requirements that may be necessary to attenuate any increase in flows discharging off-site. Refer to Cardno Sketch numbers 721769 SK09 to SK13 (Appendix B) for the typical local catchment areas adopted for the preliminary on-site detention assessment of each of the laydown area types.

6.1 Existing Conditions

The Rational Method was used to estimate the existing condition peak flow rates discharging from the local catchment areas for each of the typical laydown area types.

The Coefficient of Runoff value for the pre-developed site conditions was determined from Tables 4.05.3(a) *(Table of C_{10} values)* and 4.05.3(b) *(C_{10} values for Zero Fraction Impervious)* of the Queensland Urban Drainage Manual 2007 (QUDM). Based on available data of the subject site, the existing condition of the laydown areas was considered to have a fraction impervious of 0.0 and a land description equivalent to poor grass cover / low density pasture. A resultant C_{10} value of 0.66 was adopted for the pre-development site conditions.

A rainfall intensity frequency duration (IFD) chart was developed for laydown areas using the design rainfall IFD data available from the Bureau of Meteorology (BOM) website.

The Time of Concentration value for each of the existing site conditions was determined in accordance with Section 4.06 of QUDM. The overland sheet flow and channel flow travel times were calculated separately then combined to provide a typical total time of concentration for each of the sites. The pre-development flow travel time was estimated based on the parameters shown in **Table 6-1** below.

Table 6-1 Existing Surface Parameters for Time of Concentration Calculations

Parameter		Turnaround Areas	Track Laydown Areas	Bridge Laydown Areas
Sheet Flow	Slope Length	50 m	50 m	50 m
	Surface Grade	1.0%	1.0%	1.5%
	Adopted t_c	12 min	12 min	14 min
Channel Flow	Slope Length	90 m	250 m	250 m
	Surface Fall	1 m	2.5 m	2.5m
	Adopted t_c	6 min	13 min	13 min
Total t_c		18 min	25 min	25 min

A summary of the parameters determined to estimate the typical pre-development 2, 5, 10, 20, 50 and 100 year ARI peak flow rates from the local catchment area of each type of laydown area are provided in **Table 6-2** to **Table 6-4** below.

Table 6-2 Typical Turnaround Areas Existing Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.56	0.63	0.66	0.69	0.76	0.79
Area (ha)	1.0	1.0	1.0	1.0	1.0	1.0
Time of Concentration (min)	18	18	18	18	18	18
Rainfall Intensity (mm/hr)	72	94	108	126	150	168
Discharge (m^3/s)	0.11	0.16	0.20	0.24	0.32	0.37

Table 6-3 Typical Track Laydown Areas Existing Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.56	0.63	0.66	0.69	0.76	0.79
Area (ha)	4.5	4.5	4.5	4.5	4.5	4.5
Time of Concentration (min)	25	25	25	25	25	25
Rainfall Intensity (mm/hr)	62	81	93	108	128	144
Discharge (m^3/s)	0.43	0.63	0.77	0.94	1.21	1.43

Table 6-4 Typical Bridge Laydown Areas Existing Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.56	0.63	0.66	0.69	0.76	0.79
Area (ha)	6.0	6.0	6.0	6.0	6.0	6.0
Time of Concentration (min)	25	25	25	25	25	25
Rainfall Intensity (mm/hr)	62	81	93	108	128	144
Discharge (m^3/s)	0.58	0.85	1.02	1.25	1.62	1.90

6.2 Developed Condition

Similar to the existing condition flows, the Rational Method was used to estimate the peak flow rates discharging from the developed condition local catchment areas for each of the laydown areas types.

As discussed above, the Coefficient of Runoff value for the developed site conditions was determined from Table 4.05.3(a) of QUDM. Based on the proposed use of the sites, a fraction impervious of 0.90 has been adopted, with a resultant C_{10} value of 0.86 to be used for the post-development site conditions.

The Time of Concentration value for the developed site conditions was determined for the contributing local catchment areas in accordance with Section 4.06 of the Queensland Urban Drainage Manual (QUDM).

Due to the flat grades expected across the sites, surface drainage is expected to be limited to the use of swale drains / open channels. Pipe drainage is expected to be limited to cross culverts utilised under roadways and footpaths to maintain trafficability during lower ARI events. A summary of the parameters used in calculating the typical time of concentration for each of the laydown area types is included in **Table 6-5**.

Table 6-5 Developed Surface Parameters for Time of Concentration Calculations

Parameter		Turnaround Area	Track Laydown Area	Bridge Laydown Area
Sheet Flow	Slope Length	50 m	50 m	50 m
	Surface Grade	1%	1%	1%
	Adopted t_c	7 min	7 min	7 min
Channel Flow	Slope Length	90 m	250 m	250 m
	Surface Fall	1 m	2.5 m	2.5 m
	Adopted t_c	4 min	9 min	9 min
Total t_c		11 min	16 min	16 min

A summary of the parameters determined to calculate the typical 2, 5, 10, 20, 50 and 100 year ARI developed peak flow rates (with no detention) from the contributing local catchment area of each laydown area type are provided in **Table 6-6** to **Table 6-8** below.

Table 6-6 Typical Turnaround Area Developed Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.73	0.82	0.86	0.90	0.99	1.0
Area (ha)	1.0	1.0	1.0	1.0	1.0	1.0
Time of Concentration (min)	11	11	11	11	11	11
Rainfall Intensity (mm/hr)	88	116	133	156	185	208
Discharge (m^3/s)	0.18	0.26	0.32	0.39	0.51	0.58

Table 6-7 Typical Track Laydown Area Developed Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.73	0.82	0.86	0.90	0.99	1.0
Area (ha)	4.5	4.5	4.5	4.5	4.5	4.5
Time of Concentration (min)	16	16	16	16	16	16
Rainfall Intensity (mm/hr)	76	99	114	133	158	178
Discharge (m^3/s)	0.69	1.01	1.23	1.50	1.95	2.23

Table 6-8 Typical Bridge Laydown Area Developed Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.73	0.82	0.86	0.90	0.99	1.0
Area (ha)	6.0	6.0	6.0	6.0	6.0	6.0
Time of Concentration (min)	16	16	16	16	16	16
Rainfall Intensity (mm/hr)	76	99	114	133	158	178
Discharge (m^3/s)	0.93	1.35	1.63	2.00	2.60	2.97

A comparison of the existing condition peak flows with the developed condition peak flows found that there is generally expected to be an increase in the peak flows discharging off site due to the increase in impervious area and the reduction in flow travel time on site.

On-site detention is proposed to be incorporated into the development works. This is to avoid impacts on downstream properties and infrastructure and to maintain the existing peak flow rate of runoff discharging from the developed site for all rainfall events up to and including the local catchment 100 year ARI event. The proposed on-site detention will help control the rate of discharge leaving the site.

6.3 Preliminary On-Site Detention

A preliminary assessment of the typical on-site detention storage requirements for the various types of laydown areas has been carried out using the initial sizing techniques outlined in Section 5.05.1 of QUDM. Based on the comparison of results outlined in Section 6.2 above, it will be necessary to incorporate on-site detention storage in order to maintain peak outflows equivalent to the existing conditions.

The on-site detention storage proposed for each site will be sized to maintain the equivalent pre-developed condition peak flows for local catchment rainfall events up to and including the 100 year ARI rainfall event. To control the peak rates of discharge from the nominated storage volumes it will be necessary for the outlet arrangements to be designed to maintain the existing peak flows.

A comparison of the typical existing and developed condition peak flows for each site indicated that the 100 year ARI storm event resulted in the greatest increase in peak discharge in each case. The results of the preliminary on-site detention analysis indicated the typical approximate detention storage volume required for each site to detain the increase in the 100 year ARI discharge and maintain the equivalent pre-developed

100 year ARI peak flow discharging off site. A summary of the typical volumes required for each of the laydown area types are provided in **Table 6-9** below.

Table 6-9 Detention requirements

Parameter	Turnaround Area	Track Laydown Area	Bridge Laydown Area
Required Volume (m^3)	366	2046	2729

It should be noted that the volumes outlined may be subject to change if the final catchment areas differ from those adopted for this assessment. The stage storage characteristics and outlet configuration of the detention basins will be verified as part of the detailed design for each of the laydown areas.

It is proposed to incorporate the stormwater detention and treatment into one common basin. A comparison of the total storage volumes required for sediment retention, as outlined in Section 5 of this report, and for on-site detention has indicated that the volume required for on-site detention is more critical in each case. Therefore the typical total storage volume adopted for each of laydown area types for the stormwater treatment and detention basin is the minimum listed in **Table 6-9**. Refer to Cardno Sketch numbers 721769 SK09 to SK13 (Appendix B) for the indicative layout and configuration of the stormwater treatment and detention basin for each of the typical laydown areas.

In accordance with Section 5.11 of QUDM it is recommended that any ponding within the basin should be limited to 1.2 metres at the deepest point above the basin invert if there is perceived to be a public safety issue. For deeper basins, suitable safety provisions such as refuge mounds within large basins, fences and warning signs should be provided.

6.4 Other Drainage Issues

6.4.1 Diversion of External Catchments

As the intent of this strategy is to manage the runoff from the laydown areas only, it is proposed to construct perimeter bunds along the upstream boundaries of the sites to divert the local external contributing catchment areas around the laydown areas. Refer to Cardno Sketch numbers 721769 SK09 to SK13 (Appendix B) for the indicative locations of the external catchment diversion bunds proposed for the various typical laydown areas. The final alignment and profile required for the diversion bunds will be confirmed as part of the detailed design of each site.

7 Monitoring and Maintenance Schedules

7.1 Monitoring Schedule

A monitoring program will be established for the stormwater management devices as outlined below and shown in **Table 7-1** and **Table 7-2**.

Due to the remote location of the sites, the turn-around time for the suspended solids test results may delay the release of captured surface runoff from the sediment basins. Measuring the turbidity may be an acceptable alternative, although this requires the correlation between turbidity and suspended solids to be established individually for each site. The relationship between the turbidity and suspended solids varies between soil types, so this will need to be determined for each site by measuring both parameters over the course of at least six events. Graphing the results and determining a line of best fit should provide a turbidity/suspended solids relationship suitable for estimating the turbidity level that corresponds to the suspended solids release criteria. Once this has been established, suspended solids testing samples should continue to be collected prior to any controlled release, however the release may occur prior to the results being returned. Should the suspended solids test results be outside the release criteria given in Section 3 of this report, the acceptable turbidity level must be adjusted to reduce the chance of future non-compliance. The turbidity within the basins can be measured a number of ways, including a secchi disk or a water quality probe.

Table 7-1 Monitoring Program for Sediment Basins

MONITORING ACTIVITY	FREQUENCY
Inspect sediment basin	- During construction - After each runoff event - Prior to “stop work” or “site shutdown”
Inspect submerged inflow pipes	After each runoff event
Testing of Suspended Solids, pH, and Dissolved Oxygen	- Prior to controlled release - Immediately following rain events > 25mm in a 24 hour period

In the case of vegetated buffers and vegetated swales, the collection of water quality samples is unlikely to yield valuable results. Given this, no sample based monitoring is recommended for these treatment systems. Instead, an inspection based monitoring and maintenance scheme as detailed below is considered appropriate for these types of devices.

Table 7-2 Monitoring Program for Vegetated Swales

MONITORING ACTIVITY	FREQUENCY
Inspect for erosion / scour of invert & batters	After major storm events > 25mm in 24 hrs or 3 monthly
Inspect for weed inundation / litter & debris accumulation	3 monthly
Inspect for inappropriate access, excessive wear & damage to invert & batters	3 monthly
Inspect for build-up of sediments	3 monthly
Inspect condition of vegetation such as vegetation health & density	3 monthly
Inspect condition of inlet & outlet structures	After major storm events > 25mm in 24 hrs or 3 monthly

7.2 Maintenance Schedule

The on-going performance of the stormwater management devices will be dependent on the maintenance conducted.

The maintenance programs as outlined below and detailed in **Table 7-3** and **Table 7-4** are to be implemented for the stormwater treatment devices.

Table 7-3 Maintenance Program for Sediment Basins

MAINTENANCE ACTIVITY	FREQUENCY
Clean out accumulated sediment	Every 2 years as per sediment basin calculations or as required by results of monitoring
Check visible pipes for leaks	6 monthly or as required by results of monitoring
Check fill material for settlement	6 monthly or as required by results of monitoring
Remove all trash from basin and riser	6 monthly or as required by results of monitoring
De-silt submerged inflow pipes	6 monthly or as required by results of monitoring

Sediment basins must be operated and maintained in an effective operational condition. These structures must not be allowed to accumulate sediment volumes in excess of forty per cent (40%) sediment storage design capacity. Where sedimentation basins are used a marker shall be placed within the basin to show the level above which the design storage capacity occurs. Materials removed from sediment retention devices must be disposed of in a manner approved by the consent authority that does not cause pollution.

Table 7-4 Maintenance Program for Vegetated Swales

MAINTENANCE ACTIVITY	FREQUENCY
Repairs to swale profile	As required by results of monitoring
Irrigating, infilling of vegetation to maintain sufficient cover	As required by results of monitoring
Removal of litter, debris, weeds & excessive sediment build up	6 monthly or as required by results of monitoring
Mowing / pruning of swale vegetation to maintain optimal vegetation height	As required by results of monitoring

Reforming of any swale profile will be required when the design flow area of the swale is reduced by 25%.

8 Emergency Flood Management Strategies

A regional flooding analysis to assess the impacts of the proposed Carmichael Rail Alignment on the existing major floodplains, river and creek crossings was undertaken by Calibre Operations Pty Ltd for the Carmichael Coal Mine and Rail project. Based on the results of the investigation (included in the Drainage Design Report (Reference No.CARP12033-REP-C-003, dated Dec 2012)), and the Hydrology Drawings, a number of the laydown areas were identified as being inundated during a 50 year ARI storm event.

For the areas that may be inundated during a 50 year ARI storm event, it is recommended that the contractor operating the facility consider developing an Emergency Flood Management Strategy to minimise the risk to people, equipment and infrastructure during flood events.

The following information provides some strategies that the contractor may consider when developing an Emergency Flood Management Plan for the construction facility areas at risk of inundation. Procedures for flood emergency management in the case of a flood emergency could include communication based management or flood gauge based management. Strategies for remaining on site during a flood emergency have not been considered for the laydown areas as no habitable buildings are expected to be incorporated into these construction areas.

Due to the remote location of many of these laydown areas, flood gauged based management strategies may not be available at many of the facility sites. Based on this, a communication based management plan may be more appropriate for the sites.

Any materials that have the potential to cause environmental harm such as fuel, cement etc. should be either stored above the appropriate flood level or be able to be moved off site in a timely manner if the need arises.

8.1 Communication Based Management Strategies

Communication based management strategies generally rely on regular flood warnings and river height bulletins issued by the Bureau of Meteorology (BoM). These warning and bulletins are sent to radio stations for broadcast, and to local authorities, police and emergency services. Flood warnings, river height bulletins and other weather related information is available on the BoM website and through telephone recorded information services.

The contractor should consider identifying the names of the creek and river systems that have the potential to inundate the nominated construction facility as well as site access roads and tracks, and determine if the BoM has a warning system monitoring the identified watercourse. If available, the contractor should then document the appropriate contact details to enable access the identified warning systems.

To gain more information on flood warning, the contractor may also consider registering the construction facility area with the local council, the local branch of the state emergency services department and any local disaster management centres.

The contractor should ensure that all staff accessing the facility are informed of the flood characteristics of the site and surrounding area, the emergency evacuation protocols and processes and the site evacuation routes in the event of a flood emergency.

If a flood event has been forecast for the area by the BoM or other local authority, then the contractor may want to consider some of the following procedures as part of the emergency evacuation protocols and processes for the facility site.

> Securing the site by cleaning up materials and storing equipment / machinery that have the potential to be carried away during a flood event.

> Moving equipment / machinery that can be relocated off site to higher ground.

> Evacuate the facility site while low hazard level access is still available off site.

8.2 Flood Gauge Based Management Strategies

Flood gauge based management strategies generally incorporate the same communication based strategies as outlined above, however where flood gauges may be established for adjacent creek or river systems defined flood level information could be available.

The contractor may then consider utilising the available flood level information to set trigger levels for various actions to occur on site as part of the emergency evacuation protocols and processes developed for the construction facility.

9 Conclusions

In preparing this conceptual stormwater management strategy, preliminary water quality and quantity assessments were undertaken for each of the typical laydown area sites.

The objectives of this stormwater management strategy were to meet the performance criteria outlined in **Table 3-1** of this report. The outcome of this preliminary investigation has recommended the inclusion of a number of stormwater quality and quantity management measures detailed herein and summarised as follows:

> Numerous vegetated swales for treatment and conveyance purposes as indicatively shown on Cardno Sketch numbers 721769 SK09 to SK13 (Appendix B); and

> Constructed sediment basins as described in Sections 5 and 6, and indicatively shown on Cardno Sketch numbers 721769 SK09 to SK13 (Appendix B).

The detailed design of the treatment and detention devices will need to comply with the information outlined within this stormwater management strategy, and with the relevant authority guidelines.

10 References

Department of Environment and Resource Management 2009, *Queensland Water Quality Guidelines (2009)*, Version 3 September 2009, Brisbane, QLD

Department of Natural Resources and Water 2007, *Queensland Urban Drainage Manual 2007 (QUDM)*, Volume 1 Second Edition 2007, Brisbane, QLD

International Erosion Control Association (Australasia) 2008, *Best Practice Erosion and Sediment Control*, November 2008, Picton, NSW

Water by Design 2010, *MUSIC Modelling Guidelines Version 1.0 – 2010*, Brisbane, QLD

APPENDIX A

REFERENCE DRAWINGS

Cardno
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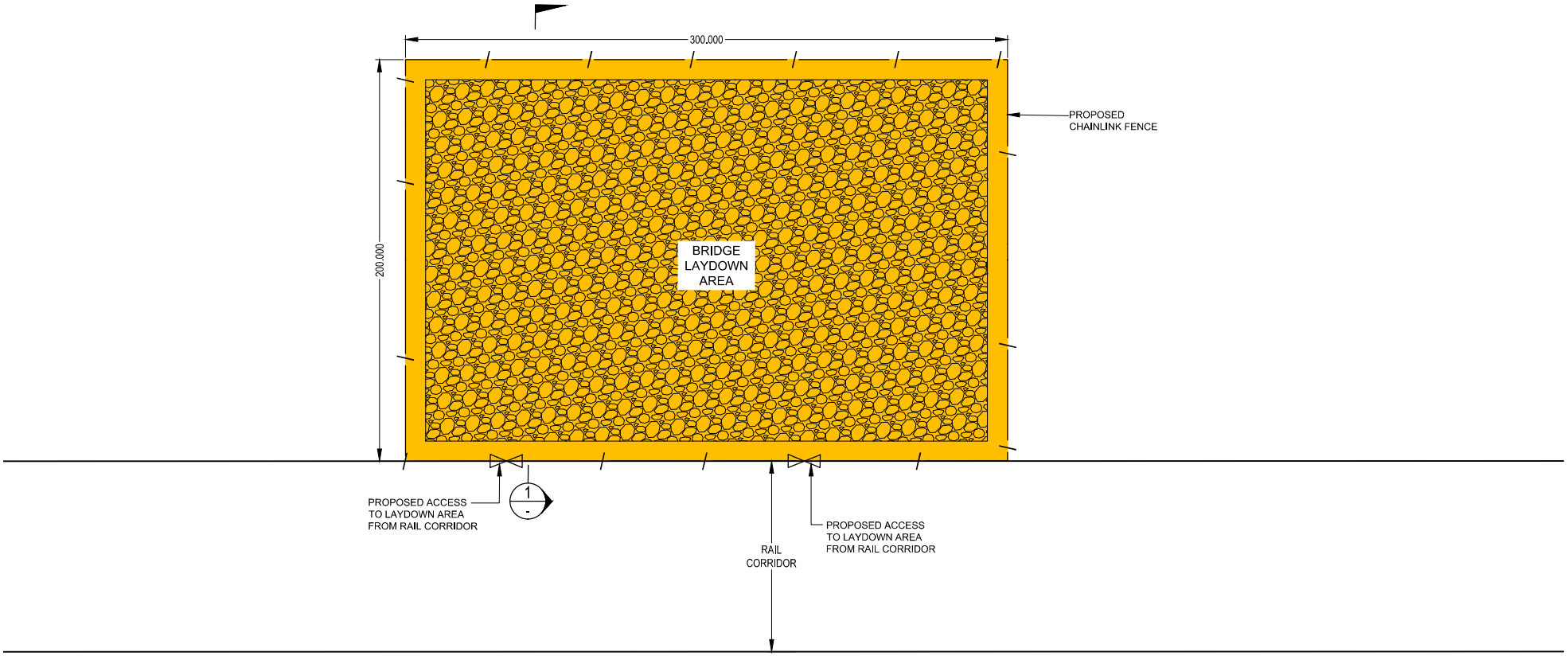
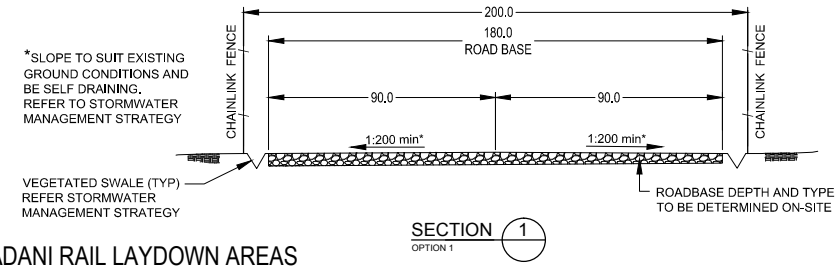
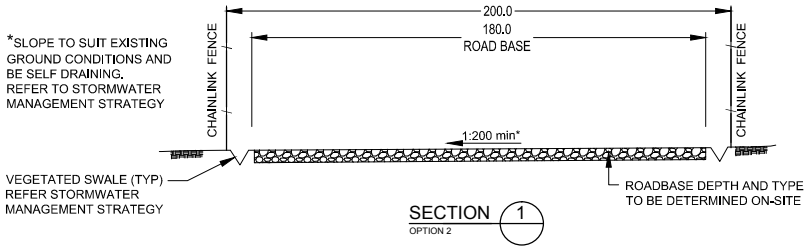


PLAN VIEW



SECTION 1
OPTION 1



SECTION 1
OPTION 2

ADANI RAIL LAYDOWN AREAS

TYPICAL BRIDGE LAYDOWN AREA

DRAFT FOR DISCUSSION

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Quality Endorsed Company

REF NUMBER: 7903/44/001/SK-001(P3)
DATE: 18/04/2013

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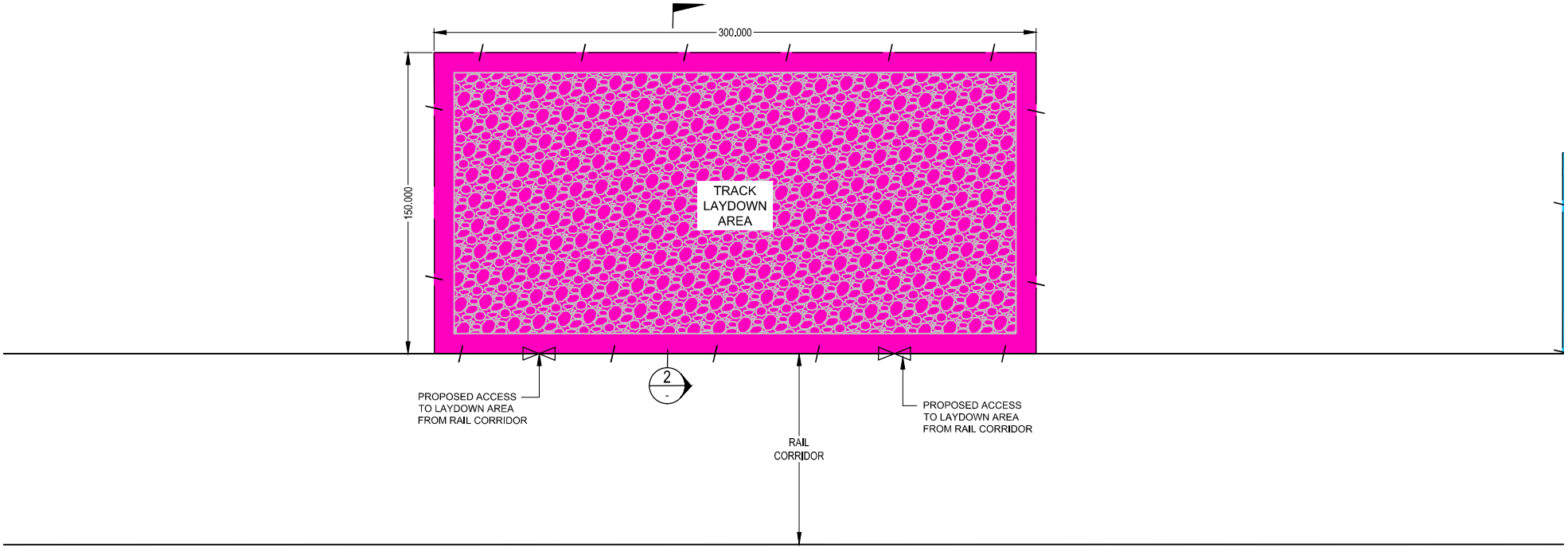

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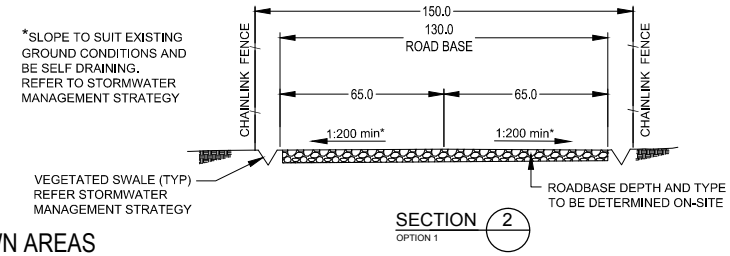

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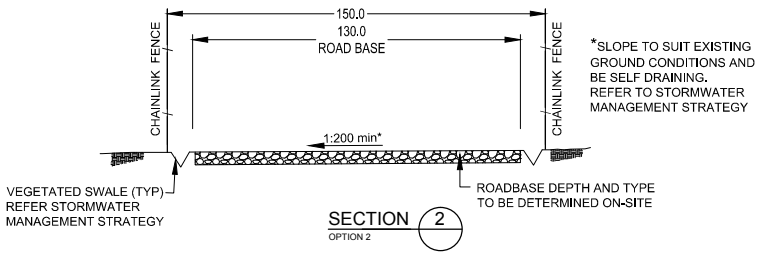

SECTION 2
OPTION 2

ADANI RAIL LAYDOWN AREAS

TYPICAL TRACK LAYDOWN AREA

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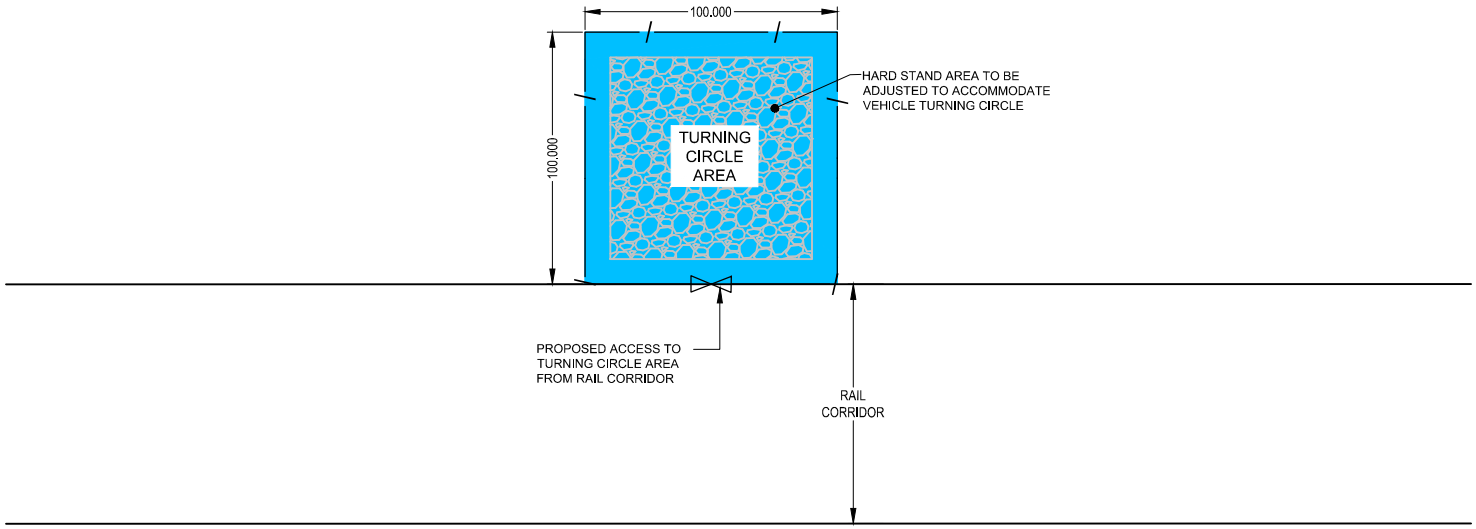

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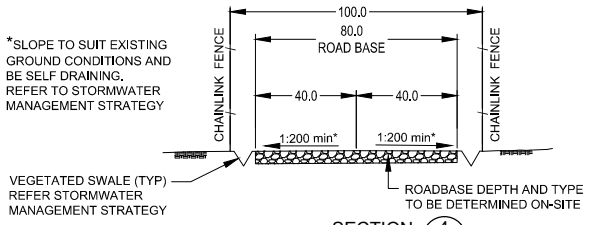
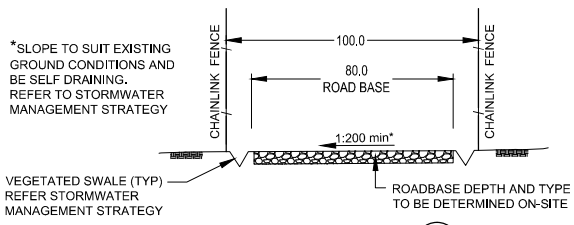


SECTION 4
OPTION 1



SECTION 4
OPTION 2

ADANI RAIL LAYDOWN AREAS

TYPICAL TURNING CIRCLE AREA

DRAFT FOR DISCUSSION

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DATE: 18/04/2013

APPENDIX B

FIGURES & SKETCHES

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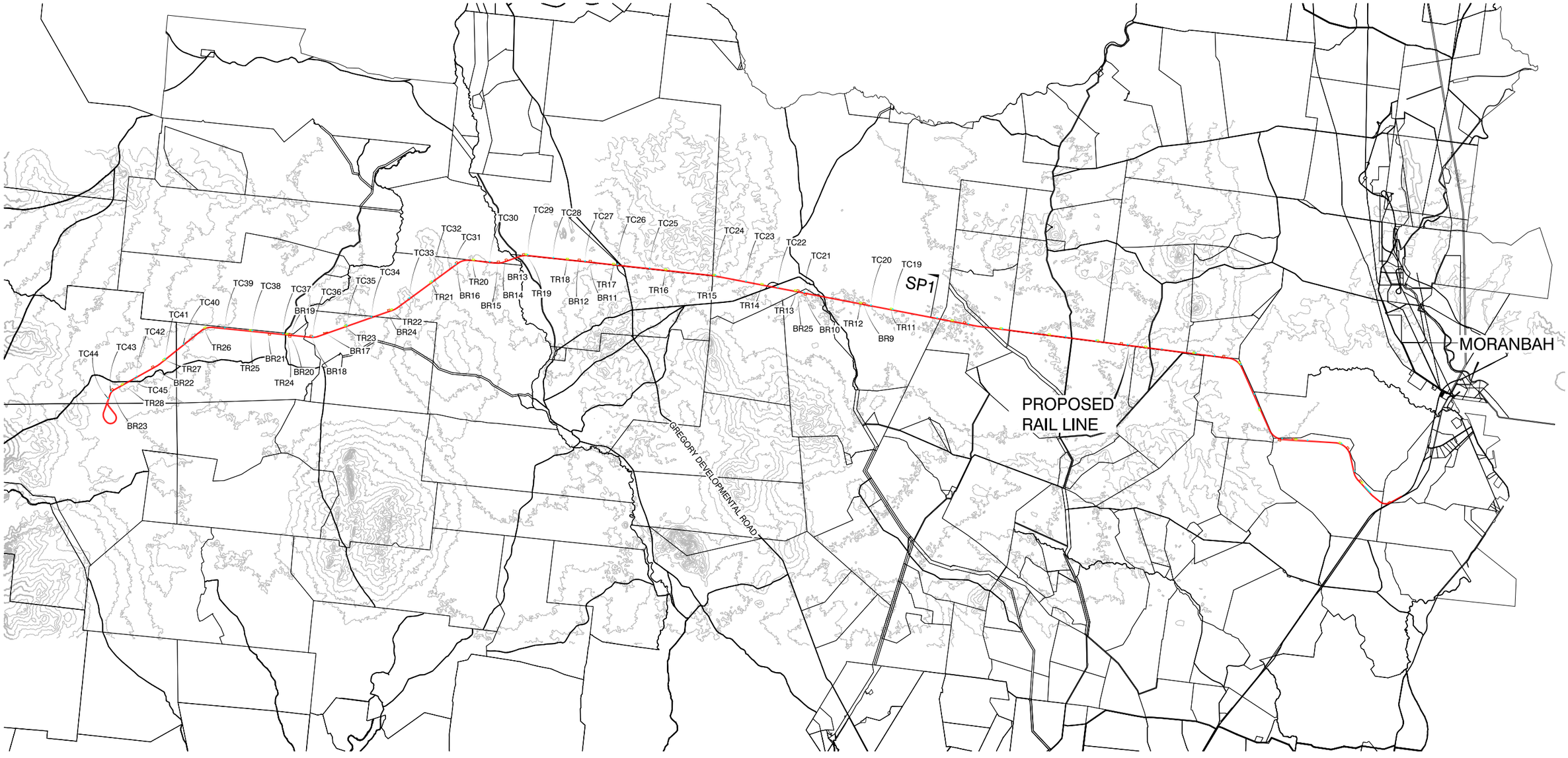

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Carmichael Coal Mine Rail

Locality Plan for the Laydown Area Locations

Date: April 2013
Drawing Number: Sketch 721769 - 003
Revision: B

DATE PLOTTED: 12 July 2013 11:19 AM
CAD FILE: P:\721769 Adani\03 Design\Cad\03 Sketches\721769 Sk01-03 Locality Plans.dwg

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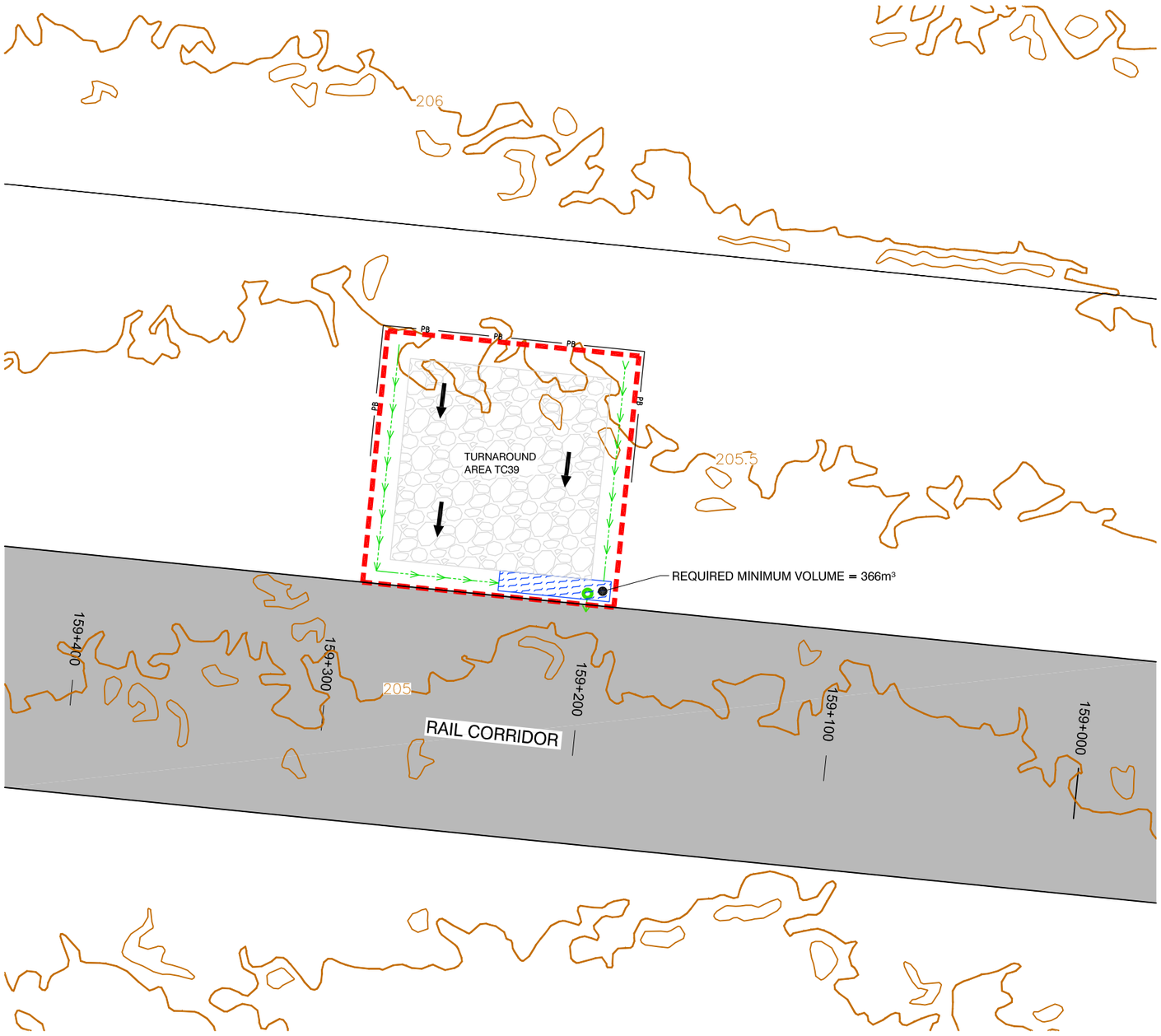

TYPICAL TURN AROUND AREA

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DATE PLOTTED: 12 July 2013 1:50 PM
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Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Stormwater Management Strategy For Turnaround Laydown Areas

Date: April 2013
Drawing Number: Sketch 721769 - 009
Revision: B

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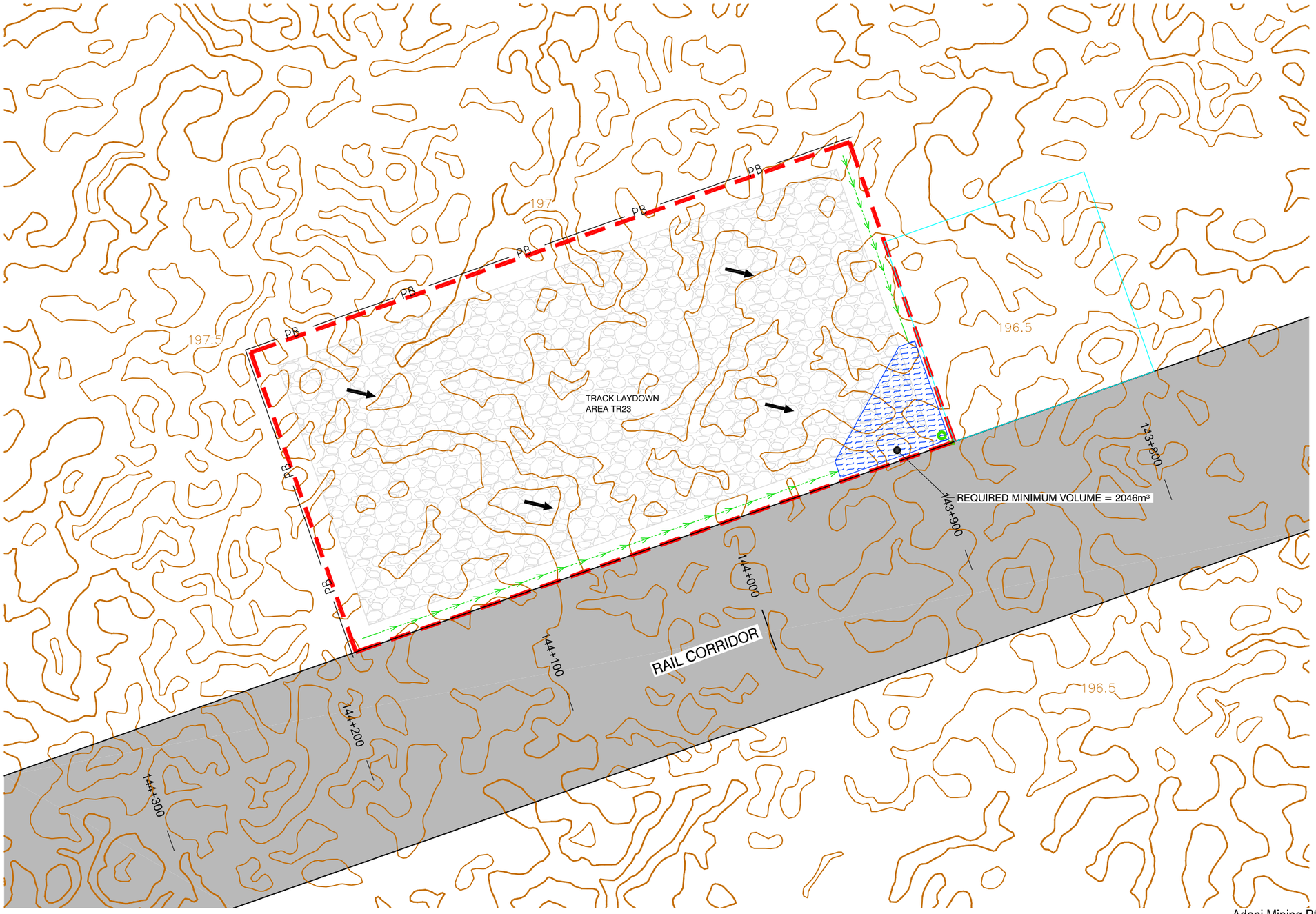

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Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Stormwater Management Strategy For Track Laydown Areas Single Catchment

Date	Drawing Number	Revision
April 2013	Sketch 721769 - 010	B

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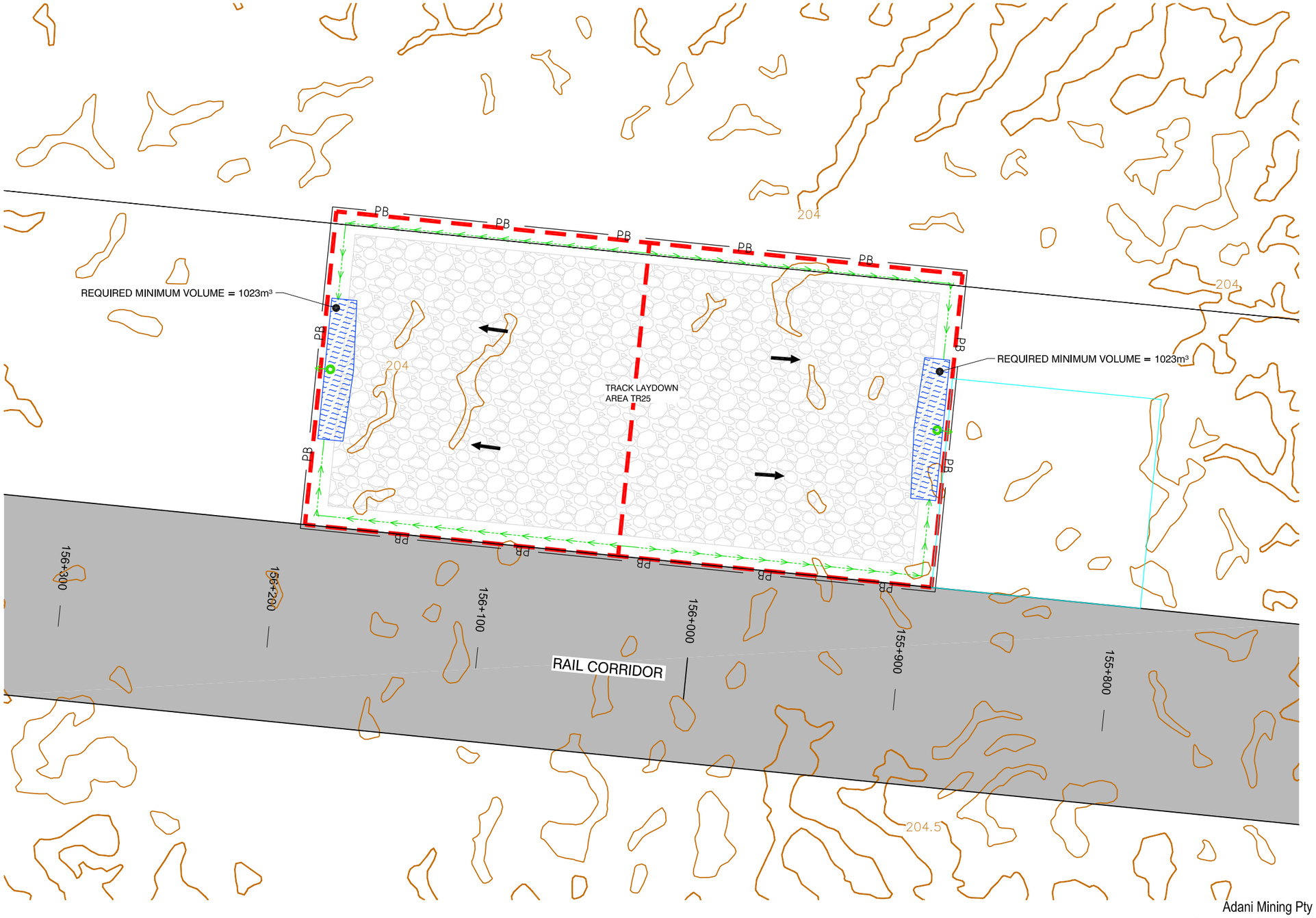

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Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Stormwater Management Strategy For Track Laydown Areas Split Catchment

Date: April 2013
Drawing Number: Sketch 721769 - 011
Revision: B

DATE PLOTTED: 12 July 2013 1:53 PM
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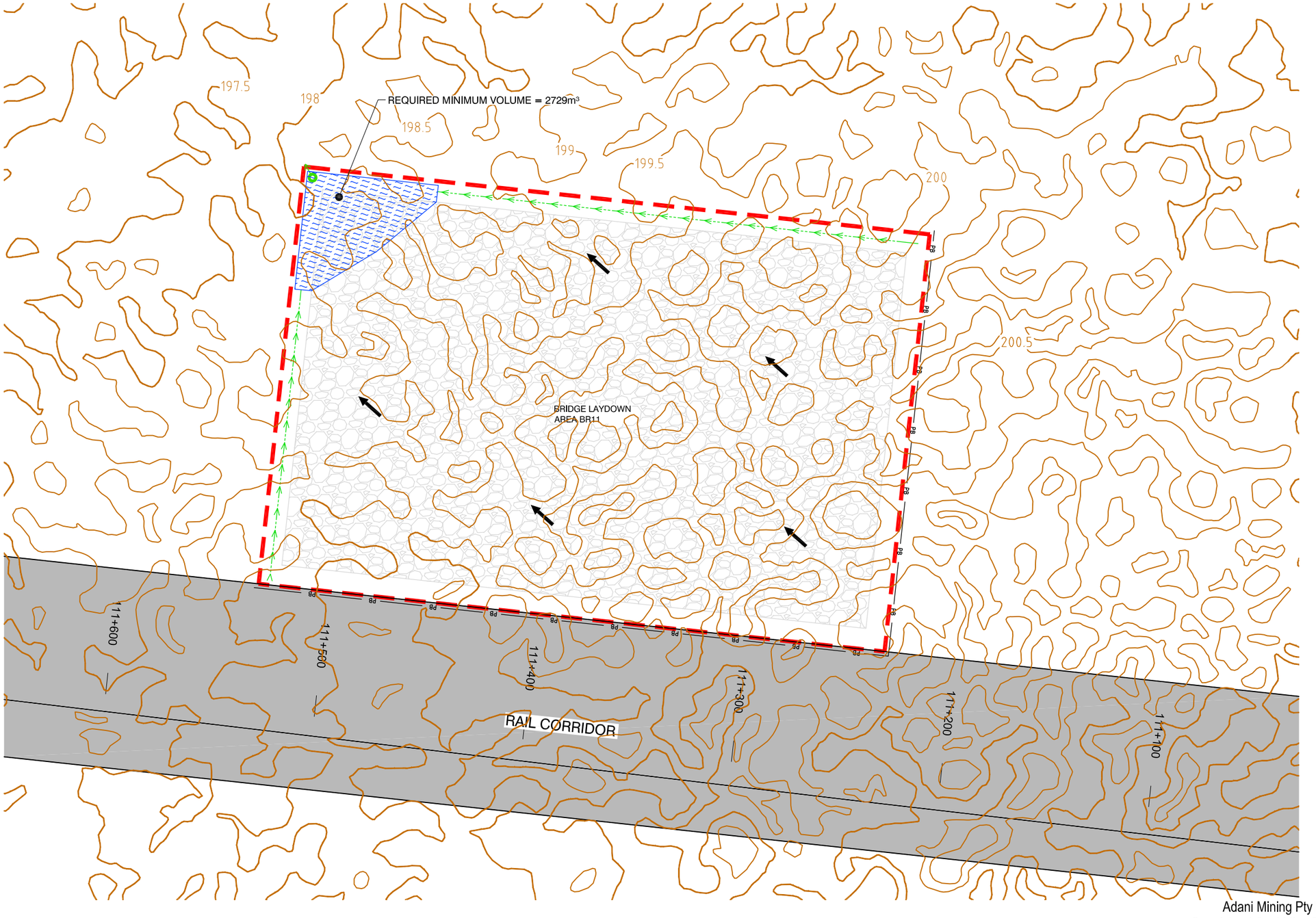

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Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Stormwater Management Strategy For Bridge Laydown Areas Single Catchment

Date: April 2013
Drawing Number: Sketch 721769 - 012
Revision: B

DATE PLOTTED: 22 July 2013 3:18 PM
CAD FILE: P:\721769 Adani\03 Design\Cad\03 Sketches\721769 SK09-13 Laydown SW Treatment.dwg

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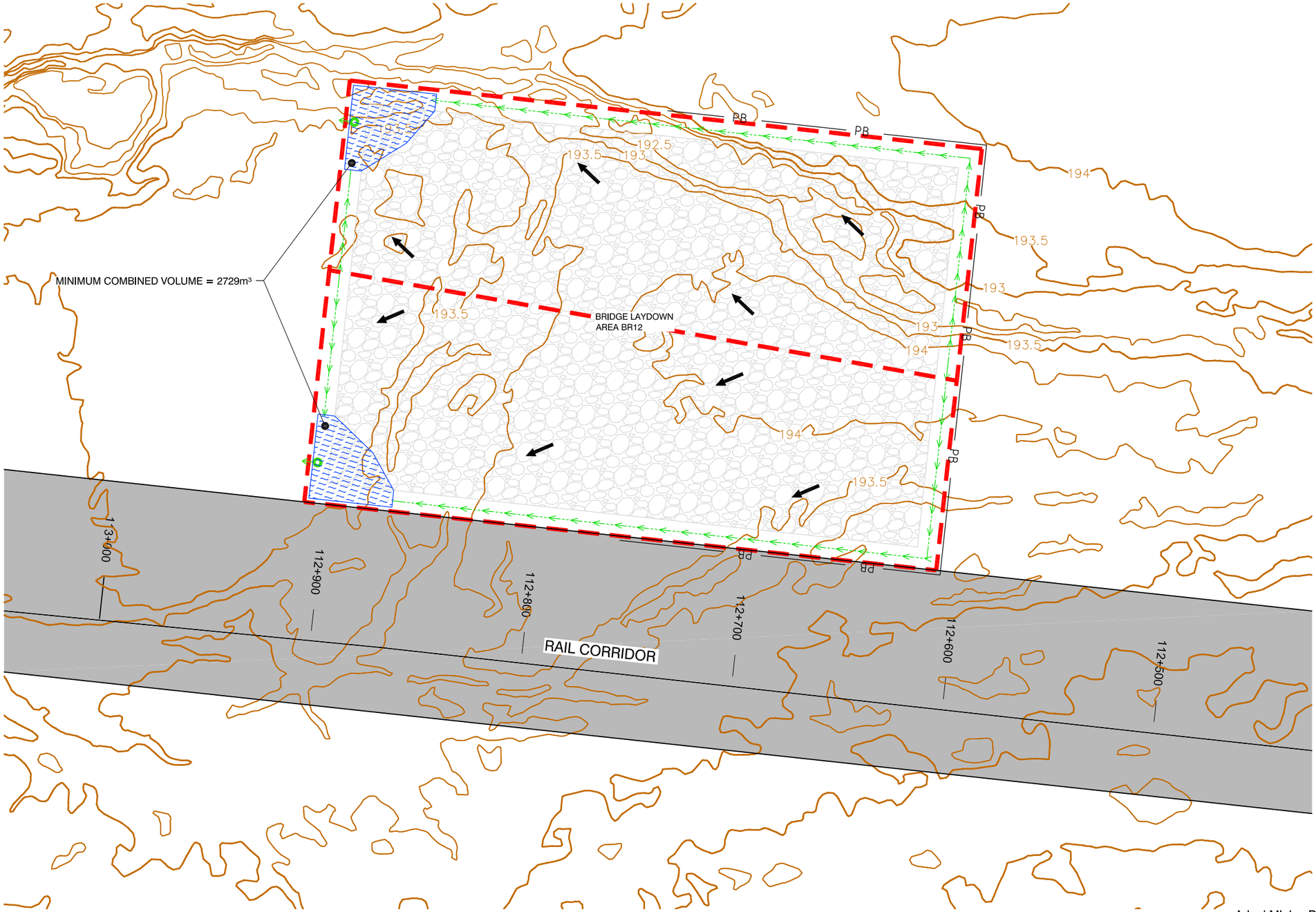

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Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Stormwater Management Strategy For Bridge Laydown Areas Split Catchments

Date: April 2013
Drawing Number: Sketch 721769 - 013
Revision: B

DATE PLOTTED: 12 July 2013 1:56 PM
CAD FILE: P:\721769 Adani\03 Design\Cad\03 Sketches\721769 Sk09-13 Laydown SW Treatment.dwg

APPENDIX

C

WATER QUALITY CALCULATIONS

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VOLUME OF SEDIMENT BASIN: TYPE D SOILS

PROJECT: Carmichael Coal Mines — **DESIGNER:-** SW
Maintenance Yard, Ballast Stockpile and Welding Depot
JOB No:- 7217/69 — **DATE:-** 12/Apr/13

Sediment Storage Zone Volume

Input Value	Catchment/Basin Name		
	Turnaround Area	Track Laydown Area	Bridge Laydown Area
S	10.5	10.5	10.5
R (Calculated)	2411.4	2411.4	2411.4
R (from chart)			
R (adopted)	2411.4	2411.4	2411.4
K	0.02	0.02	0.02
LS	0.17	0.17	0.17
P	1.3	1.3	1.3
C	1	1	1
A - Soil Loss (tonnes/ha/yr)	10.7	10.7	10.7
Volume (m^3/ha/yr)	8.2	8.2	8.2
Disturbed Area (ha)	1.0	4.5	6.0
Calculated Soil Loss (m^3/yr)	8.2	36.9	49.2
Sediment Storage Zone (m^3)*	1.4	6.2	8.2

*Assumes regeneration after 2 months

Settling Zone Volume

Cv	1	1	1
Catchment Area (ha)	1.0	4.5	6.0
R(y%ile, 5day) (mm)	32.5	32.5	32.5
Settling Zone (m^3)	325	1462.5	1950
Basin Vol. per Hectare (m^3)	326	326	326

Preliminary Basin Sizing

Depth of Basin (m)	1	1	1
Total Basin Vol (m^3)	326.4	1468.7	1958.2
Approx. Width (m)	10	22	26
Approx. Length (m)	31	66	77

APPENDIX

D

WATER QUANTITY CALCULATIONS

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Bridge Laydown Areas - 100 year ARI flow

Existing Case

Area	6	ha
C_{10}	0.66	
$F_{100}xC_{10}$	0.79	
C_{100}	0.79	
Time of conc	25	mins
Intensity	144	mm/hr
Flow	1.90	m^3/s
Total Flow	1.90	m^3/s
Volume	2851.2	m^3

Sheet flow - 50m over 1.0% grade, poorly grassed - 12 mins
Channel flow - 250m, 2.5m fall, natural channel - 13 mins
Total 25 mins

Developed Case

Area	6	ha
C_{10}	0.86	
$F_{100}xC_{10}$	1.03	
C_{100}	1.00	
Time of conc	16	mins
Intensity	178	mm/hr
Flow	2.97	m^3/s
Total Flow	2.97	m^3/s
Volume	2848.0	m^3

Sheet flow - 50m over 1.0% grade, compacted earth surface - 7 mins
Channel flow - 250m, 2.5m fall, earthern table drains - 9 mins
Total 16 mins

Detention Basin Sizing (preliminary)

Peak inflow	2.97	m^3/s
Peak outflow	1.90	m^3/s
Volume	3797.33	m^3
r	0.36	

Required storage volume

Culp	Boyd	Carroll	Basha	Maximum
781.55	1364.31	817.97	1072.93	1364.31

Peak flow only factor: 2

Required volume is - 2729 m^3.

Assuming a rectangular basin with 1 in 2 side slopes,
required surface area is:

Depth (m)	Length (m)	Width (m)	Area (m^2)	Volume (m^3)
0.0	19.0	79.5	1510.5	
1.5	25.0	85.5	2137.5	2736.0

Turnaround Areas - 100 year ARI flow

Existing Case

Area	1	ha	
C_{10}	0.66		
$F_{100}xC_{10}$	0.79		
C_{100}	0.79		
Time of conc	18	mins	Sheet flow - 50m over 1.0% grade, poorly grassed - 12 mins
Intensity	168	mm/hr	Channel flow - 90m, 1m fall, natural channel - 6 mins
			Total 18 mins
Flow	0.37	m^3/s	
Total Flow	0.37	m^3/s	
Volume	399.2	m^3	

Developed Case

Area	1	ha	
C_{10}	0.86		
$F_{100}xC_{10}$	1.03		
C_{100}	1.00		
Time of conc	11	mins	Sheet flow - 50m over 1.0% grade, compacted earth surface - 7 mins
Intensity	208	mm/hr	Channel flow - 90m, 1m fall, earthern table drains - 4 mins
			Total 11 mins
Flow	0.58	m^3/s	
Total Flow	0.58	m^3/s	
Volume	381.3	m^3	

Detention Basin Sizing (preliminary)

Peak inflow	0.58	m^3/s
Peak outflow	0.37	m^3/s
Volume	508.44	m^3
r	0.36	

Required storage volume

Culp	Boyd	Carroll	Basha	Maximum
105.07	183.20	109.95	144.13	183.20

Peak flow only factor: 2

Required volume is - 366 m^3.

Assuming a rectangular basin with 1 in 2 side slopes,
required surface area is:

Depth (m)	Length (m)	Width (m)	Area (m^2)	Volume (m^3)
0.0	5.0	27.0	135.0	
1.5	11.0	33.0	363.0	373.5

Track Laydown Areas - 100 year ARI flow

Existing Case

Area	4.5	ha
C_{10}	0.66	
$F_{100}xC_{10}$	0.79	
C_{100}	0.79	
Time of conc	25	mins
Intensity	144	mm/hr
Flow	1.43	m^3/s
Total Flow	1.43	m^3/s
Volume	2138.4	m^3

Sheet flow - 50m over 1.0% grade, poorly grassed - 12 mins
Channel flow - 250m, 2.5m fall, natural channel - 13 mins
Total 25 mins

Developed Case

Area	4.5	ha
C_{10}	0.86	
$F_{100}xC_{10}$	1.03	
C_{100}	1.00	
Time of conc	16	mins
Intensity	178	mm/hr
Flow	2.23	m^3/s
Total Flow	2.23	m^3/s
Volume	2136.0	m^3

Sheet flow - 50m over 1.0% grade, compacted earth surface - 7 mins
Channel flow - 250m, 2.5m fall, earthern table drains - 9 mins
Total 16 mins

Detention Basin Sizing (preliminary)

Peak inflow	2.23	m^3/s
Peak outflow	1.43	m^3/s
Volume	2848.00	m^3
r	0.36	

Required storage volume

Culp	Boyd	Carroll	Basha	Maximum
586.16	1023.23	613.48	804.70	1023.23

Peak flow only factor: 2

Required volume is - 2046 m^3.

Assuming a rectangular basin with 1 in 2 side slopes,
required surface area is:

Depth (m)	Length (m)	Width (m)	Area (m^2)	Volume (m^3)
0.0	16.0	68.5	1096.0	
1.5	22.0	74.5	1639.0	2051.3

Stormwater Management Strategy

Carmichael Coal Rail SP1 Concrete Batching Plants

721769

Prepared for
Adani Mining Pty Ltd

19/07/2013

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Document Information

Prepared for	Adani Mining Pty Ltd
Project Name	Carmichael Coal Rail SP1 Concrete Batching Plants
File Reference	P:\721769 Adani\02 Project Management\Reports\Conc Batch Plant\130717 Conc Batching Plant SWMS V5.docx
Job Reference	721769
Date	19/07/2013

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Document Control

Version	Date	Author	Author Initials	Reviewer	Reviewer Initials
1	22/03/2013	Scott Walter		Carlo de Byl	
2	31/05/2013	Scott Walter		Carlo de Byl	
3	21/06/2013	Scott Walter		Carlo de Byl	
4	12/07/2013	Scott Walter		Carlo de Byl	
5	19/07/2013	Scott Walter	SW	Carlo de Byl	CD

Table of Contents

Appendices

Tables

1 Introduction

This conceptual Stormwater Management Strategy (SWMS) report has been prepared on behalf of Adani Mining Pty Ltd for the five proposed Carmichael Coal Rail Project Concrete Batching Plants located along the proposed SP1 rail allignment (the subject site).

The intent of this strategy is to provide an overview of the stormwater management aspects to support the Material Change of Use application for the concrete batching plants required as part of the rail construction. This SWMS report includes detailed policies, performance criteria and procedures to minimise the impact of the development on the physical and social environment.

This SWMS intends to address the operational phase of the concrete batching plants that are expected to have a design life of approximately 2 years.

2 Existing Site and Proposed Development

2.1 Existing Site Description

The five Carmichael Coal Rail Project Concrete Batching Plant sites are located between approximately 80km and 150km west of Moranbah, Queensland in the Isaac Regional Council. Approximate levels for each of the sites have been obtained from a review of available aerial contour information. A summary of the details of each of the sites is included in **Table 2-1** below.

Table 2-1 Concrete Batching Plant Location Details

Plant	Area	Lot number	Distance west of Moranbah	Chainage along Track	Site Elevation (RL)	Approximate Grade
BP4*	4.6 ha	10BL49	80km	Ch 82 500	206m - 206.5m	0.5%
BP5*	4.6 ha	4SP116046	98km	Ch 101 100	225m - 227m	1.0%
BP6	4.6 ha	4SP116046	105km	Ch 108 200	209m - 210m	0.5%
BP7	4.6 ha	662PH1491	145km	Ch 152 200	199m - 200m	0.5%
BP8	4.6 ha	662PH1491	147km	Ch 154 400	204.5m - 206m	0.5%

*Based on the regional hydraulic analysis undertaken by Calibre Operations Pty Ltd and summarised in the Drainage Design Report (Ref. No. CARP12033-REP-C003), this site may be partially or fully inundated during a 50 year ARI storm event. Refer to Section 8 for possible emergency flood management strategies for these sites.

Refer to Cardno Sketch 721769 SK01 (Appendix B) for the locality plan showing an indicative location of the concrete batching plants and Cardno Sketch numbers 721769 SK04 to SK08 (Appendix B) for a plan of each of the Concrete Batching Plant sites showing the topography.

2.2 Developed Site Description

It is proposed to establish a concrete batching plant on each site to support the construction of the proposed railway linking the Carmichael Coal Mine with the port terminals situated to the east. The developed sites will contain temporary structures, storage areas and a basic road network with minimal sealed areas.

As minimal bulk earthworks are anticipated in order to construct each of the batching plants, the developed condition site topography is expected to generally resemble the existing conditions.

Refer to Cardno sketch number 7903/44/001/SK003 (Appendix A) for the typical development layout for the batching plant sites.

3 Performance Criteria

The establishment and operation of the batching plant sites has been considered as a construction site for the lifetime of the rail construction project, which is expected to be 2 years.

Based on this, the construction and operational phases of the batching plant sites will be governed by the same performance criteria as outlined below.

The *'Queensland Water Quality Guidelines (2009)'* (QWQ guidelines) (which is referenced by the *Environmental Protection (Water) Policy (2009)*, a subordinate document of the *Environmental Protection Act (1994)*) provides a summary of design objectives for the management of stormwater quality and flow for the construction phase of developments in Queensland. This summary provided in Table 8.2.1 of the QWQ guidelines outlines design objectives for a number of pollutants including sediment, nutrients, litter and hydrocarbons.

Based on the above information, the release criteria for controlled runoff events or pumped discharges from the construction site is to be as shown in **Table 3-1** below.

Table 3-1 Controlled Discharge Performance Criteria

Parameter	Release Criteria	Criteria Type
Total Suspended Solids	< 50 mg/L	Maximum
Coarse Sediments	To be retained on site	Descriptive
Turbidity (NTU)	< 10% above receiving water	Maximum
Nutrients (N and P)	Manage through Sediment Control	Descriptive
pH	6.5-8.5	Range
Litter	No visible litter washed from site	Descriptive
Hydrocarbons	No visible sheen on receiving water	Descriptive
Dissolved Oxygen	> 6 mg/L	Minimum
Stormwater drainage/flow management	Peak flows for 1-year and 100-year ARI event to match the pre-development condition of the site	Maximum

For the management of sediments, Table 8.2.1 of the QWQ guidelines outlines the following:

> Testing of suspended solids and pH within any temporary sedimentation basins is to occur prior to any controlled discharges.

> Testing of turbidity within the temporary sediment basins and the receiving waters is to be performed before the controlled discharging of the sediment basins. If the turbidity of the sediment basin is greater than 10% above the receiving waters, further dosing with gypsum or a suitable alternative is required until acceptable levels are reached (refer to *Table B17 – Characteristics of Various Flocculating Agents, Appendix B of IECA's 'Best Practice Erosion and Sediment Control',* (2008)).

4 Stormwater Management Strategy

4.1 Stormwater Quality

Based on the limited lifespan of the concrete batching plants and the sites' proximity to the adjacent railway corridor construction area, the primary objective of the proposed stormwater quality management strategy will be to control soil erosion on site and minimise sediment discharge to the downstream receiving local water courses using appropriate best management practices.

Refer to Cardno sketch numbers 721769 SK04 to SK08 (Appendix B) for an indicative layout of the stormwater quality management measures proposed to be adopted to treat the contributing local catchment areas of each of the concrete batching plant sites.

4.1.1 Available Management Practices

A wide range of stormwater quality improvement devices are available to achieve the best practice stormwater management of runoff from a developed site. **Table 4-1** lists the common stormwater quality improvement devices, including their treatment efficiencies and the constraints of their use.

Table 4-1 Stormwater Management Practices

Treatment Technique	Pollutant Removal Efficiency (1)							Scale (2)	Constraints
				Nutrients					
	Litter & Debris	Coarse Sediment	Fine Sediment	Dissolved	Particulate	Metals	Hydrocarbons		
Litter baskets / racks	L-M							Local	Requires frequent maintenance
Sediment basins	L	M-H	L-M		L	L	L	Regional	Aesthetic and safety issues
Gross pollutant traps	H	H	L		L	L	L	Local/ Regional	Requires regular maintenance
Filter strips / buffer strips	L	M	L-M	L	L-M	L-M	L	Lot/Local	Requires flat terrain
Grass / vegetated swales	L	M-H	L-M	L	L-M	L-M	L	Local	Requires flat terrain
Extended detention basins	M	H	L-M	L	M	M	L	Regional	Requires pre-treatment, Large land area required
Infiltration trenches	L	M-H	M	L-M	M	M	M	Local	Requires pre-treatment
Bio-retention systems	L	M-H	M	L	M	M	L-M	Local	Requires pre-treatment
Porous pavements		L-M	L-M	L	M	M	M	Local	Not appropriate for steep sites and heavy traffic

Treatment Technique	Pollutant Removal Efficiency (1)							Scale (2)	Constraints
	Litter & Debris	Coarse Sediment	Fine Sediment	Nutrients: Dissolved	Nutrients: Particulate	Metals	Hydrocarbons		
Constructed wetlands	M-H	H	M	H	H	M-H	M	Regional	Requires pre-treatment, Not appropriate for steep sites, Large land area required
Community education								Regional	Community participation

Information Source: Queensland Urban Drainage Manual Table 11.05.4 (Typical pollutant removal efficiencies of treatment systems (2007). Benefit Ranking: L = Low Benefit, M = Medium Benefit, H = High Benefit.

Notes:

(1) Removal rates are provided for information only with the efficiency rating subject to adequate design. The actual removal rates used for detailed water quality modelling purposes should be in accordance with *MUSIC Modelling Guidelines Version 1.0 – 2010* prepared by Water by Design.

(2) Scales: Lot – less than 1 ha; Local – 1 to 10 ha; Regional – greater than 10 ha.

Given the features of the subject sites, a number of the measures listed in **Table 4-1** above would not be considered appropriate to be incorporated into the stormwater treatment train for the concrete batching plant sites.

Provided below is information on a number of the listed stormwater quality improvement devices including the suitability of these devices to be incorporated into the development of the subject site to treat stormwater runoff from the proposed concrete batching plant sites.

Litter Baskets/Racks

Litter baskets and trash racks are generally located upstream of other treatment measures such as extended detention basins or constructed wetlands. They are primarily used as a pre-treatment device for stormwater runoff, removing litter, debris and other gross pollutants from the runoff before it discharges into other secondary and tertiary treatment devices located downstream.

Litter baskets are generally incorporated into the pipe drainage system. Due to the relatively flat grades expected across the sites, the incorporation of pipe drainage within the batching plant areas is expected to be limited. Therefore it is not intended to use litter baskets within the batching plant sites.

In the event that high levels of gross pollutants are being generated from the batching plant areas, trash racks could be incorporated at the locations where concentrated surface flows are discharging into the sediment basins to provide some pre-treatment.

Gross Pollutant Traps (GPT) / Oil & Grit Separators

GPT / Oil and Grit Separators incorporated into the stormwater treatment train can contribute to the effective removal of solid pollutants, sediments and hydrocarbons from stormwater runoff from roadways and other hardstand areas of proposed developments.

Generally GPTs and Oil and Grit Separators shall be designed to treat flows generated by the 3 month Average Recurrence Interval (ARI) rainfall event.

As the incorporation of pipe drainage within the sites is expected to be limited, it is not intended to use GPT's / Oil & Grit Separators within the concrete batching plants.

Sediment Basins

During the construction phase of the development sediment loads are expected to be higher due to areas being cleared and exposed for the construction of roads and holding areas as well as the placement of machinery. It is recommended that as part of the erosion and sediment control plan prepared for the construction phase of the development some form of sediment basin will be utilised to help manage sediment transport off-site.

The use of sediment basins is considered appropriate for the concrete batching plant development.

Vegetated Filter Strips / Buffer Strips

Filter / buffer strips can be either areas of planted vegetation or strips of retained vegetation left in its natural state. These vegetated areas may provide both an effective way of reducing peak flows and improving stormwater runoff quality. During the construction phase of the development the retention of existing vegetation in-conjunction with other erosion control measures can assist to stabilise exposed areas. In the case of the proposed development areas that grade away from proposed pipe drainage networks, buffer strips are considered one of the key stormwater management techniques, particularly where no other stormwater treatment techniques are possible. Upon completion of the concrete batching plant construction works any exposed non-trafficable areas should be turfed, seeded, landscaped or stabilised as soon as possible to reduce the risk of erosion.

It should be noted that in order for buffer strips to be effective, flow must be overland, and not concentrated. Therefore, flow spreaders may be required in conjunction with buffer strips to ensure optimal performance, particularly for those areas which drain away from proposed pipe drainage networks.

The use of vegetated filter / buffer strips is considered appropriate for this development.

Grassed / Vegetated Swales

Grassed / vegetated swales are designed to treat stormwater runoff by ensuring sufficient detention time to allow the removal of nutrients and fine sediments. This is achieved through filtration and infiltration. Hydrocarbon removal will also be achieved through filtration and attachment to vegetation where biological breakdown of the hydrocarbons can occur.

Swale lengths and widths can vary dependent on the site conditions, however to operate most effectively swales need to be located on relatively flat grades no steeper than 4-5%. The use of vegetated swales is limited in steep slope areas, unless suitable scour protection measures are incorporated.

Due to the relatively flat grades expected across the sites, the use of grassed / vegetated swales is considered appropriate for the treatment and conveyance of surface flows within the batching plant sites.

Infiltration Trenches

Infiltration trenches are predominantly dry shallow grassed areas that trap the first flush runoff. The trapped runoff then infiltrates through the filtration medium removing fine sediment and nutrients. The base of the infiltration trench should be lined with an adequately designed sub-surface perforated pipe drainage network to convey filtered runoff to the trench outlet before discharging to the downstream receiving environment.

The use of infiltration trenches is considered appropriate for these sites subject to the availability of appropriate filter media and the ability to be properly drained.

Bio-retention Systems

Similar to vegetated swales, bio-retention systems are designed to treat stormwater runoff by ensuring sufficient detention time to allow the removal of nutrients and fine sediments. This is achieved through filtration, plant uptake, adsorption and biological degradation. Hydrocarbon removal will also be achieved through filtration and attachment to vegetation where the biological breakdown of hydrocarbons can occur.

Bio-retention systems contain an infiltration filter media, typically filled with sandy loam. All runoff collected within the system for the design storm event must pass through this filter. The filter media must be capable of sustaining vegetation growth as the vegetation is responsible for much of the uptake of nutrients within the system. The base of the bio-retention systems should be lined with an adequately designed sub-surface

perforated pipe drainage network to convey the filtered runoff to the system outlet before discharging to the receiving system.

Bio-retention systems can be used in both flat areas and in steeper areas by stepping the system. Bio-retention systems can also be incorporated into the base of detention basins combining both stormwater quality and quantity into one area.

As the vegetation in the basins takes around 2 years to properly establish, the use of bio-retention systems is not considered appropriate for these sites.

Porous Pavements

Porous pavements vary with design, but generally incorporate a surface material consisting of a grid / lattice system, modular clay / concrete blocks, or open-graded asphalt / concrete pavements with much of the fine aggregate material omitted. The surface material is bedded on a coarse sand filter layer constructed over a gravel drainage layer. The use of porous pavements can assist in the removal of fine particulate matter, hydrocarbons, nutrients and soluble pollutants from stormwater runoff.

Porous pavements are suited most to areas of low traffic volume and low runoff volume. Porous pavements are most effective when used at grades of less than 5%. Because of this, porous pavements are recommended to be used in the parking areas only.

Due to the high levels of sediments expected to be generated from the batching plant sites, the use of porous pavements is not considered appropriate for these development areas.

Rainwater Tanks

In addition to providing a low cost supply of water to assist in reducing demand on water supply, rainwater tanks can also provide a reduction in peak flow rates from rainfall events with the provision of additional storage volume.

The use of rainwater tanks is only considered appropriate for these developments if there are suitable roof areas from which to collect rainwater runoff.

Level Spreader Devices

For roof area drainage that cannot be connected to a piped drainage network the concentrating of roof water runoff at a single discharge outlet can lead to erosion and scour problems. By utilising a level spreader at the outlet to disperse the overflows over a larger area, the flows will be less concentrated and velocities will be reduced, reducing the risk of erosion and the incidence of re-suspension of sediments. Level / flow spreaders should be located away from high pedestrian traffic areas and be directed towards vegetated buffer strips or other landscaped areas.

The use of level spreader devices is only considered appropriate for this development in instances where piped outlets from rainwater tanks or small roof and hardstand areas are not directly connected to a receiving pipe drainage network.

Constructed Wetlands

Constructed wetlands are a water quality treatment system comprising of an inlet pond to remove coarse sediments, and a macrophyte zone to remove fine particulates and soluble pollutants. Additionally, constructed wetlands also provide landscape value, passive recreation, wildlife habitat and flood control.

Wetlands are particularly useful on sites constrained by water and environmental sensitivity as they can be incorporated as an upstream component of existing waterbodies and environmentally sensitive aquatic features.

The dominant feature of the wetland is the macrophyte zone which comprises of vegetated marshes, shallow and deep pools.

Wetlands require reasonably large flat areas of land. Currently, bio-retention systems provide superior performance with a reduced footprint compared to wetlands. Given the relatively low rainfall and high evaporation that occurs in the region, there are also concerns in relation to constructed wetlands being dry

for prolonged periods. Therefore this type of treatment device is not considered appropriate for the concrete batching plant sites.

4.1.2 Adopted Strategy

Based on the site constraints the following stormwater quality improvement devices and management practices are considered appropriate to be incorporated in the development of the concrete batching plant sites:

Rainwater tanks and level spreader devices

Due to the flat grades encountered over the sites, it may not be possible to direct all roof area drainage to a piped drainage network that will be able to free drain to the nominated stormwater treatment and detention basins. Therefore in these instances it is suggested that the roof area drainage discharge to rainwater tank with a level spreader device attached to the outlet. As indicated above, this would assist in dispersing the outflows over a larger area to reduce the risk of erosion and the incidence of re-suspension of sediments.

Vegetated Swales

As grades across the sites are generally less than 2% the use of vegetated swales for stormwater treatment is considered appropriate. As noted above, due to the relatively flat grades across the subject site vegetated swales may be used for conveyance purposes throughout much of the site as an alternative to conventional piped drainage which is expected to be limited by depth.

Sediment Basins

As the primary target of this stormwater management strategy is to control soil erosion and minimise sediment transport from the concrete batching plant sites this type of device is considered the most appropriate control device for the concrete batching plant sites.

With the lifespan of the batching plants anticipated to be approximately 2 years, the use of alternative devices such as bio-retention basins are limited as these types of devices generally take a period of approximately 2 years to appropriately establish.

The flexibility in the shape of sediment basins combined with the efficient pollutant retention rates for sediments that these systems provide make sediment basins ideal for the sites.

In addition to the above listed stormwater management practices, other principals of water sensitive urban design that can be incorporated into the development of the sites include:

> Retention of existing drainage features, where possible;

> Protection of natural systems by limiting development to non-sensitive areas and providing adequate buffers between development and natural systems;

> Non-worsening of peak flow rates from site.

It should be noted that this stormwater management strategy has been based on a preliminary layout. Although stormwater treatment practices have been recommended for use in certain areas throughout the subject site, a number of treatment measures may be appropriate and the key principles of the stormwater management strategy will remain applicable despite potential layout changes.

Should the detailed design bring about changes to the proposed layout, Section 4.1.1 of this stormwater management strategy provides a list of alternative treatment practices that may be suitable for the site and could potentially be designed to meet the nominated water quality objectives. The key aim of this stormwater management strategy is that the practices listed as suitable for the site should be used in a manner which results in best practice stormwater management measures being incorporated into the development.

4.1.3 On-site Fuel Storage

It is expected that a generator will be provided at each concrete batching plant location to power the batching plant. A fuel storage tank of approximately 60,000 litres will also be provided near the generator sites to provide fuel storage for the generator and refuelling of vehicles. All fuel storage tanks must be located within a bunded containment area, sized in accordance with the relevant state or local guidelines to ensure all

hydrocarbons are contained, should a spill or leak occur. All fuel storage tanks should be located above the nominated flood level. The refuelling area should be surrounded by a trafficable bund to capture any runoff or hydrocarbon spills and convey the potentially contaminated runoff towards a containment area.

4.2 Stormwater Quantity

The intent of this stormwater quantity strategy for the five concrete batching plant sites is to manage runoff generated from the local contributing catchment area (i.e. the subject site area) only. Based on this, it is proposed to construct perimeter bunds along the upstream boundaries of the subject site to divert the local external contributing catchment areas around the concrete batching plant sites.

A regional hydrologic and hydraulic assessment of the railway corridor was undertaken by Calibre Operations Pty Ltd, with the outcomes of this investigation documented in their Drainage Design report (Ref. No. CARP12033-REP-G-100 Rev 0, dated Dec 2012).

The purpose of this stormwater quantity management strategy is to avoid impacts on the downstream receiving properties and infrastructure, by ensuring that the peak flows discharging from the developed condition concrete batching plant site areas are equivalent to, or less than the peak flows expected from the existing condition site. It is proposed to incorporate an on-site detention basin into each of the sites to control the developed condition peak flows discharging from the subject site for rainfall events up to and including the 100 year ARI event for the local catchment.

To control the peak rates of discharge from the proposed detention basins it will be necessary for the outlet arrangement to be designed to maintain peak flows equivalent to the existing condition peak discharges. It is noted that where a free draining piped outlet cannot be provided to drain the proposed detention basins within the footprint of the concrete batching plant site areas, a pump system may need to be provided if a free draining outlet cannot be provided external to the sites.

The proposed detention basin will also be utilised as a sediment retention basin for water quality purposes. All water trapped within the sediment / detention basin is to be tested for compliance with the release criteria outlined in **Table 3-1** prior to a controlled release from the site or alternatively the water could be used for dust suppression or irrigation.

Due to the flat nature of the sites, not all stormwater runoff generated will be able to be conveyed to the proposed on-site detention basins with the use of a conventional pit and pipe drainage system. As a result it is proposed to use drainage swales to convey runoff to the nominated detention basin locations.

The indicative location and minimum size of the proposed basins are shown on Cardno sketch numbers 721769 SK04 to SK08 (Appendix B). Calculations for the sizing of the detention basins can be found in Section 6 of this report.

5 Stormwater Quality Assessment

As outlined above, the lifespan for the concrete batching plant sites is anticipated to be only approximately 2 years and therefore has been considered as a construction site for the lifetime of the rail construction project.

The works to be carried out on the sites have the potential to increase the level of sediment laden runoff discharging from the site for the lifespan of the construction project. Based on this, the following assessment for each site has been undertaken to determine the on-site sediment retention storage requirements that will be necessary to retain the expected soil loss generated. Refer to Cardno sketch numbers 721769 SK04 to SK08 (Appendix B) for the local catchment areas adopted for the preliminary stormwater quality assessment.

5.1 Soil Loss Calculations

Data obtained from the Australian Soil Resource Information System on the 12th October 2012 indicated that the soils on the subject sites are expected to be medium clays with an approximate clay content of 40 – 50%. The data obtained was from the national soil grid. This soil type is considered to be a dispersive soil (type D) and based on the Revised Universal Soil Loss Equation (RUSLE) the predicted soil loss rate has been estimated for each of the disturbed catchment areas.

Catchment parameters for the disturbed areas of the subject sites were based on existing contour information. These catchment parameters have been summarised in **Table 5-1** below.

Table 5-1 Catchment Parameters

Catchment No.	Internal / Site Catchment Area (ha)	Approx. Average Site Slope (%)
BP4	4.6	0.5
BP5	4.6	1.0
BP6	4.6	0.5
BP7	4.6	0.5
BP8	4.6	0.5

The results of the soil loss assessment using the revised soil loss equation are summarised in **Table 5-2** below. For more detailed information refer to the sediment loss calculations provided in Appendix C of this report.

Table 5-2 Soil Loss Parameters

Catchment No.	Rainfall Erosivity Factor (R)	Soil Erodibility Factor (K)	Slope Length / Gradient Factor (LS)	Erosion Control Practice Factor (P)	Ground Cover (C)	Soil Loss (A) (t/ha/yr)	Sediment Storage Volume (m^3)
BP4	2411	0.02	0.17	1.3	1.0	10.7	6.3
BP5	2411	0.02	0.17	1.3	1.0	10.7	6.3
BP6	2411	0.02	0.17	1.3	1.0	10.7	6.3
BP7	2411	0.02	0.17	1.3	1.0	10.7	6.3
BP8	2411	0.02	0.17	1.3	1.0	10.7	6.3

Based on the information above, the soil loss within each of the disturbed areas has been estimated to be equivalent to Soil Loss Class 1 (0 to 150 tonnes/ha/yr), which classifies the sites as very low erosion risks, as outlined in Table 3.1 of the 'Best Practice Erosion and Sediment Control (2008)' guidelines prepared by the International Erosion Control Association – Australasia.

5.2 Sediment Basin Calculations

In conjunction with the above information, the calculations for the total sediment basin volume have been carried out and shown in **Table 5-3** below.

Table 5-3 Sediment Basin Calculations

Basin No.	Volumetric Runoff Coefficient (Cv)	Catchment Area of Basin (A)	5 day total rainfall depth (R) [85%ile, 5day	Settling Zone Volume (10xCvxAxR)	Total Basin Volume (m^3)
BP4	1.0	4.6	32.5	1495	1501
BP5	1.0	4.6	32.5	1495	1501
BP6	1.0	4.6	32.5	1495	1501
BP7	1.0	4.6	32.5	1495	1501
BP8	1.0	4.6	32.5	1495	1501

A comparison of the total storage volumes required for sediment retention and for on-site detention will be carried out in Section 6 of this report. This comparison will be made to determine which design conditions will be considered as the critical case.

6 Stormwater Quantity Assessment

The local catchment peak discharges from each of the concrete batching plant sites are expected to increase in comparison to the existing condition peak flows as a result of the proposed developments. This expected increase in peak discharge is the result of the increase in the percentage of impervious area and the reduction in flow travel time post development. Based on this, the following assessments of the pre-development and post development local catchment flows for each site has been undertaken to determine if there is an increase in post development flows from the subject sites, and estimate the on-site detention storage requirements that may be necessary to attenuate any increase in flows discharging off-site. Refer to Cardno sketch numbers 721769 SK04 to SK08 (Appendix B) for the local catchment areas adopted for the preliminary on-site detention assessment.

6.1 Existing Conditions

The Rational Method was used to estimate the existing condition peak flow rates discharging from each of the local catchment areas for the concrete batching plant sites.

The Coefficient of Runoff value for the pre-developed site conditions was determined from Tables 4.05.3(a) *(Table of C_{10} values)* and 4.05.3(b) *(C_{10} values for Zero Fraction Impervious)* of the Queensland Urban Drainage Manual 2007 (QUDM). Based on available data of the subject sites, the existing condition of the concrete batching plant sites was considered to have a fraction impervious of 0.0 and a land description equivalent to poor grass cover / low density pasture. A resultant C_{10} value of 0.66 was adopted for the pre-development site conditions.

A rainfall intensity frequency duration (IFD) chart was developed for the concrete patching plant areas using the design rainfall IFD data available from the Bureau of Meteorology (BOM) website.

The Time of Concentration value for each of the existing site conditions was determined in accordance with Section 4.06 of QUDM. The overland sheet flow and channel flow travel times were calculated separately then combined to provide a total time of concentration for each of the sites. The pre-development flow travel time was estimated based on the parameters shown in **Table 6-1** below.

Table 6-1 Existing Surface Parameters for Time of Concentration Calculations

Parameter		BP4	BP5	BP6	BP7	BP8
Sheet Flow	Slope Length	50 m	50 m	50 m	50 m	50 m
	Surface Grade	0.5%	1.0%	0.5%	0.5%	0.5%
	Adopted t_c	14 min	12 min	14 min	14 min	14 min
Channel Flow	Slope Length	250 m	250 m	250 m	250 m	250 m
	Surface Fall	0.5 m	1.5 m	1 m	0.5 m	0.5 m
	Adopted t_c	24 min	16 min	19 min	24 min	24 min
	Total t_c	38 min	28 min	33 min	38 min	38 min

A summary of the parameters determined to estimate the pre-development 2, 5, 10, 20, 50 and 100 year ARI peak flow rates from the local catchment areas of each of the concrete batching plant sites of the subject site are provided in **Table 6-2** to **Table 6-6** below.

Table 6-2 BP4 Existing Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.56	0.63	0.66	0.69	0.76	0.79
Area (ha)	4.6	4.6	4.6	4.6	4.6	4.6
Time of Concentration (min)	38	38	38	38	38	38
Rainfall Intensity (mm/hr)	50	66	75	88	104	117
Discharge (m^3/s)	0.36	0.53	0.63	0.78	1.01	1.18

Table 6-3 BP5 Existing Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.56	0.63	0.66	0.69	0.76	0.79
Area (ha)	4.6	4.6	4.6	4.6	4.6	4.6
Time of Concentration (min)	28	28	28	28	28	28
Rainfall Intensity (mm/hr)	59	77	88	102	121	136
Discharge (m^3/s)	0.42	0.62	0.74	0.90	1.17	1.38

Table 6-4 BP6 Existing Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.56	0.63	0.66	0.69	0.76	0.79
Area (ha)	4.6	4.6	4.6	4.6	4.6	4.6
Time of Concentration (min)	33	33	33	33	33	33
Rainfall Intensity (mm/hr)	54	71	81	95	112	126
Discharge (m^3/s)	0.39	0.57	0.68	0.84	1.09	1.28

Table 6-5 BP7 Existing Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.56	0.63	0.66	0.69	0.76	0.79
Area (ha)	4.6	4.6	4.6	4.6	4.6	4.6
Time of Concentration (min)	38	38	38	38	38	38
Rainfall Intensity (mm/hr)	50	66	75	88	104	117
Discharge (m^3/s)	0.36	0.53	0.63	0.78	1.01	1.18

Table 6-6 BP8 Existing Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.56	0.63	0.66	0.69	0.76	0.79
Area (ha)	4.6	4.6	4.6	4.6	4.6	4.6
Time of Concentration (min)	38	38	38	38	38	38
Rainfall Intensity (mm/hr)	50	66	75	88	104	117
Discharge (m^3/s)	0.36	0.53	0.63	0.78	1.01	1.18

6.2 Developed Condition

Similar to the existing condition flows, the Rational Method was used to estimate the peak flow rates discharging from each of the developed condition local catchment areas for the concrete batching plant sites.

As discussed above, the Coefficient of Runoff value for the developed site conditions was determined from Table 4.05.3(a) of QUDM. Based on the proposed use of the sites, a fraction impervious of 0.90 has been adopted, with a resultant C_{10} value of 0.86 to be used for the post-development site conditions.

The Time of Concentration value for the developed site conditions was determined for the contributing local catchment area in accordance with Section 4.06 of QUDM.

Due to the flat grades expected across the development sites, surface drainage is expected to be limited to the use of swale drains / open channels. Pipe drainage is expected to be limited to cross culverts utilised under roadways and footpaths to maintain trafficability during lower ARI events. A summary of the parameters used in calculating the time of concentration for each of the concrete batching plant sites is included in **Table 6-7**.

Table 6-7 Developed Surface Parameters for Time of Concentration Calculations

Parameter		BP4	BP5	BP6	BP7	BP8
Sheet Flow	Slope Length	50 m	50 m	50 m	50 m	50 m
	Surface Grade	0.5%	1.0%	0.5%	0.5%	0.5%
	Adopted t_c	8 min	7 min	8 min	8 min	8 min
Channel Flow	Slope Length	250 m	250 m	250 m	250 m	250 m
	Surface Fall	0.5 m	1.5 m	1 m	0.5 m	0.6 m
	Adopted t_c	16 min	11 min	13 min	16 min	16 min
Total t_c		24 min	18 min	21 min	24 min	24 min

A summary of the parameters determined to calculate the 2, 5, 10, 20, 50 and 100 year ARI developed peak flow ratess (with no detention) from the contributing local catchment areas of the concrete batching plant sites are provided in **Table 6-8** to **Table 6-12** below.

Table 6-8 BP4 Developed Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.73	0.82	0.86	0.90	0.99	1.0
Area (ha)	4.3	4.3	4.3	4.3	4.3	4.3
Time of Concentration (min)	24	24	24	24	24	24
Rainfall Intensity (mm/hr)	63	83	95	110	131	147
Discharge (m^3/s)	0.59	0.87	1.04	1.27	1.66	1.88

Table 6-9 BP5 Developed Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.73	0.82	0.86	0.90	0.99	1.0
Area (ha)	4.3	4.3	4.3	4.3	4.3	4.3
Time of Concentration (min)	18	18	18	18	18	18
Rainfall Intensity (mm/hr)	72	94	108	126	150	168
Discharge (m^3/s)	0.67	0.98	1.19	1.45	1.90	2.15

Table 6-10 BP6 Developed Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.73	0.82	0.86	0.90	0.99	1.0
Area (ha)	4.3	4.3	4.3	4.3	4.3	4.3
Time of Concentration (min)	21	21	21	21	21	21
Rainfall Intensity (mm/hr)	67	88	101	117	140	157
Discharge (m^3/s)	0.63	0.92	1.11	1.35	1.77	2.01

Table 6-11 BP7 Developed Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.73	0.82	0.86	0.90	0.99	1.0
Area (ha)	4.3	4.3	4.3	4.3	4.3	4.3
Time of Concentration (min)	24	24	24	24	24	24
Rainfall Intensity (mm/hr)	63	83	95	110	131	147
Discharge (m^3/s)	0.59	0.87	1.04	1.27	1.66	1.88

Table 6-12 BP8 Developed Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.73	0.82	0.86	0.90	0.99	1.0
Area (ha)	4.3	4.3	4.3	4.3	4.3	4.3
Time of Concentration (min)	24	24	24	24	24	24
Rainfall Intensity (mm/hr)	63	83	95	110	131	147
Discharge (m^3/s)	0.59	0.87	1.04	1.27	1.66	1.88

A comparison of the existing condition peak flows with the developed condition peak flows found that there is generally expected to be an increase in the peak flows discharging off site due to the increase in impervious area and the reduction in flow travel time on site.

On-site detention is proposed to be incorporated into the development works. This is to avoid impacts on downstream properties and infrastructure and to maintain the existing peak flow rate of runoff discharging from the developed site for all rainfall events up to and including the local catchment 100 year ARI event. The proposed on-site detention will help control the rate of discharge leaving the site.

6.3 Preliminary On-Site Detention

A preliminary assessment of the on-site detention storage requirements for each of the concrete batching plant sites has been carried out using the initial sizing techniques outlined in Section 5.05.1 of QUDM. Based on the comparison of results outlined in Section 6.2 above, it will be necessary to incorporate on-site detention storage in order to maintain peak outflows equivalent to the existing conditions.

The on-site detention storage proposed for each site will be sized to maintain the equivalent pre-developed condition peak flows for local catchment rainfall events up to and including the 100 year ARI rainfall event. To control the peak rates of discharge from the nominated storage volume it will be necessary for the outlet arrangements to be designed to maintain the existing peak flows.

A comparison of the existing and developed condition peak flows for each site indicated that the 100 year ARI storm event resulted in the greatest increase in peak discharge in each case. The results of the preliminary on-site detention analysis indicated the approximate detention storage volume required for each site to detain the increase in the 100 year ARI discharge and maintain the equivalent pre-developed 100 year ARI peak flow discharging off site. A summary of the volumes required for each site are provided in **Table 6-13** below.

Table 6-13 Detention requirements

Parameter	BP4	BP5	BP6	BP7	BP8
Required Volume (m^3)	2666	2219	2456	2666	2666

It should be noted that the volume outlined may be subject to change if the final catchment areas differ from those adopted for this assessment. The stage storage characteristics and outlet configuration of the detention basin will be verified as part of the detailed design for each of the concrete batching plants.

It is proposed to incorporate the stormwater detention and treatment into one common basin. A comparison of the total storage volumes required for sediment retention, as outlined in Section 5 of this report, and for on-site detention has indicated that the volume required for on-site detention is more critical in each case. Therefore the total storage volume adopted for each of the concrete batching plant sites for the stormwater treatment and detention basin is a minimum listed in **Table 6-13**. Refer to Cardno sketch numbers 721769 SK04 to SK08 (Appendix B) for the indicative layout and configuration of the stormwater treatment and detention basin for each of the concrete batching plant sites.

In accordance with Section 5.11 of QUDM it is recommended that any ponding within the basin should be limited to 1.2 metres at the deepest point above the basin invert if there is perceived to be a public safety issue. For deeper basins, suitable safety provisions such as refuge mounds within large basins, fences and warning signs should be provided.

6.4 Other Drainage Issues

6.4.1 Diversion of External Catchments

As the intent of this strategy is to manage the runoff from the concrete batching plant site areas only, it is proposed to construct perimeter bunds along the upstream boundaries of the subject site to divert the local external contributing catchment areas around the sites. Refer to Cardno sketch numbers 721769 SK04, SK06 and SK07 (Appendix B) for the indicative locations of the external catchment diversion bunds proposed for the concrete batching plant sites. The final alignment and profile required for the diversion bunds will be confirmed as part of the detailed design of each of the concrete batching plants.

7 Monitoring and Maintenance Schedules

7.1 Monitoring Schedule

A monitoring program will be established for the stormwater management devices as outlined below and shown in **Table 7-1, Table 7-2, 0** and **Table 7-4**.

Due to the remote location of the site, the turn-around time for the suspended solids test results may delay the release of captured surface runoff from the sediment basin. Measuring the turbidity may be an acceptable alternative, although this requires the correlation between turbidity and suspended solids to be established individually for each site. The relationship between the turbidity and suspended solids varies between soil types, so this will need to be determined for each site by measuring both parameters over the course of at least six events. Graphing the results and determining a line of best fit should provide a turbidity/suspended solids relationship suitable for estimating the turbidity level that corresponds to the suspended solids release criteria. Once this has been established, suspended solids testing samples should continue to be collected prior to any controlled release, however the release may occur prior to the results being returned. Should the suspended solids test results be outside the release criteria given in Section 3 of this report, the acceptable turbidity level must be adjusted to reduce the chance of future non-compliance. The turbidity within the basins can be measured a number of ways, including a secchi disk or a water quality probe.

Table 7-1 Monitoring Program for Sediment Basins

MONITORING ACTIVITY	FREQUENCY
Inspect sediment basin	- During construction - After each runoff event - Prior to “stop work” or “site shutdown”
Inspect submerged inflow pipes	After each runoff event
Testing of Turbidity, Suspended Solids, pH, and Dissolved Oxygen	- Prior to controlled release - Immediately following rain events > 25mm in a 24 hour period

To maximise the effectiveness of the stormwater management measures for the roof drainage areas that do not connect directly to a piped drainage system, the following activities are suggested to regularly visually monitor the condition of the rainwater tanks and level spreader outlets.

Table 7-2 Monitoring Program for Rainwater Tanks

MONITORING ACTIVITY	FREQUENCY
Observe water surcharging from surcharge weir/pipe/pit of tank	After major storm events > 25mm in 24 hrs
Inspect silt / litter trap	After major storm events > 25mm in 24 hrs or 3 monthly
Inspect structural integrity / condition of device	6 monthly

Table 7-3 Monitoring Program for Level Spreader Devices

MONITORING ACTIVITY	RECOMMENDED FREQUENCY
Inspect for incidents of erosion / scour of soils at outlet	After major storm events > 25mm in 24 hrs or 3 monthly
Inspect for weed inundation / litter accumulation within the receiving environment	3 monthly
Inspect for excessive wear & damage of receiving environment	
Inspect for build-up of sediments at outlet	
Inspect health of vegetation at outlet	

In the case of vegetated buffers and vegetated swales, the collection of water quality samples is unlikely to yield valuable results. Given this, no sample based monitoring is recommended for these treatment systems. Instead, an inspection based monitoring and maintenance scheme as detailed below is considered appropriate for these types of devices.

Table 7-4 Monitoring Program for Vegetated Swales

MONITORING ACTIVITY	FREQUENCY
Inspect for erosion / scour of invert & batters	After major storm events > 25mm in 24 hrs or 3 monthly
Inspect for weed inundation / litter & debris accumulation	3 monthly
Inspect for inappropriate access, excessive wear & damage to invert & batters	3 monthly
Inspect for build-up of sediments	3 monthly
Inspect condition of vegetation such as vegetation health & density	3 monthly
Inspect condition of inlet & outlet structures	After major storm events > 25mm in 24 hrs or 3 monthly

7.2 Maintenance Schedule

The on-going performance of the stormwater management devices will be dependent on the maintenance conducted.

The maintenance programs as outlined below and detailed in **Table 7-5**, **Table 7-6**, **Table 7-7** and **Table 7-8** are to be implemented for the stormwater treatment devices.

Table 7-5 Maintenance Program for Sediment Basins

MAINTENANCE ACTIVITY	FREQUENCY
Clean out accumulated sediment	Every 2 years as per sediment basin calculations or as required by results of monitoring
Check visible pipes for leaks	6 monthly or as required by results of monitoring
Check fill material for settlement	6 monthly or as required by results of monitoring
Remove all trash from basin and riser	6 monthly or as required by results of monitoring
De-silt submerged inflow pipes	6 monthly or as required by results of monitoring

Sediment basins must be operated and maintained in an effective operational condition. These structures must not be allowed to accumulate sediment volumes in excess of forty per cent (40%) sediment storage design capacity. Where sedimentation basins are used a marker shall be placed within the basin to show

the level above which the design storage capacity occurs. Materials removed from sediment retention devices must be disposed of in a manner approved by the consent authority that does not cause pollution.

Table 7-6 Maintenance Program for Rainwater Tanks

MAINTENANCE ACTIVITY	FREQUENCY
Clean out silt / litter trap	6 monthly or as required by results of monitoring
Remove debris from surcharge weir / pipe / pit	
Dewater and clean out / de-silt tank	As required by monitoring

Table 7-7 Maintenance Program for Level Spreader Devices

MAINTENANCE ACTIVITY	FREQUENCY
Repairs to landscaping / level spreaders	As required by monitoring
Watering, re-vegetating, grass cutting of receiving environment	
Removal of litter, debris, weeds & excessive sediment build up within receiving environment	

Table 7-8 Maintenance Program for Vegetated Swales

MAINTENANCE ACTIVITY	FREQUENCY
Repairs to swale profile	As required by results of monitoring
Irrigating, infilling of vegetation to maintain sufficient cover	As required by results of monitoring
Removal of litter, debris, weeds & excessive sediment build up	6 monthly or as required by results of monitoring
Mowing / pruning of swale vegetation to maintain optimal vegetation height	As required by results of monitoring

Reforming of any swale profile will be required when the design flow area of the swale is reduced by 25%.

8 Emergency Flood Management Strategies

A regional flooding analysis to assess the impacts of the proposed Carmichael Rail Alignment on the existing major floodplains, river and creek crossings was undertaken by Calibre Operations Pty Ltd for the Carmichael Coal Mine and Rail project. Based on the results of the investigation (included in the Drainage Design Report (Reference No.CARP12033-REP-C-003, dated Dec 2012)), and the Hydrology Drawings, a number of the concrete batching plant locations were identified as being partially inundated during a 50 year ARI storm event.

For the areas that may be inundated during a 50 year ARI storm event, it is recommended that the contractor operating the facility consider developing an Emergency Flood Management Strategy to minimise the risk to people, equipment and infrastructure during flood events.

The following information provides some strategies that the contractor may consider when developing an Emergency Flood Management Plan for the construction facility areas at risk of inundation. Procedures for flood emergency management in the case of a flood emergency could include communication based management or flood gauge based management. Strategies for remaining on site during a flood emergency have not been considered for the concrete batching plant sites as no habitable buildings are expected to be incorporated into these construction facility areas.

Due to the remote location of many of the concrete batching plant areas, flood gauged based management strategies may not be available to many of the facility sites. Based on this, a communication based management plan may be more appropriate for the sites.

Any materials that have the potential to cause environmental harm such as fuel, cement etc. should be either stored above the appropriate flood level or be able to be moved off site in a timely manner if the need arises.

8.1 Communication Based Management Strategies

Communication based management strategies generally rely on regular flood warnings and river height bulletins issued by the Bureau of Meteorology (BoM). These warning and bulletins are sent to radio stations for broadcast, and to local authorities, police and emergency services. Flood warnings, river height bulletins and other weather related information is available on the BoM website and through telephone recorded information services.

The contractor should consider identifying the names of the creek and river systems that have the potential to inundate the concrete batching plants as well as site access roads and tracks, and determine if the BoM has a warning system monitoring the identified watercourse. If available, the contractor should then document the appropriate contact details to enable access the identified warning systems.

To gain more information on flood warning, the contractor may also consider registering the construction facility area with the local council, the local branch of the state emergency services department and any local disaster management centres.

The contractor should ensure that all staff accessing the facility are informed of the flood characteristics of the site and surrounding area, the emergency evacuation protocols and processes and the site evacuation routes in the event of a flood emergency.

If a flood event has been forecast for the area by the BoM or other local authority, then the contractor may want to consider some of the following procedures as part of the emergency evacuation protocols and processes for the facility site.

> Securing the site by cleaning up materials and storing equipment / machinery that have the potential to be carried away during a flood event.

> Moving equipment / machinery that can be relocated off site to higher ground.

> Evacuate the facility site while low hazard level access is still available off site.

8.2 Flood Gauge Based Management Strategies

Flood gauge based management strategies generally incorporate the same communication based strategies as outlined above, however where flood gauges may be established for adjacent creek or river systems defined flood level information could be available.

The contractor may then consider utilising the available flood level information to set trigger levels for various actions to occur on site as part of the emergency evacuation protocols and processes developed for the concrete batching plant facilities.

9 Conclusions

In preparing this conceptual stormwater management strategy, preliminary water quality and quantity assessments were undertaken for the five concrete batching plant sites.

The objectives of this stormwater management strategy were to meet the performance criteria outlined in **Table 3-1** of this report. The outcome of this preliminary investigation has recommended the inclusion of a number of stormwater quality and quantity management measures detailed herein and summarised as follows:

> Numerous vegetated swales for treatment and conveyance purposes as indicatively shown on Cardno sketch numbers 721769 SK04 to SK08 (Appendix B); and

> Constructed sediment basins as described in Sections 5 and 6, and indicatively shown on Cardno sketch numbers 721769 SK04 to SK08 (Appendix B).

The detailed design of the treatment and detention devices will need to comply with the information outlined within this stormwater management strategy, and with the relevant authority guidelines.

10 References

Department of Environment and Resource Management 2009, *Queensland Water Quality Guidelines (2009)*, Version 3 September 2009, Brisbane, QLD

Department of Natural Resources and Water 2007, *Queensland Urban Drainage Manual 2007 (QUDM)*, Volume 1 Second Edition 2007, Brisbane, QLD

International Erosion Control Association (Australasia) 2008, *Best Practice Erosion and Sediment Control*, November 2008, Picton, NSW

Water by Design 2010, *MUSIC Modelling Guidelines Version 1.0 – 2010*, Brisbane, QLD

APPENDIX A

REFERENCE DRAWINGS

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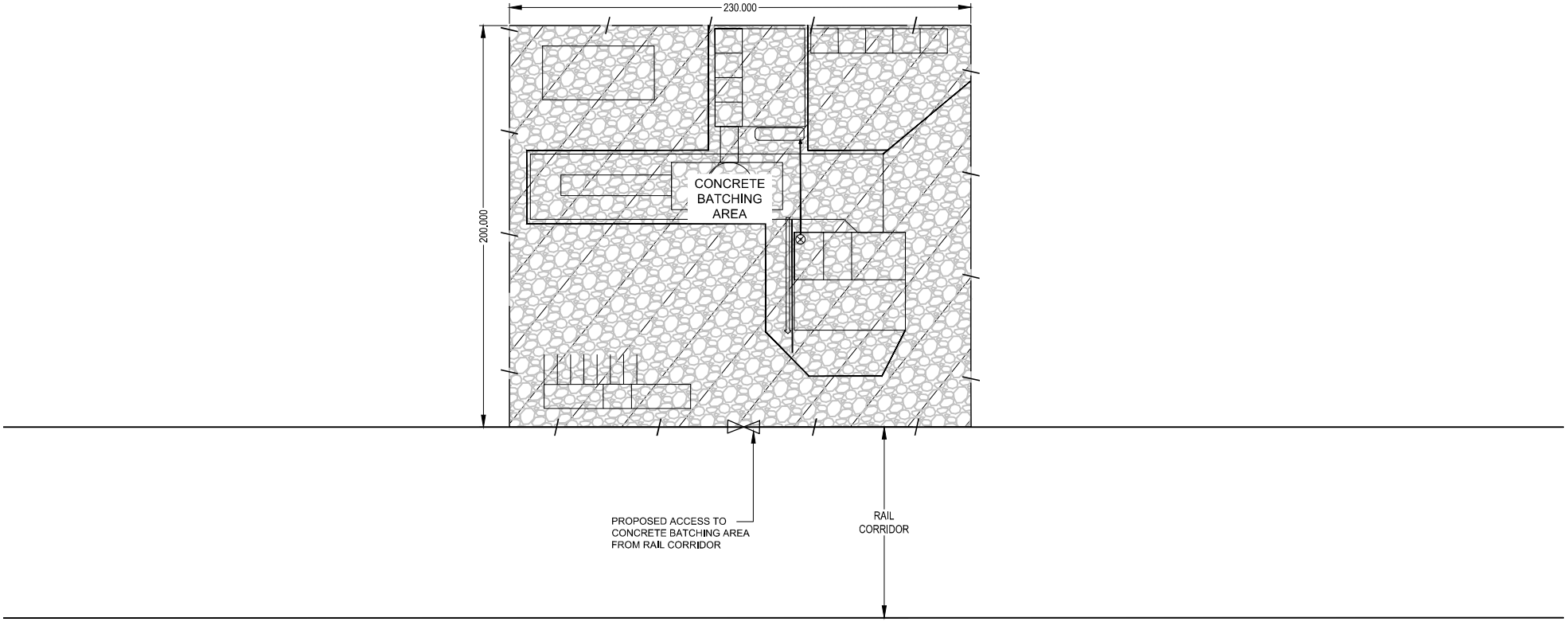

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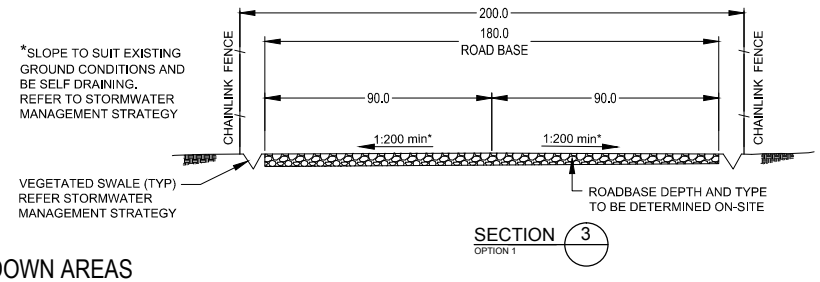
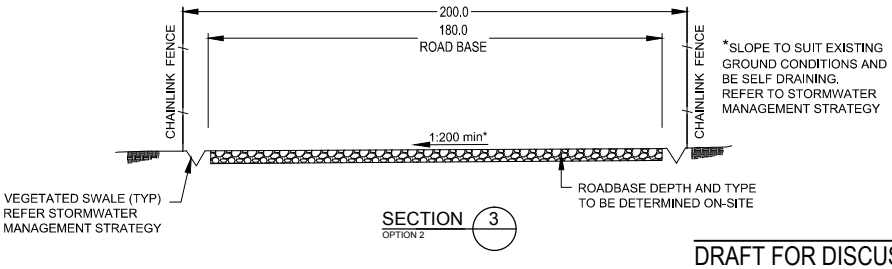


SECTION 3
OPTION 1



SECTION 3
OPTION 2

ADANI RAIL LAYDOWN AREAS

TYPICAL CONCRETE BATCH LAYDOWN AREA

DRAFT FOR DISCUSSION

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Quality Endorsed Company

REF NUMBER: 7903/44/001/SK-003(P3)
DATE: 18/04/2013

APPENDIX B

FIGURES & SKETCHES

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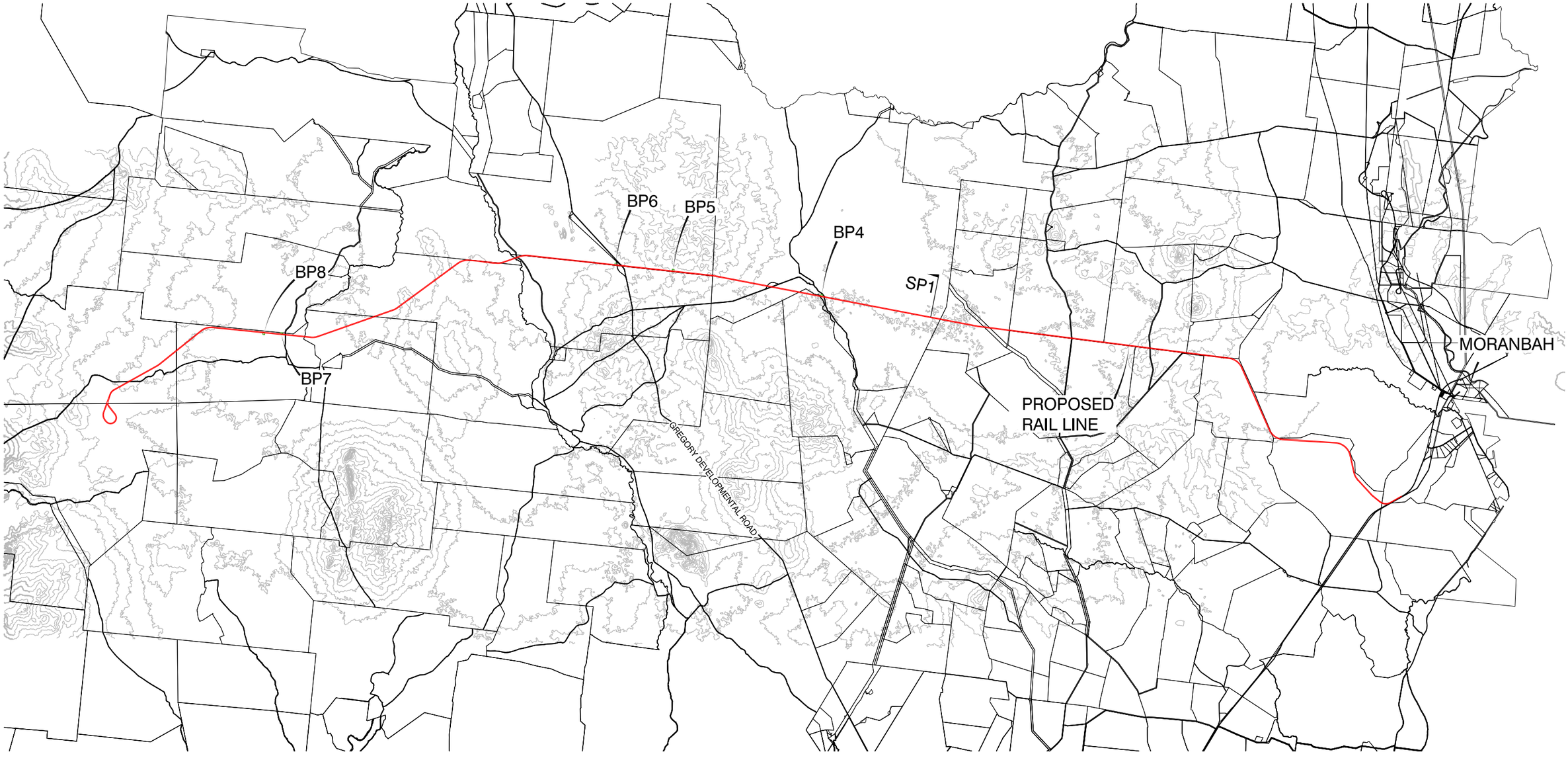

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Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Locality Plan for the Concrete Batching Plant Locations

Date: April 2013
Drawing Number: Sketch 721769 - 001
Revision: C

DATE PLOTTED: 12 July 2013 11:17 AM
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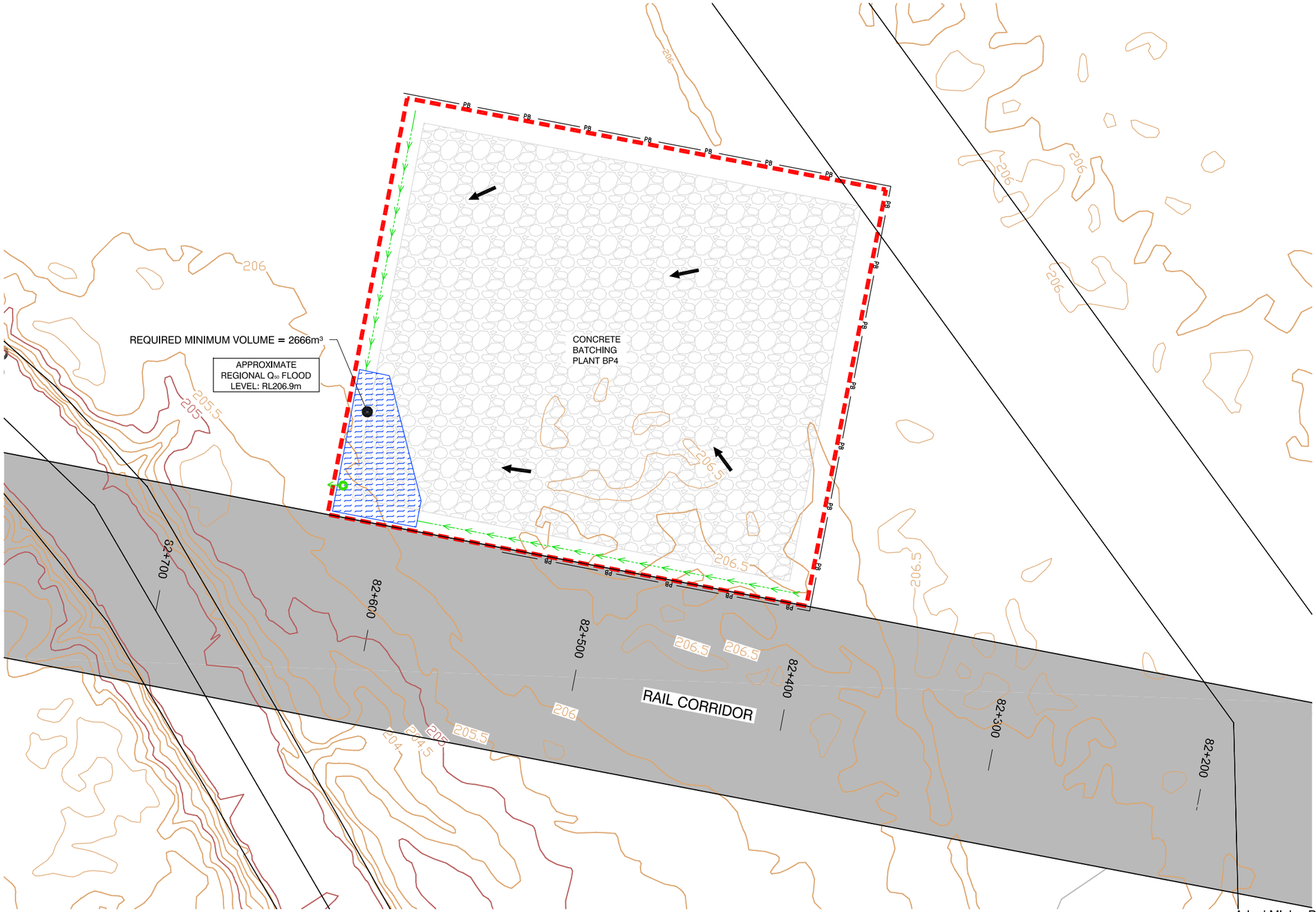
LEGEND

- EXISTING SURFACE CONTOURS (0.5m INTERVALS)
- DEVELOPED CATCHMENT BOUNDARY
- VEGETATED SWALES (INDICATIVE ONLY)
- PB — PERIMETER BUND
- OVERLAND FLOW DIRECTION
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED SEDIMENT/DETENTION BASIN AND OUTLET (INDICATIVE ONLY) REFER NOTE 7.

NOTES:

1. CONTOURS ARE BASED ON AERIAL SURVEY. DETAILED SURVEY WILL BE REQUIRED TO CONFIRM CONTRIBUTING CATCHMENT AREAS FOR DETAILED DESIGN.
2. WHERE THE ROOF AREA DRAINAGE CANNOT BE PROVIDED WITH A FREE DRAINING CONNECTION TO THE PROPOSED SEDIMENT/DETENTION BASIN THE ROOF AREA DRAINAGE TO DISCHARGE TO RAINWATER TANK WITH A LEVEL SPREADER ATTACHED TO OUTLET.
3. SOME MINOR RE-GRADING WILL BE REQUIRED ONCE EXACT SITE CONDITIONS ARE DETERMINED.
4. WHERE A FREE DRAINING PIPED OUTLET CANNOT BE PROVIDED TO DRAIN THE SEDIMENT/DETENTION BASIN WITHIN THE FOOTPRINT OF THE CONSTRUCTION FACILITY AREA, A PUMP WILL NEED TO BE PROVIDED. ALTERNATIVELY APPROVAL WILL NEED TO BE SOUGHT TO PROVIDE A FREE DRAINING PIPED OUTLET EXTERNAL TO THE EXTENTS OF THE SITE.
5. ALL WATER TRAPPED WITHIN THE SEDIMENT/DETENTION BASIN IS TO BE TESTED FOR COMPLIANCE WITH THE RELEASE CRITERIA OUTLINED IN THE SWMS PRIOR TO A CONTROLLED RELEASE OFF-SITE.
6. CONSTRUCT DIVERSION BUND TO DIVERT EXTERNAL LOCAL CONTRIBUTING CATCHMENTS AROUND THE CONSTRUCTION FACILITY SITE. EXTENT AND SIZE OF THE BUND TO BE CONFIRMED AS PART OF THE DETAILED DESIGN. VELOCITY CONTROL MEASURES TO BE PROVIDED AT THE DOWNSTREAM END OF DIVERSION BUNDS TO DISPERSE CONCENTRATED FLOWS.
7. BASIN SPILLWAY LOCATION AND SIZE TO BE CONFIRMED AS PART OF THE DETAILED DESIGN.
8. REGIONAL Q50 FLOOD LEVEL DERIVED FROM RESULTS OF REGIONAL FLOODING INVESTIGATION UNDERTAKEN BY CALIBRE OPERATIONS PTY LTD FOR THE CARMICHAEL COAL MINE AND RAIL PROJECT, AND SUMMARISED IN THE DESIGN REPORT, REFERENCE NO. CARP12033-REP-C-003 (DATED DEC 2012)



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Stormwater Management Strategy For Concrete Batching Plant BP4

Date: April 2013
Drawing Number: Sketch 721769 - 004
Revision: B

DATE PLOTTED: 12 July 2013 12:20 PM
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- PB — PERIMETER BUND
- OVERLAND FLOW DIRECTION
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED SEDIMENT/DETENTION BASIN AND OUTLET (INDICATIVE ONLY) REFER NOTE 7.

NOTES:

1. CONTOURS ARE BASED ON AERIAL SURVEY. DETAILED SURVEY WILL BE REQUIRED TO CONFIRM CONTRIBUTING CATCHMENT AREAS FOR DETAILED DESIGN.
2. WHERE THE ROOF AREA DRAINAGE CANNOT BE PROVIDED WITH A FREE DRAINING CONNECTION TO THE PROPOSED SEDIMENT/DETENTION BASIN THE ROOF AREA DRAINAGE TO DISCHARGE TO RAINWATER TANK WITH A LEVEL SPREADER ATTACHED TO OUTLET.
3. SOME MINOR RE-GRADING WILL BE REQUIRED ONCE EXACT SITE CONDITIONS ARE DETERMINED.
4. WHERE A FREE DRAINING PIPED OUTLET CANNOT BE PROVIDED TO DRAIN THE SEDIMENT/DETENTION BASIN WITHIN THE FOOTPRINT OF THE CONSTRUCTION FACILITY AREA, A PUMP WILL NEED TO BE PROVIDED. ALTERNATIVELY APPROVAL WILL NEED TO BE SOUGHT TO PROVIDE A FREE DRAINING PIPED OUTLET EXTERNAL TO THE EXTENTS OF THE SITE.
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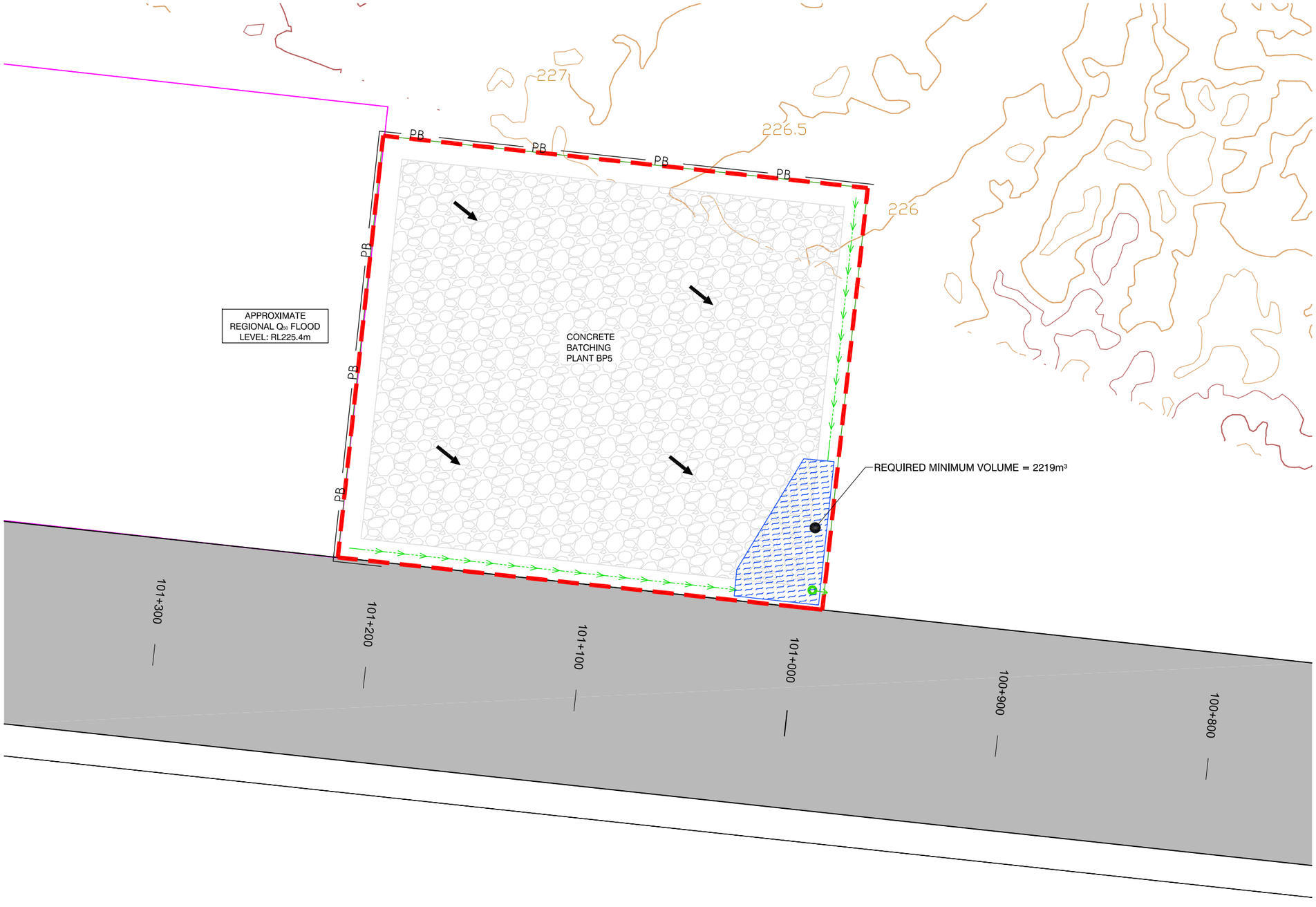
7. BASIN SPILLWAY LOCATION AND SIZE TO BE CONFIRMED AS PART OF THE DETAILED DESIGN.
8. REGIONAL Q50 FLOOD LEVEL DERIVED FROM RESULTS OF REGIONAL FLOODING INVESTIGATION UNDERTAKEN BY CALIBRE OPERATIONS PTY LTD FOR THE CARMICHAEL COAL MINE AND RAIL PROJECT, AND SUMMARISED IN THE DESIGN REPORT, REFERENCE NO. CARP12033-REP-C-003 (DATED DEC 2012)



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Stormwater Management Strategy For Concrete Batching Plant BP5

Date: April 2013
Drawing Number: Sketch 721769 - 005
Revision: B

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- VEGETATED SWALES (INDICATIVE ONLY)
- PB — PERIMETER BUND
- OVERLAND FLOW DIRECTION
- PROPOSED CONCRETE BATCHING PLANT AREA
- PROPOSED SEDIMENT/DETENTION BASIN AND OUTLET (INDICATIVE ONLY) REFER NOTE 7.

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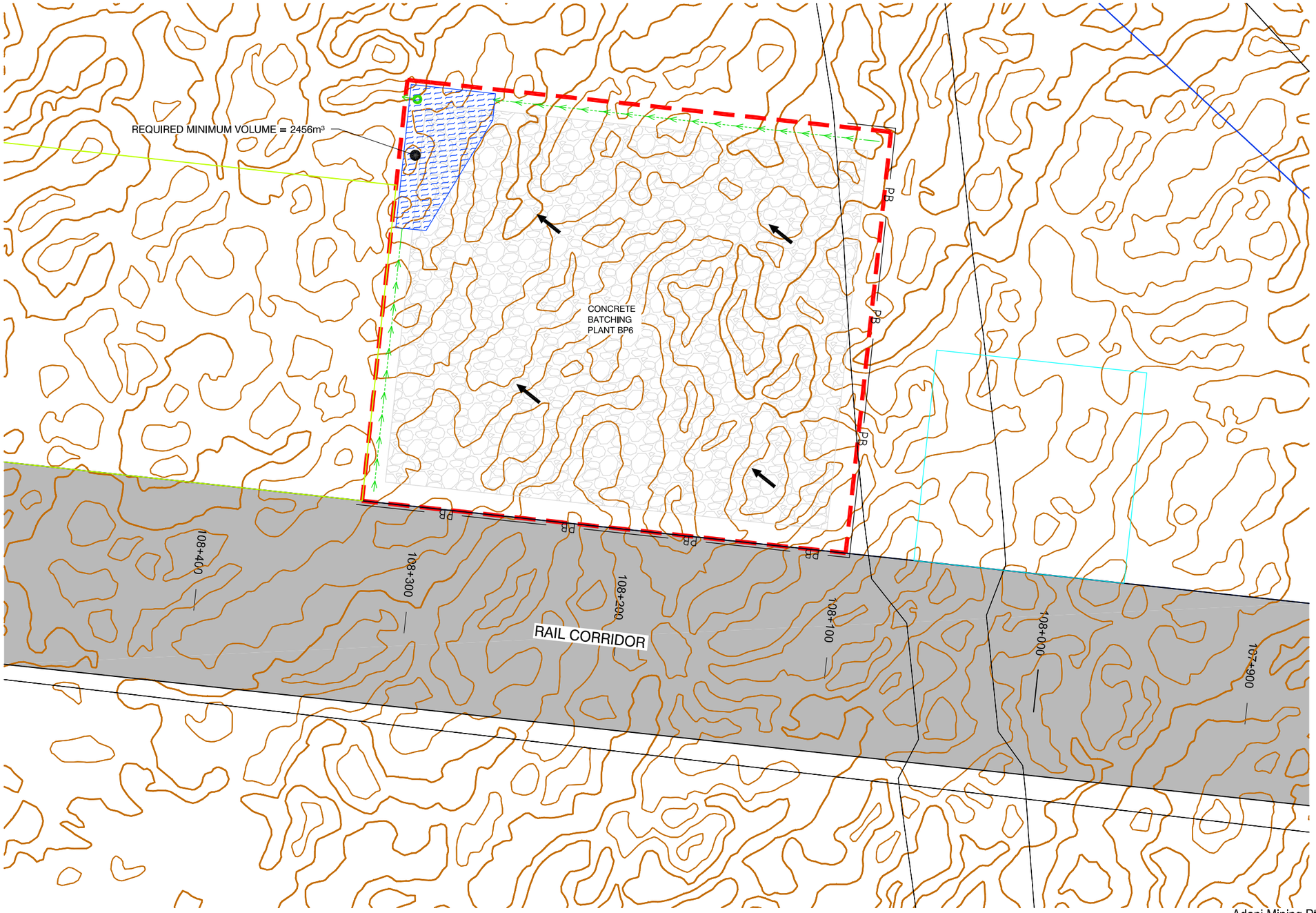

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Stormwater Management Strategy For Concrete Batching Plant BP6

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LEGEND

- EXISTING SURFACE CONTOURS (0.5m INTERVALS)
- DEVELOPED CATCHMENT BOUNDARY
- VEGETATED SWALES (INDICATIVE ONLY)
- PB — PERIMETER BUND
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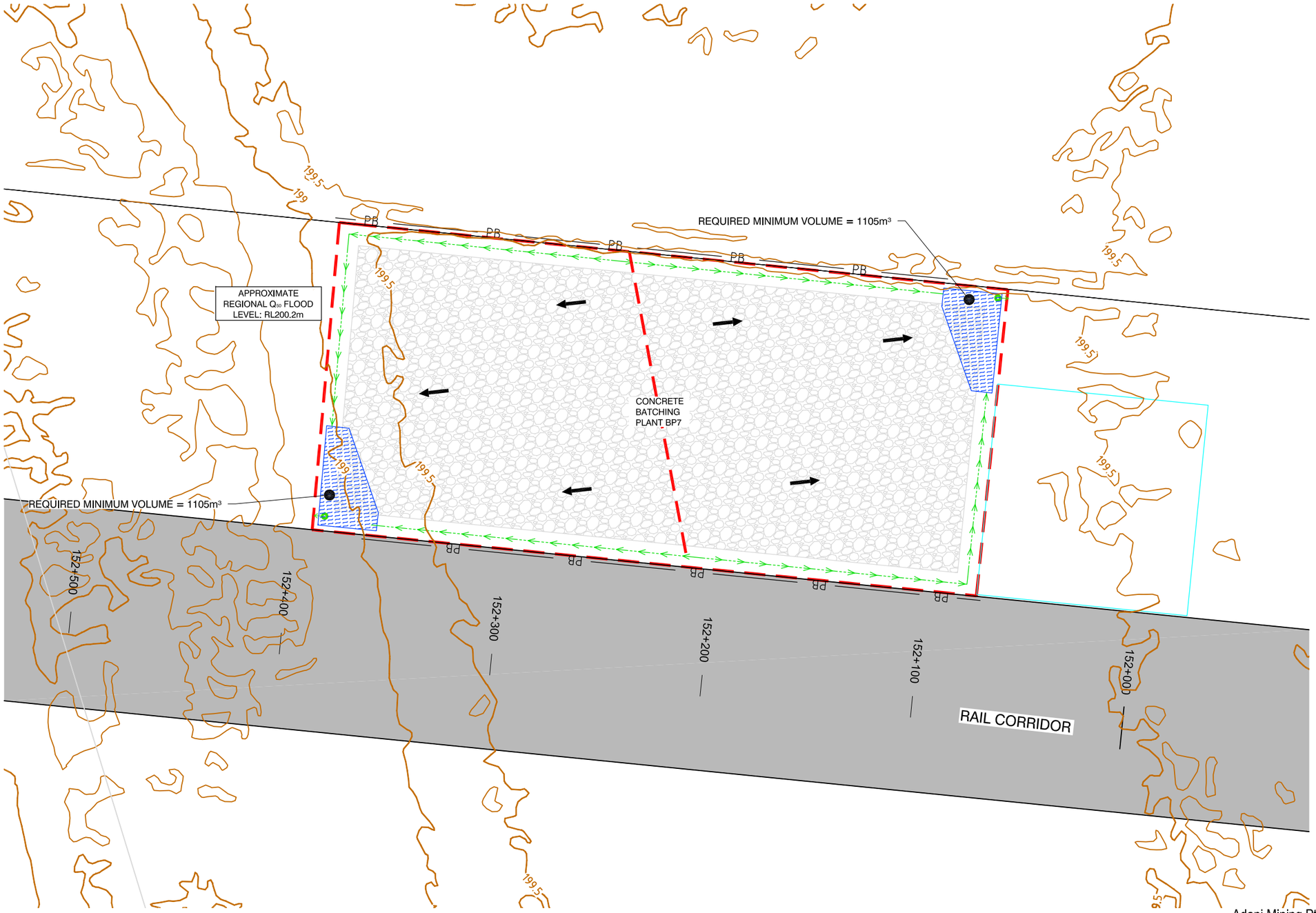

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Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Stormwater Management Strategy For Concrete Batching Plant BP7

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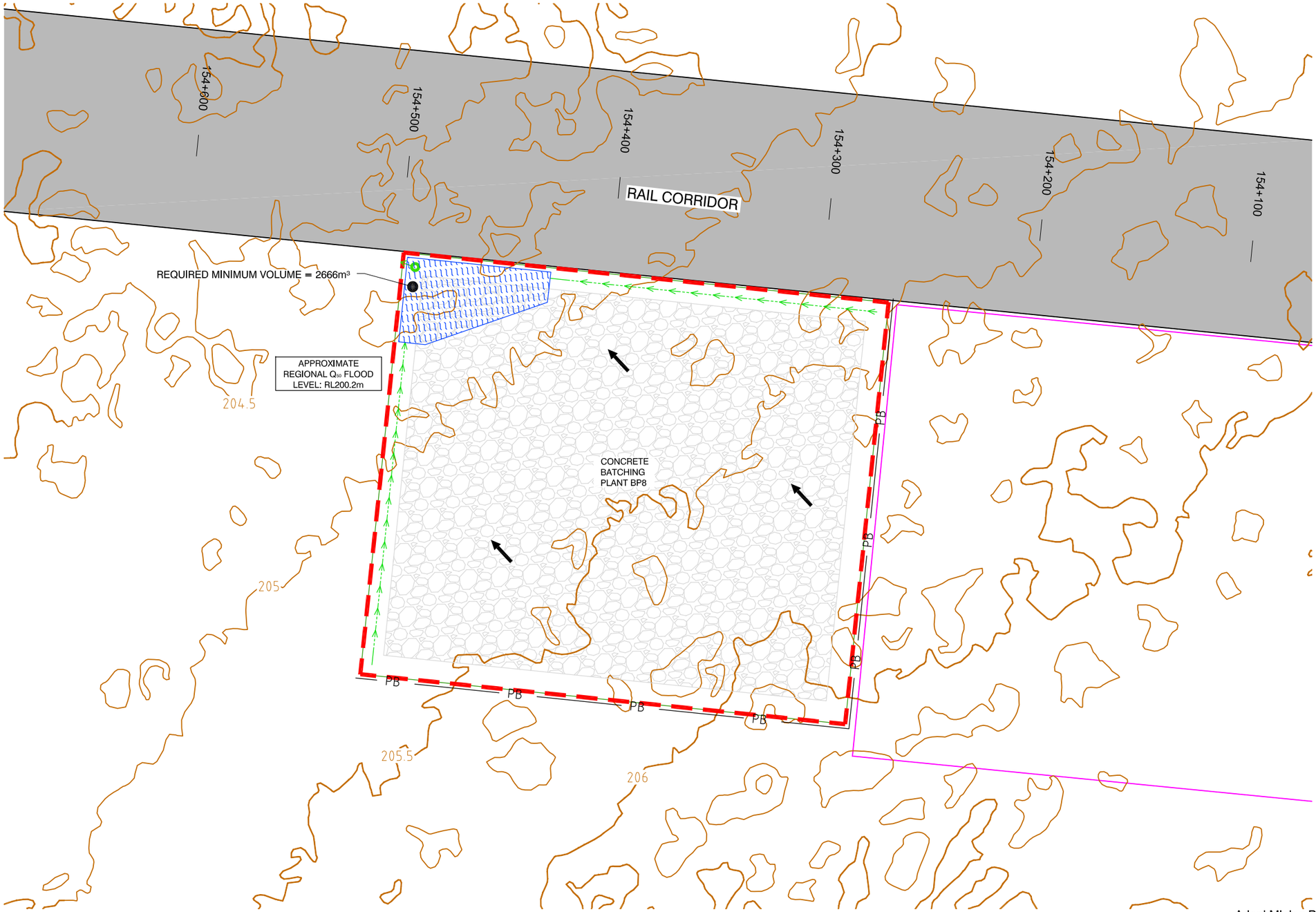

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Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Stormwater Management Strategy For Concrete Batching Plant BP8

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APPENDIX

C

WATER QUALITY CALCULATIONS

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VOLUME OF SEDIMENT BASIN: TYPE D SOILS

PROJECT: Carmichael Coal Mines
SP1 Concrete Batching Plants
JOB No:- 7217/69

DESIGNER:- SW
DATE:- 12/Apr/13

Sediment Storage Zone Volume

Input Value	Catchment/Basin Name				
	BP4	BP5	BP6	BP7	BP8
S	10.5	10.5	10.5	10.5	10.5
R (Calculated)	2411.4	2411.4	2411.4	2411.4	2411.4
R (from chart)					
R (adopted)	2411.4	2411.4	2411.4	2411.4	2411.4
K	0.02	0.02	0.02	0.02	0.02
LS	0.17	0.17	0.17	0.17	0.17
P	1.3	1.3	1.3	1.3	1.3
C	1	1	1	1	1
A - Soil Loss (tonnes/ha/yr)	10.7	10.7	10.7	10.7	10.7
Volume (m^3/ha/yr)	8.2	8.2	8.2	8.2	8.2
Disturbed Area (ha)	4.6	4.6	4.6	4.6	4.6
Calculated Soil Loss (m^3/yr)	37.72	37.72	37.72	37.72	37.72
Sediment Storage Zone (m^3)*	6.3	6.3	6.3	6.3	6.3

*Assumes regeneration after 2 months

Settling Zone Volume

Cv	1	1	1	1	1
Catchment Area (ha)	4.6	4.6	4.6	4.6	4.6
R(y%ile, 5day) (mm)	32.5	32.5	32.5	32.5	32.5
Settling Zone (m^3)	1495	1495	1495	1495	1495
Basin Vol. per Hectare (m^3)	326	326	326	326	326

Preliminary Basin Sizing

Depth of Basin (m)	1	1	1	1	1
Total Basin Vol (m^3)	1501.3	1501.3	1501.3	1501.3	1501.3
Approx. Width (m)	22	22	22	22	22
Approx. Length (m)	67	67	67	67	67

APPENDIX

D

WATER QUANTITY CALCULATIONS

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Concrete Batch Plant 4 - 100 year ARI flow

Existing Case

Area	4.6	ha
C_{10}	0.66	
$F_{100}xC_{10}$	0.79	
C_{100}	0.79	
Time of conc	38	mins
Intensity	117	mm/hr
Flow	1.18	m^3/s
Total Flow	1.18	m^3/s
Volume	2699.6	m^3

Sheet flow - 50m over 0.5% grade, poorly grassed - 14 mins
Channel flow - 250m, 0.5m fall, natural channel - 24 mins
Total 38 mins

Developed Case

Area	4.6	ha
C_{10}	0.86	
$F_{100}xC_{10}$	1.03	
C_{100}	1.00	
Time of conc	24	mins
Intensity	147	mm/hr
Flow	1.88	m^3/s
Total Flow	1.88	m^3/s
Volume	2704.8	m^3

Sheet flow - 50m over 0.5% grade, compacted earth surface - 8 mins
Channel flow - 250m, 0.5m fall, earthern table drains - 16 mins
Total 24 mins

Detention Basin Sizing (preliminary)

Peak inflow	1.88	m^3/s
Peak outflow	1.18	m^3/s
Volume	3606.40	m^3
r	0.37	

Required storage volume

Culp	Boyd	Carroll	Basha	Maximum
772.84	1333.04	807.85	1052.94	1333.04

Peak flow only factor: 2

Required volume is - 2666 m^3.

Assuming a rectangular basin with 1 in 2 side slopes,
required surface area is:

Depth (m)	Length (m)	Width (m)	Area (m^2)	Volume (m^3)
0.0	19.0	78.0	1482.0	
1.5	25.0	84.0	2100.0	2686.5

Concrete Batch Plant 5 - 100 year ARI flow

Existing Case

Area	4.6	ha
C_{10}	0.66	
$F_{100}xC_{10}$	0.79	
C_{100}	0.79	
Time of conc	28	mins
Intensity	136	mm/hr
Flow	1.38	m^3/s
Total Flow	1.38	m^3/s
Volume	2312.2	m^3

Sheet flow Sheet flow - 50m over 1.0% grade, poorly grassed - 12 mins
Channel flo Channel flow - 250m, 1.5m fall, natural channel - 16 mins
Total 38 mi Total 28 mins

Developed Case

Area	4.6	ha
C_{10}	0.86	
$F_{100}xC_{10}$	1.03	
C_{100}	1.00	
Time of conc	18	mins
Intensity	168	mm/hr
Flow	2.15	m^3/s
Total Flow	2.15	m^3/s
Volume	2318.4	m^3

Sheet flow Sheet flow - 50m over 1.0% grade, compacted earth surface
Channel flo Channel flow - 250m, 1.5m fall, earthern table drains - 11 min
Total 24 mi Total 18 mins

Detention Basin Sizing (preliminary)

Peak inflow	2.15	m^3/s
Peak outflow	1.38	m^3/s
Volume	3091.20	m^3
r	0.36	

Required storage volume

Culp	Boyd	Carroll	Basha	Maximum
635.15	1109.30	664.79	872.23	1109.30

Peak flow only factor: 2

Required volume is - 2219 m^3.

Assuming a rectangular basin with 1 in 2 side slopes,
required surface area is:

Depth (m)	Length (m)	Width (m)	Area (m^2)	Volume (m^3)
0.0	19.0	78.0	1482.0	
1.5	25.0	84.0	2100.0	2686.5

Concrete Batch Plant 6 - 100 year ARI flow

Existing Case

Area	4.6	ha
C_{10}	0.66	
$F_{100}xC_{10}$	0.79	
C_{100}	0.79	
Time of conc	33	mins
Intensity	126	mm/hr
Flow	1.28	m^3/s
Total Flow	1.28	m^3/s
Volume	2524.7	m^3

Sheet flow - 50m over 0.5% grade, poorly grassed - 14 mins
Channel flow - 250m,1m fall, natural channel - 19 mins
Total 33 mins

Developed Case

Area	4.6	ha
C_{10}	0.86	
$F_{100}xC_{10}$	1.03	
C_{100}	1.00	
Time of conc	21	mins
Intensity	157	mm/hr
Flow	2.01	m^3/s
Total Flow	2.01	m^3/s
Volume	2527.7	m^3

Sheet flow - 50m over 0.5% grade, compacted earth surface - 8 mins
Channel flow - 250m, 1m fall, earthern table drains - 13 mins
Total 21 mins

Detention Basin Sizing (preliminary)

Peak inflow	2.01	m^3/s
Peak outflow	1.28	m^3/s
Volume	3370.27	m^3
r	0.36	

Required storage volume

Culp	Boyd	Carroll	Basha	Maximum
707.68	1228.07	740.20	967.87	1228.07

Peak flow only factor: 2

Required volume is - 2456 m^3.

Assuming a rectangular basin with 1 in 2 side slopes,
required surface area is:

Depth (m)	Length (m)	Width (m)	Area (m^2)	Volume (m^3)
0.0	20.0	69.0	1380.0	
1.5	26.0	75.0	1950.0	2497.5

Concrete Batch Plant 7 - 100 year ARI flow

Existing Case

Area	4.6	ha
C_{10}	0.66	
$F_{100}xC_{10}$	0.79	
C_{100}	0.79	
Time of conc	38	mins
Intensity	117	mm/hr
Flow	1.18	m^3/s
Total Flow	1.18	m^3/s
Volume	2699.6	m^3

Sheet flow - 50m over 0.5% grade, poorly grassed - 14 mins
Channel flow - 250m, 0.5m fall, natural channel - 24 mins
Total 38 mins

Developed Case

Area	4.6	ha
C_{10}	0.86	
$F_{100}xC_{10}$	1.03	
C_{100}	1.00	
Time of conc	24	mins
Intensity	147	mm/hr
Flow	1.88	m^3/s
Total Flow	1.88	m^3/s
Volume	2704.8	m^3

Sheet flow - 50m over 0.5% grade, compacted earth surface - 8 mins
Channel flow - 250m, 0.5m fall, earthern table drains - 16 mins
Total 24 mins

Detention Basin Sizing (preliminary)

Peak inflow	1.88	m^3/s
Peak outflow	1.18	m^3/s
Volume	3606.40	m^3
r	0.37	

Required storage volume

Culp	Boyd	Carroll	Basha	Maximum
772.84	1333.04	807.85	1052.94	1333.04

Peak flow only factor: 2

Required volume is - 2666 m^3.

Assuming a rectangular basin with 1 in 2 side slopes,
required surface area is:

Depth (m)	Length (m)	Width (m)	Area (m^2)	Volume (m^3)
0.0	19.0	78.0	1482.0	
1.5	25.0	84.0	2100.0	2686.5

Concrete Batch Plant 8 - 100 year ARI flow

Existing Case

Area	4.6	ha
C_{10}	0.66	
$F_{100}xC_{10}$	0.79	
C_{100}	0.79	
Time of conc	38	mins
Intensity	117	mm/hr
Flow	1.18	m^3/s
Total Flow	1.18	m^3/s
Volume	2699.6	m^3

Sheet flow - 50m over 0.5% grade, poorly grassed - 14 mins
Channel flow - 250m, 0.5m fall, natural channel - 24 mins
Total 38 mins

Developed Case

Area	4.6	ha
C_{10}	0.86	
$F_{100}xC_{10}$	1.03	
C_{100}	1.00	
Time of conc	24	mins
Intensity	147	mm/hr
Flow	1.88	m^3/s
Total Flow	1.88	m^3/s
Volume	2704.8	m^3

Sheet flow - 50m over 0.5% grade, compacted earth surface - 8 mins
Channel flow - 250m, 0.5m fall, earthern table drains - 16 mins
Total 24 mins

Detention Basin Sizing (preliminary)

Peak inflow	1.88	m^3/s
Peak outflow	1.18	m^3/s
Volume	3606.40	m^3
r	0.37	

Required storage volume

Culp	Boyd	Carroll	Basha	Maximum
772.84	1333.04	807.85	1052.94	1333.04

Peak flow only factor: 2

Required volume is - 2666 m^3.

Assuming a rectangular basin with 1 in 2 side slopes,
required surface area is:

Depth (m)	Length (m)	Width (m)	Area (m^2)	Volume (m^3)
0.0	19.0	78.0	1482.0	
1.5	25.0	84.0	2100.0	2686.5

Stormwater Management Strategy

Carmichael Coal Rail SP1 Maintenance Yard and Construction Depot

721769

Prepared for
Adani Mining Pty Ltd

29/07/2013

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4	12/07/2013	Scott Walter		Carlo de Byl	
5	19/07/2013	Scott Walter		Rod Barry	
6	29/07/2013	Scott Walter	SW	Carlo de Byl	CD

Table of Contents

Appendices

Tables

1 Introduction

This conceptual Stormwater Management Strategy (SWMS) report has been prepared on behalf of Adani Mining Pty Ltd for the proposed Carmichael Coal Rail project maintenance yard and the construction depot area located along the proposed SP1 rail alignment (the subject site).

The intent of this strategy is to provide an overview of the stormwater management aspects to support the Material Change of Use application for the maintenance yard and construction depot sites required as part of the rail construction. This SWMS report includes detailed policies, performance criteria and procedures to minimise the impact of the development on the physical and social environment.

This SWMS intends to address the operational phase of the work sites. The maintenance yard is expected to be required for the life of the rail line, while the construction depot is expected to have a design life of approximately 2 years, which is the expected construction time of the rail line.

2 Existing Site and Proposed Development

2.1 Existing Site Description

The Carmichael Coal Rail maintenance yard and construction depot areas are located between approximately 100km and 160km west of Moranbah, Queensland in the Isaac Regional Council. Approximate levels for each of the sites have been obtained from a review of available aerial contour information. A summary of the details of each of the sites is included in **Table 2-1** below. There are existing overland flowpaths running through the proposed Construction depot area. Overland flowpaths through the site need to be included to ensure that runoff from the upstream catchment is adequately conveyed through the site. The location of one of the overland flowpaths has been estimated from aerial photography as contours were not available for the area. As such, the exact catchments may need to be refined once more detailed contour information is available.

Table 2-1 Maintenance Yard and Construction Depot Area Location Details

Plant	Area	Lot number	Distance west of Moranbah	Chainage along Track	Site Elevation (RL)	Approximate Grade
Maintenance Yard*	41.4 ha	662PH1491	157km	Ch 165 000	207.5m - 209m	0.1%
Construction Depot*	264.5 ha	4SP116046	106km	Ch 110 000	197m – 211.5m	1-2%

*Based on the regional hydraulic analysis undertaken by Calibre Operations Pty Ltd and summarised in the Drainage Design Report (Ref. No. CARP12033-REP-C003), these sites may be partially or fully inundated during a 50 year ARI storm event. As the maintenance yard is expected to remain in service for the long term, more accurate survey and flood levels should be obtained to assess the flood immunity of the site. Refer to Section 8 for possible emergency flood management strategies for these sites.

Refer to Cardno Sketch 721769 SK02 (Appendix B) for the locality plan showing an indicative location of the maintenance yard and construction depot and Cardno Sketch numbers 721769 SK14 and SK17 (Appendix B) for plans of each site showing the topography.

2.2 Developed Site Description

It is proposed to establish the maintenance yard and a construction depot area to support the construction and maintenance of the proposed railway linking the Carmichael Coal Mine with the port terminals situated to the east. The developed sites will contain temporary structures, storage areas and a basic road network with minimal sealed areas.

As minimal bulk earthworks are anticipated in order to construct each of the sites, the developed condition site topography is expected to generally resemble the existing conditions.

Refer to Cardno Sketch numbers 7803/04 Figure 2 (Appendix A) for the typical development layout of the maintenance yard site.

3 Performance Criteria

The establishment and operation of the construction depot area has been considered a construction site for the lifetime of the rail construction project, which is expected to be 2 years.

For the maintenance yard area, it is anticipated that the operation of the facility will continue beyond the construction phase of the railway alignment and continue to be in use for the life of the rail line. Based on the expected finished surface treatment and the types of activities expected to be undertaken on site to maintain the rolling stock, the types of pollutants anticipated to be generated from the site are expected to be similar to that of a construction site. As the life span of the maintenance yard will be longer, a more permanent treatment regime will be implemented. Based on this, the construction and operational phases of the maintenance yard area will be governed by the performance criteria as outlined below.

3.1 Construction Phase

The *'Queensland Water Quality Guidelines (2009)'* (QWQ guidelines) (which is referenced by the *Environmental Protection (Water) Policy (2009)*, a subordinate document of the *Environmental Protection Act (1994)*) provides a summary of design objectives for the management of stormwater quality and flow for the construction phase of developments in Queensland. This summary provided in Table 8.2.1 of the QWQ guidelines outlines design objectives for a number of pollutants including sediment, nutrients, litter and hydrocarbons.

Based on the above information, the release criteria for controlled runoff events or pumped discharges from any construction site is to be as shown in **Table 3-1** below.

Table 3-1 Controlled Discharge Performance Criteria

Parameter	Release Criteria	Criteria Type
Total Suspended Solids	< 50 mg/L	Maximum
Coarse Sediments	To be retained on site	Descriptive
Turbidity (NTU)	< 10% above receiving water	Maximum
Nutrients (N and P)	Manage through Sediment Control	Descriptive
pH	6.5-8.5	Range
Litter	No visible litter washed from site	Descriptive
Hydrocarbons	No visible sheen on receiving water	Descriptive
Dissolved Oxygen	> 6 mg/L	Minimum
Stormwater drainage/flow management	Peak flows for 1-year and 100-year ARI event to match the pre-development condition of the site	Maximum

For the management of sediments, Table 8.2.1 of the QWQ guidelines outlines the following:

> Testing of suspended solids and pH within any temporary sedimentation basins is to occur prior to any controlled discharges.

> Testing of turbidity within the temporary sediment basins and the receiving waters is to be performed before the controlled discharging of the sediment basins. If the turbidity of the sediment basin is greater than 10% above the receiving waters, further dosing with gypsum or a suitable alternative is required until acceptable levels are reached (refer to *Table B17 – Characteristics of Various Flocculating Agents, Appendix B of IECA's 'Best Practice Erosion and Sediment Control',* (2008)).

3.2 Operational Phase

The maintenance yard is to remain in use for a longer period. As such, the stormwater quality objectives for maintenance yard area have been taken from the Queensland Government's '*Urban Stormwater Quality Planning Guidelines (Dec 2010)'* which provides design objectives for the management of stormwater quality for the various regions of the state. The site falls in the Western Districts region according to Figure 2.5 in the *Urban Stormwater Quality Planning Guidelines (2012)* and Table 2.2 of the same document lists the minimum reductions in mean annual loads from unmitigated development as:

- 85% reduction in total suspended solids (TSS);
- 70% reduction in total phosphorus load (TP);
- 45% reduction in total nitrogen load (TN); and
- 90% reduction in gross pollutant load.

4 Stormwater Management Strategy

4.1 Stormwater Quality

Based on the lifespan of the maintenance yard and construction depot area, and the sites' proximity to the adjacent railway corridor construction area, the primary objective of the proposed stormwater quality management strategy will be to control soil erosion on site and minimise sediment discharge to the downstream receiving local water courses using appropriate best management practices.

Refer to Cardno Sketch numbers 721769 SK14 and SK17 (Appendix B) for an indicative layout of the stormwater quality management measures proposed to be adopted to treat the contributing local catchment areas of each of the sites.

4.1.1 Available Management Practices

A wide range of stormwater quality improvement devices are available to achieve the best practice stormwater management of runoff from a developed site. **Table 4-1** lists the common stormwater quality improvement devices, including their treatment efficiencies and the constraints of their use.

Table 4-1 Stormwater Management Practices

Treatment Technique	Pollutant Removal Efficiency (1)							Scale (2)	Constraints
	Litter & Debris	Coarse Sediment	Fine Sediment	Nutrients: Dissolved	Nutrients: Particulate	Metals	Hydrocarbons		
Litter baskets / racks	L-M							Local	Requires frequent maintenance
Sediment basins	L	M-H	L-M		L	L	L	Regional	Aesthetic and safety issues
Gross pollutant traps	H	H	L		L	L	L	Local/ Regional	Requires regular maintenance
Filter strips / buffer strips	L	M	L-M	L	L-M	L-M	L	Lot/Local	Requires flat terrain
Grass / vegetated swales	L	M-H	L-M	L	L-M	L-M	L	Local	Requires flat terrain
Extended detention basins	M	H	L-M	L	M	M	L	Regional	Requires pre-treatment, Large land area required
Infiltration trenches	L	M-H	M	L-M	M	M	M	Local	Requires pre-treatment
Bio-retention systems	L	M-H	M	L	M	M	L-M	Local	Requires pre-treatment
Porous pavements		L-M	L-M	L	M	M	M	Local	Not appropriate for steep sites and heavy traffic

Treatment Technique	Pollutant Removal Efficiency (1)							Scale (2)	Constraints
	Litter & Debris	Coarse Sediment	Fine Sediment	Nutrients: Dissolved	Nutrients: Particulate	Metals	Hydrocarbons		
Constructed wetlands	M-H	H	M	H	H	M-H	M	Regional	Requires pre-treatment, Not appropriate for steep sites, Large land area required
Community education								Regional	Community participation

Information Source: Queensland Urban Drainage Manual Table 11.05.4 (Typical pollutant removal efficiencies of treatment systems (2007). Benefit Ranking: L = Low Benefit, M = Medium Benefit, H = High Benefit.

Notes:

(1) Removal rates are provided for information only with the efficiency rating subject to adequate design. The actual removal rates used for detailed water quality modelling purposes should be in accordance with *MUSIC Modelling Guidelines Version 1.0 – 2010* prepared by Water by Design.

(2) Scales: Lot – less than 1 ha; Local – 1 to 10 ha; Regional – greater than 10 ha.

Given the features of the subject sites, a number of the measures listed in **Table 4-1** above would not be considered appropriate to be incorporated into the stormwater treatment train for the maintenance yard and construction depot area.

Provided below is information on a number of the listed stormwater quality improvement devices including the suitability of these devices to be incorporated into the development of the subject site to treat stormwater runoff from the proposed maintenance yard and construction depot area.

Litter Baskets/Racks

Litter baskets and trash racks are generally located upstream of other treatment measures such as extended detention basins or constructed wetlands. They are primarily used as a pre-treatment device for stormwater runoff, removing litter, debris and other gross pollutants from the runoff before it discharges into other secondary and tertiary treatment devices located downstream.

Litter baskets are generally incorporated into the pipe drainage system. Due to the relatively flat grades expected across the sites, the incorporation of pipe drainage within the maintenance yard and construction depot is expected to be limited. Therefore it is not intended to use litter baskets within the maintenance yard and construction depot sites.

In the event that high levels of gross pollutants are being generated from the maintenance yard and construction depot areas, trash racks could be incorporated at the locations where concentrated surface flows are discharging into the sediment basins to provide some pre-treatment.

Gross Pollutant Traps (GPT) / Oil & Grit Separators

GPT / Oil and Grit Separators incorporated into the stormwater treatment train can contribute to the effective removal of solid pollutants, sediments and hydrocarbons from stormwater runoff from roadways and other hardstand areas within the proposed development sites.

Generally GPTs and Oil and Grit Separators shall be designed to treat flows generated by the 3 month Average Recurrence Interval (ARI) rainfall event.

As the general operation of the maintenance yard is expected to include works such as maintaining heavy machinery including diesel locomotives it is recommended that oil and grit separators are incorporated into the maintenance yard to collect runoff from any sealed hardstand areas where such maintenance is carried out.

Sediment Basins

During the construction phase of the development sediment loads are expected to be higher due to areas being cleared and exposed for the construction of roads and holding areas as well as the placement of machinery. It is recommended that as part of the erosion and sediment control plan prepared for the construction phase of the development some form of sediment basin will be utilised to help manage sediment transport off-site.

The use of sediment basins is considered appropriate for the maintenance yard and construction depot area.

Vegetated Filter Strips / Buffer Strips

Filter / buffer strips can be either areas of planted vegetation or strips of retained vegetation left in its natural state. These vegetated areas may provide both an effective way of reducing peak flows and improving stormwater runoff quality. During the construction phase of the development the retention of existing vegetation in-conjunction with other erosion control measures can assist to stabilise exposed areas. In the case of the proposed development areas that grade away from proposed pipe drainage networks, buffer strips are considered one of the key stormwater management techniques, particularly where no other stormwater treatment techniques are possible. Upon completion of the maintenance yard and construction depot area construction works any exposed, non-trafficable areas should be turfed, seeded, landscaped or stabilised as soon as possible to reduce the risk of erosion.

It should be noted that in order for buffer strips to be effective, flow must be overland and not concentrated. Therefore, flow spreaders may be required in conjunction with buffer strips to ensure optimal performance, particularly for those areas which drain away from proposed pipe drainage networks.

The use of vegetated filter / buffer strips is considered appropriate for this development.

Grassed / Vegetated Swales

Grassed / vegetated swales are designed to treat stormwater runoff by ensuring sufficient detention time to allow the removal of nutrients and fine sediments. This is achieved through filtration and infiltration. Hydrocarbon removal will also be achieved through filtration and attachment to vegetation where biological breakdown of the hydrocarbons can occur.

Swale lengths and widths can vary dependent on the site conditions, however to operate most effectively swales need to be located on relatively flat grades no steeper than 4-5%. The use of vegetated swales is limited in steep slope areas, unless suitable scour protection measures are incorporated.

Due to the relatively flat grades expected across the sites, the use of grassed / vegetated swales is considered appropriate for the treatment and conveyance of surface flows within the maintenance yard and construction depot sites.

Infiltration Trenches

Infiltration trenches are predominantly dry shallow grassed areas that trap the first flush runoff. The trapped runoff then infiltrates through the filtration medium removing fine sediment and nutrients. The base of the infiltration trench should be lined with an adequately designed sub-surface perforated pipe drainage network to convey filtered runoff to the trench outlet before discharging to the downstream receiving environment.

The use of infiltration trenches is considered appropriate for these sites subject to the availability of appropriate filter media and the ability to be properly drained.

Bio-retention Systems

Similar to vegetated swales, bio-retention systems are designed to treat stormwater runoff by ensuring sufficient detention time to allow the removal of nutrients and fine sediments. This is achieved through filtration, plant uptake, adsorption and biological degradation. Hydrocarbon removal will also be achieved through filtration and attachment to vegetation where the biological breakdown of hydrocarbons can occur.

Bio-retention systems contain an infiltration filter media, typically filled with sandy loam. All runoff collected within the system for the design storm event must pass through this filter. The filter media must be capable of sustaining vegetation growth as the vegetation is responsible for much of the uptake of nutrients within the system. The base of the bio-retention systems should be lined with an adequately designed sub-surface

perforated pipe drainage network to convey the filtered runoff to the system outlet before discharging to the receiving system.

Bio-retention systems can be used in both flat areas and in steeper areas by stepping the system. Bio-retention systems can also be incorporated into the base of detention basins combining both stormwater quality and quantity into one area.

As the vegetation in the basins takes around 2 years to properly establish, the use of bio-retention systems is not considered appropriate for the construction depot site, however it may be suitable for the maintenance yard.

Porous Pavements

Porous pavements vary with design, but generally incorporate a surface material consisting of a grid / lattice system, modular clay / concrete blocks, or open-graded asphalt / concrete pavements with much of the fine aggregate material omitted. The surface material is bedded on a coarse sand filter layer constructed over a gravel drainage layer. The use of porous pavements can assist in the removal of fine particulate matter, hydrocarbons, nutrients and soluble pollutants from stormwater runoff.

Porous pavements are suited most to areas of low traffic volume and low runoff volume. Porous pavements are most effective when used at grades of less than 5%. Because of this, porous pavements are recommended to be used in the parking areas only.

Due to the high levels of sediments expected to be generated from the maintenance yard and construction depot sites, the use of porous pavements is not considered appropriate for these development areas.

Rainwater Tanks

In addition to providing a low cost supply of water to assist in reducing demand on water supply, rainwater tanks can also provide a reduction in peak flow rates from rainfall events with the provision of additional storage volume.

The use of rainwater tanks is only considered appropriate for these developments if there are suitable roof areas from which to collect rainwater runoff.

Level Spreader Devices

For roof area drainage that cannot be connected to a piped drainage network the concentrating of roof water runoff at a single discharge outlet can lead to erosion and scour problems. By utilising a level spreader at the outlet to disperse the overflows over a larger area, the flows will be less concentrated and velocities will be reduced, reducing the risk of erosion and the incidence of re-suspension of sediments. Level / flow spreaders should be located away from high pedestrian traffic areas and be directed towards vegetated buffer strips or other landscaped areas.

The use of level spreader devices is only considered appropriate for this development in instances where piped outlets from rainwater tanks or small roof and hardstand areas are not directly connected to a receiving pipe drainage network.

Constructed Wetlands

Constructed wetlands are a water quality treatment system comprising of an inlet pond to remove coarse sediments, and a macrophyte zone to remove fine particulates and soluble pollutants. Additionally, constructed wetlands also provide landscape value, passive recreation, wildlife habitat and flood control.

Wetlands are particularly useful on sites constrained by water and environmental sensitivity as they can be incorporated as an upstream component of existing waterbodies and environmentally sensitive aquatic features.

The dominant feature of the wetland is the macrophyte zone which comprises of vegetated marshes, shallow and deep pools.

Wetlands require reasonably large flat areas of land. Currently, bio-retention systems provide superior performance with a reduced footprint compared to wetlands. Given the relatively low rainfall and high evaporation that occurs in the region, there are also concerns in relation to constructed wetlands being dry

for prolonged periods. Therefore this type of treatment device is not considered appropriate for the maintenance yard or construction depot area.

4.1.2 Adopted Strategy

Based on the site constraints the following stormwater quality improvement devices and management practices are considered appropriate to be incorporated in the development of the maintenance yard and construction depot area:

Rainwater tanks and level spreader devices

Due to the flat grades encountered over the sites, it may not be possible to direct all roof area drainage to a piped drainage network that will be able to free drain to the nominated stormwater treatment and detention basins. Therefore in these instances it is suggested that the roof area drainage discharge to rainwater tank with a level spreader device attached to the outlet. As indicated above, this would assist in dispersing the outflows over a larger area to reduce the risk of erosion and the incidence of re-suspension of sediments.

Vegetated Swales

As grades across the sites are generally less than 2% the use of vegetated swales for stormwater treatment is considered appropriate. As noted above, due to the relatively flat grades across the subject site vegetated swales may be used for conveyance purposes throughout much of the site as an alternative to conventional piped drainage which is expected to be limited by depth.

Oil and Grit Separators

As works in the maintenance yard are expected to include maintenance work on heavy machinery and diesel locomotives, there is a high likelihood of oil and grease contaminating stormwater runoff. Specific maintenance areas should be included in the maintenance yard and all runoff from these areas should be directed to a suitable oil and grit separator to remove hydrocarbon contaminants prior to discharge from the site.

Any planned refuelling areas to be incorporated into the maintenance yard need to be designed in such a manner to help reduce the possibility of hydrocarbons mixing with stormwater runoff. In order to minimise rainfall and runoff entering the refuelling area it is recommended that the refuelling area be covered by an impermeable roof structure, and the ground area be surrounded by a trafficable bund. A grated trench drain should be provided within the bunded refuelling area to capture any runoff or hydrocarbon spills and convey the potentially contaminated runoff towards an oil and grit separator or hydrocarbon spill containment unit.

Sediment Basins

The primary target of this stormwater management strategy is to control soil erosion and minimise sediment transport from the maintenance yard and construction depot area. This type of device is considered the most appropriate control device for the construction depot area.

With the lifespan of the construction depot anticipated to be approximately 2 years, the use of alternative devices such as bio-retention basins are limited as these types of devices generally take a period of approximately 2 years to appropriately establish.

The flexibility in the shape of sediment basins combined with the efficient pollutant retention rates for sediments that these systems provide make sediment basins ideal for the construction depot site.

Bio-retention Basins

Similar to the sediment basins, the flexibility in the shape of bio-retention basins combined with the efficient pollutant retention rates for pollutants that these systems provide make bio-retention basins ideal for the maintenance area. Once established, the plant life present in the basins provides a more efficient system than sediment basins, making them ideal for treating the maintenance area. This makes bio-retention areas ideal for the maintenance yard as the planted area will have time to properly establish.

In addition to the above listed stormwater management practices, other principals of water sensitive urban design that can be incorporated into the development of the sites include:

> Retention of existing drainage features, where possible;

> Protection of natural systems by limiting development to non-sensitive areas and providing adequate buffers between development and natural systems;

> Non-worsening of peak flow rates from site.

It should be noted that this stormwater management strategy has been based on preliminary layouts. Although stormwater treatment practices have been recommended for use in certain areas throughout the subject site, a number of treatment measures may be appropriate and the key principles of the stormwater management strategy will remain applicable despite potential layout changes.

Should the detailed design bring about changes to the proposed layout, Section 4.1.1 of this stormwater management strategy provides a list of alternative treatment practices that may be suitable for the site and could potentially be designed to meet the nominated water quality objectives. The key aim of this stormwater management strategy is that the practices listed as suitable for the site should be used in a manner which results in best practice stormwater management measures being incorporated into the development.

4.1.3 On-site Fuel Storage

It is expected that a generator will be provided at both the maintenance yard and construction depot sites to provide power to the sites. Fuel storage tanks of approximately 60,000 litres will also be provided near the generator sites to provide fuel storage for the generator and refuelling of vehicles. The maintenance yard will also have an additional 1,050,000 litres of fuel storage for the refuelling of the diesel locomotives. All fuel storage tanks must be located within a bunded containment area, sized in accordance with the relevant state or local guidelines to ensure all hydrocarbons are contained, should a spill or leak occur. All fuel storage tanks should be located above the nominated flood level. The refuelling area should be surrounded by a trafficable bund to capture any runoff or hydrocarbon spills and convey the potentially contaminated runoff towards a containment area.

4.2 Stormwater Quantity

The intent of this stormwater quantity strategy for the maintenance yard and construction depot area is to manage runoff generated from the local contributing catchment areas (i.e. the subject site area) only. Based on this, it is proposed to construct perimeter bunds along the upstream boundaries of the subject site to divert the local external contributing catchment areas around the sites.

A regional hydrologic and hydraulic assessment of the railway corridor was undertaken by Calibre Operations Pty Ltd, with the outcomes of this investigation documented in their Drainage Design report (Ref. No. CARP12033-REP-G-100 Rev 0, dated Dec 2012).

The purpose of this stormwater quantity management strategy is to avoid impacts on the downstream receiving properties and infrastructure, by ensuring that the peak flows discharging from the developed condition maintenance yard and construction depot area are equivalent to, or less than the peak flows expected from the existing condition site. It is proposed to incorporate an on-site detention basin into each of the sites to control the developed condition peak flows discharging from the subject site for rainfall events up to and including the 100 year ARI event for the local catchment.

To control the peak rates of discharge from the proposed detention basins it will be necessary for the outlet arrangements to be designed to maintain peak flows equivalent to the existing condition peak discharges. It is noted that where a free draining piped outlet cannot be provided to drain the proposed detention basin within the footprint of the maintenance yard and construction depot areas, a pump system may need to be provided if a free draining outlet cannot be provided external to the sites.

The proposed detention basin for the construction depot will also be utilised as a sediment retention basin for water quality purposes. All water trapped within the sediment / detention basin is to be tested for compliance with the release criteria outlined in **Table 3-1** prior to a controlled release from the site or alternatively the water could be used for dust suppression or irrigation.

Due to the flat nature of the sites, not all stormwater runoff generated will be able to be conveyed to the proposed on-site detention basin with the use of a conventional pit and pipe drainage system. As a result it is proposed to use drainage swales to convey runoff to the nominated detention basin locations.

The indicative location and minimum size of the proposed basins are shown on Cardno Sketch numbers 721769 SK14 and SK17 (Appendix B). Calculations for the sizing of the detention basins can be found in Section 6 of this report.

5 Stormwater Quality Assessment

As outlined above, the lifespan for the construction depot area is anticipated to be only approximately 2 years and therefore has been considered as a construction site for the lifetime of the rail construction project while the maintenance facility is permanent for the life of the rail line.

The works to be carried out on the sites have the potential to increase the level of sediment laden runoff discharging from the site for the lifespan of the construction project. Based on this, the following assessment for each site has been undertaken to determine the on-site sediment retention storage requirements that will be necessary to retain the expected soil loss generated. Refer to Cardno Sketch numbers 721769 SK14 and SK17 (Appendix B) for the subject site local catchment areas adopted for the preliminary on-stormwater quality assessment.

5.1 Soil Loss Calculations

Data obtained from the Australian Soil Resource Information System on the 12th October 2012 indicated that the soils on the subject sites are expected to be medium clays with an approximate clay content of 40 – 50%. The data obtained was from the national soil grid. This soil type is considered to be a dispersive soil (type D) and based on the Revised Universal Soil Loss Equation (RUSLE) the predicted soil loss rate has been estimated for each of the disturbed catchment areas.

Catchment parameters for the disturbed areas of the subject sites were based on existing contour information. These catchment parameters have been summarised in **Table 5-1** below.

Table 5-1 Catchment Parameters

Catchment No.	Internal / Site Catchment Area (ha)	Approx. Average Site Slope
Maintenance Yard North	33.6	0.1%
Maintenance Yard South	7.8	0.12%
Construction Depot North	145.9	0.5%
Construction Depot South	105.0	0.5%
Construction Depot West	7.5	0.5%

The results of the soil loss assessment using the revised soil loss equation are summarised in **Table 5-2** below. For more detailed information refer to the sediment loss calculations provided in Appendix C of this report.

Table 5-2 Soil Loss Parameters

Catchment	Rainfall Erosivity Factor (R)	Soil Erodibility Factor (K)	Slope Length / Gradient Factor (LS)	Erosion Control Practice Factor (P)	Ground Cover (C)	Soil Loss (A) (t/ha/yr)	Sediment Storage Volume (m^3)
Maintenance Yard North	2411	0.02	0.17	1.3	1.0	10.7	45.9
Maintenance Yard South	2411	0.02	0.17	1.3	1.0	10.7	10.7
Construction Depot North	2411	0.02	0.17	1.3	1.0	10.7	199
Construction Depot South	2411	0.02	0.17	1.3	1.0	10.7	144
Construction Depot West	2411	0.02	0.17	1.3	1.0	10.7	10

Based on the information above, the soil loss within each of the disturbed areas has been estimated to be equivalent to Soil Loss Class 1 (0 to 150 tonnes/ha/yr), which classifies the sites as very low erosion risks, as outlined in Table 3.1 of the 'Best Practice Erosion and Sediment Control (2008)' guidelines prepared by the International Erosion Control Association – Australasia.

5.2 Sediment Basin Calculations

In conjunction with the above information, the calculations for the total sediment basin volume have been carried out and shown in **Table 5-3** below.

Table 5-3 Sediment Basin Calculations

Basin	Volumetric Runoff Coefficient (Cv)	Catchment Area of Basin (A)	5 day total rainfall depth (R) [85%ile, 5day	Settling Zone Volume (10xCvxAxR)	Total Basin Volume (m^3)
Maintenance Yard North	1.0	33.6	32.5	10920	10966
Maintenance Yard South	1.0	7.8	32.5	2535	2546
Construction Depot North	1.0	145.9	32.5	47418	47617
Construction Depot South	1.0	105.0	32.5	34125	34269
Construction Depot West	1.0	7.5	32.5	2438	2448

A comparison of the total storage volumes required for sediment retention and for on-site detention will be carried out in Section 6 of this report. This comparison will be made to determine which design conditions will be considered as the critical case.

5.3 MUSIC Assessment of the Maintenance Yard

5.3.1 Approach

The operational phase water quality assessment of the maintenance yard was undertaken utilising MUSIC Version 5.00.11 in accordance with Healthy Waterways '*MUSIC Modelling Guidelines*' (Version 1.0 2010).

The reduction criteria are listed in section 3 of this report. When modelling the bio-retention basin, the interim bio-retention node has been used, in accordance with Appendix 3 of the *Urban Stormwater Quality Planning Guidelines.*

The catchment extents adopted for the MUSIC model are shown on Cardno Sketch number 721769 SK14 (Appendix B), with the details of the catchment areas and adopted bio-retention areas detailed in **Table 5-4** and **Table 5-5** below.

Table 5-4 Catchment Parameters

Parameter	Northern Catchment	Southern Catchment
Catchment Area	33.6	7.8
% Impervious	90	90
Impervious Area Properties		
Rainfall Threshhold (mm/day)	1.0	1.0
Pervious Area Properties		
Soil Storage Capacity (mm)	18	18
Initial Storage (%of Capacity)	10	10
Field Capacity (mm)	80	80
Infiltration Capacity Coefficient A	243	243
Infiltration Capacity Coefficient B	0.6	0.6
Groundwater Properties		
Initial Depth (mm)	50	50
Daily Recharge Rate (%)	0	0
Daily Baseflow Rate (%)	31	31
Daily Deep Seepage Rate (%)	0	0

Table 5-5 Treatment Parameters

Parameter	Northern Bio-retention Basin	Southern Bio-retention Basin
Inlet Properties		
Low Flow Bypass (cumecs)	0	0
High Flow Bypass (cumecs)	100	100
Storage Properties		
Extended Detention Depth (m)	0.3	0.3
Surface Area (m^2)	4800	1200
Exfiltration Rate (mm/hr)	0.0	0
Infiltration Properties		
Filter Area (m^2)	4800	1200
Filter Depth (m)	0.5	0.5
Filter Median Particle (mm)	0.45	0.45
Saturated Hydraulic Conductivity (mm/hr)	200	200
Depth below underdrain pipe (% of filter depth)	0	0
Outlet Properties		
Overflow Weir Width (m)	2.0	2.0

The rainfall data used in the modelling was the Twin Hills station 36047 data obtained from the Bureau of Meteorology. A ten year period between 1965 and 1975 was assessed. The potential evapotranspiration details for the region were obtained from Bureau of Meteorology maps.

The stormwater quality improvement devices assessed in the MUSIC model include the following treatment devices:

> Bio-Retention Systems.

The following assumptions were made in the modelling:

- A 6 minute time step was adopted to ensure accurate assessment of the proposed treatment devices;
- The pollutant generation parameters are adopted from Healthy Waterways '*MUSIC Modelling Guidelines*' (Version 1.0, 2010) for lumped catchments;
- No flow routing was assumed, which provides a conservative estimate of treatment device efficiency;
- Default MUSIC pollutant removal efficiencies were adopted for all treatment devices.

5.3.2 Results

Table 5-6 below presents the outcomes from the MUSIC modelling compared to the required load based reductions.

Table 5-6 Pollutant Load Reductions

Pollutant	Annual Load (kg/yr)		Load Reduction - Mitigated to Post-Dev (kg/yr)	Percentage Load Reduction - Mitigated to Post-Dev (%)	Required Load Reduction	Meet Load Reduction Requirement?
	Post-Development	Mitigated				
TSS	26500	3380	23120	87.3%	85%	✓
TP	68.5	18.6	49.9	72.8%	70%	✓
TN	434	238	196	45.2%	45%	✓
GP	4750	0	4750	100%	90	✓

The above results indicate that the proposed treatment train is predicted to meet the required water quality load based reductions outlined in the *Urban Stormwater Quality Planning Guidelines* as mentioned in Section 3.2 of this report.

The music model layout and results are provided below.

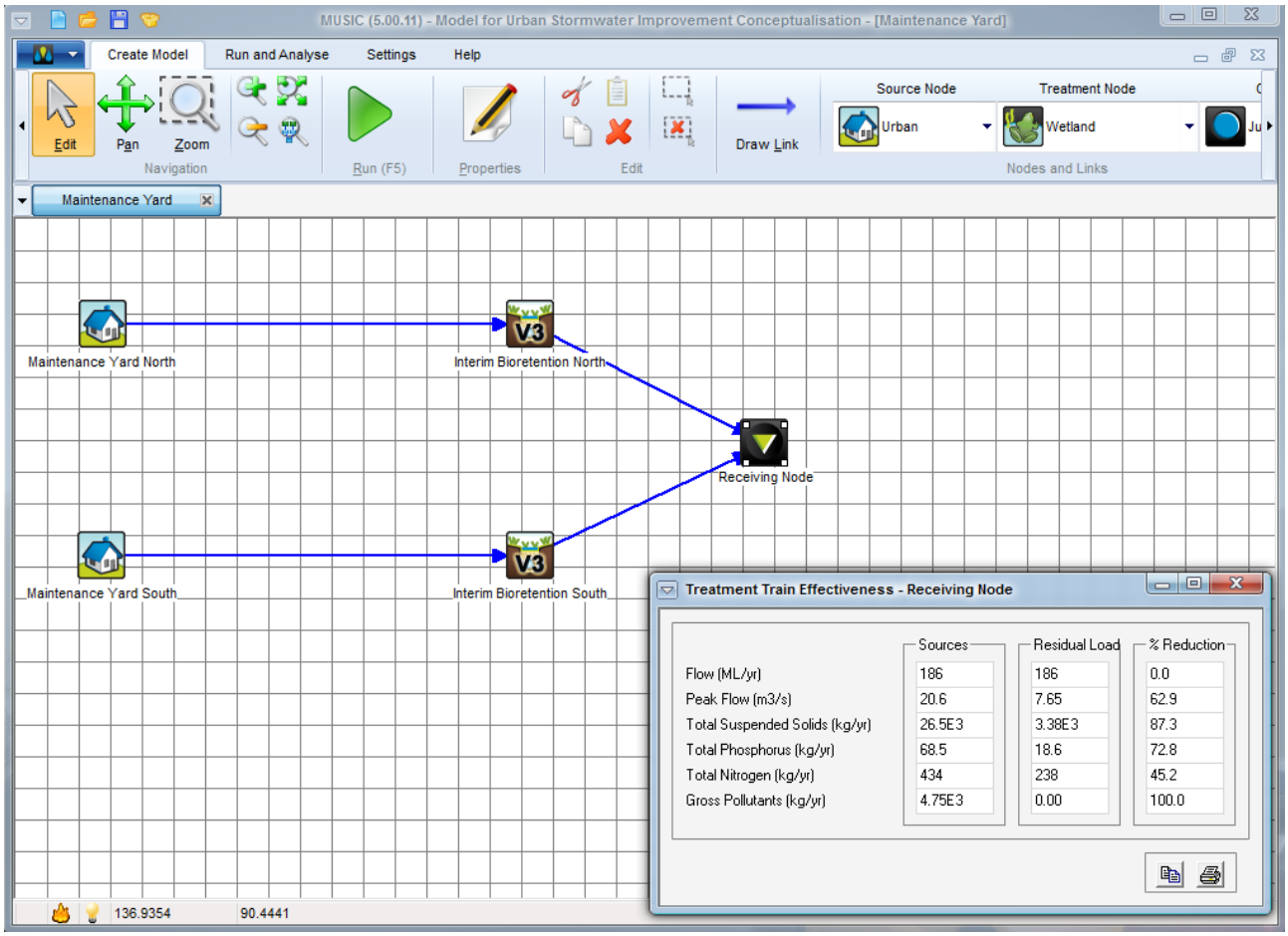


Figure 5.1 MUSIC Model Layout and Results

6 Stormwater Quantity Assessment

The local catchment peak discharges from the maintenance yard and construction depot area are expected to increase in comparison to the existing condition peak flows as a result of the proposed developments. This expected increase in peak discharge is the result of the increase in the percentage of impervious area and the reduction in flow travel time post development. Based on this, the following assessments of the pre-development and post development local catchment flows for each site have been undertaken to determine if there is an increase in post development flows from the subject sites, and estimate the on-site detention storage requirements that may be necessary to attenuate any increase in flows discharging off-site. Refer to Cardno Sketch numbers 721769 SK14 and SK17 (Appendix B) for the subject site local catchment areas adopted for the preliminary on-site detention assessment.

6.1 Existing Conditions

The Rational Method was used to estimate the existing condition peak flow rates discharging from each of the local catchment areas for the maintenance yard and construction depot.

The Coefficient of Runoff value for the pre-developed site conditions was determined from Tables 4.05.3(a) *(Table of C_{10} values)* and 4.05.3(b) *(C_{10} values for Zero Fraction Impervious)* of the Queensland Urban Drainage Manual 2007 (QUDM). Based on available data of the subject site, the existing condition of the maintenance yard and construction depot area was considered to have a fraction impervious of 0.0 and a land description equivalent to poor grass cover / low density pasture. A resultant C_{10} value of 0.66 was adopted for the pre-development site conditions.

A rainfall intensity frequency duration (IFD) chart was developed for the maintenance yard and construction depot areas using the design rainfall IFD data available from the Bureau of Meteorology (BOM) website.

The Time of Concentration value for each of the existing site conditions was determined in accordance with Section 4.06 of QUDM. The overland sheet flow and channel flow travel times were calculated separately then combined to provide a total time of concentration for each of the sites. The pre-development flow travel time was estimated based on the parameters shown in **Table 6-1** below.

Table 6-1 Existing Surface Parameters for Time of Concentration Calculations

Parameter		Maintenance Yard North	Maintenance Yard South	Construction Depot North	Construction Depot South	Construction Depot West
Sheet Flow	Slope Length	50 m	50 m	50 m	50	50 m
	Surface Grade	0.5%	0.5%	0.5%	0.5%	0.5%
	Adopted t_c	14 min	14 min	14 min	14 min	14 min
Channel Flow	Slope Length	1400 m	420 m	1500 m	3000 m	450 m
	Surface Fall	1.5 m	0.5 m	5 m	12 m	2.5 m
	Adopted t_c	84 min	42 min	60 min	44 min	18 min
Total t_c		98 min	56 min	74 min	58 min	32 min

A summary of the parameters determined to estimate the pre-development 2, 5, 10, 20, 50 and 100 year ARI peak flow rates from the local catchment areas of each of the maintenance yard and construction depot are provided in **Tables 6-2** to **6-6** below.

Table 6-2 Maintenance Yard North Existing Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.56	0.63	0.66	0.69	0.76	0.79
Area (ha)	33.6	33.6	33.6	33.6	33.6	33.6
Time of Concentration (min)	98	98	98	98	98	98
Rainfall Intensity (mm/hr)	27	36	41	47	56	64
Discharge (m^3/s)	1.41	2.11	2.53	3.04	3.97	4.73

Table 6-3 Maintenance Yard South Existing Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.56	0.63	0.66	0.69	0.76	0.79
Area (ha)	7.8	7.8	7.8	7.8	7.8	7.8
Time of Concentration (min)	56	56	56	56	56	56
Rainfall Intensity (mm/hr)	41.5	55	61	70	84	94
Discharge (m^3/s)	0.50	0.75	0.87	1.05	1.38	1.61

Table 6-4 Construction Depot North Existing Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.56	0.63	0.66	0.69	0.76	0.79
Area (ha)	145.9	145.9	145.9	145.9	145.9	145.9
Time of Concentration (min)	74	74	74	74	74	74
Rainfall Intensity (mm/hr)	34.2	46	53	61	72.5	81
Discharge (m^3/s)	7.78	11.69	14.18	17.13	22.30	26.0

Table 6-5 Construction Depot South Existing Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.56	0.63	0.66	0.69	0.76	0.79
Area (ha)	105	105	105	105	105	105
Time of Concentration (min)	58	58	58	58	58	58
Rainfall Intensity (mm/hr)	39.1	53.2	60.2	70.2	83.6	93.6
Discharge (m^3/s)	6.4	9.73	11.59	14.19	18.51	21.62

Table 6-6 Construction Depot West Existing Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.56	0.63	0.66	0.69	0.76	0.79
Area (ha)	7.5	7.5	7.5	7.5	7.5	7.5
Time of Concentration (min)	32	32	32	32	32	32
Rainfall Intensity (mm/hr)	55	72	82	96	114	128
Discharge (m^3/s)	0.64	0.94	1.13	1.39	1.80	2.11

6.2 Developed Condition

Similar to the existing condition flows, the Rational Method was used to estimate the peak flow rates discharging from each of the developed condition local catchment areas for the maintenance yard and construction depot.

As discussed above, the Coefficient of Runoff value for the developed site conditions was determined from Table 4.05.3(a) of QUDM. Based on the proposed use of the sites, a fraction impervious of 0.90 has been adopted, with a resultant C_{10} value of 0.86 to be used for the post-development site conditions.

The time of concentration value for the developed site conditions was determined for the contributing local catchment area in accordance with Section 4.06 of QUDM.

Due to the flat grades expected across the development sites, surface drainage is expected to be limited to the use of swale drains / open channels. Pipe drainage is expected to be limited to cross culverts utilised under roadways and footpaths to maintain trafficability during lower ARI events. A summary of the parameters used in calculating the time of concentration for the maintenance yard and construction depot areas is included in **Table 6-7** below.

Table 6-7 Developed Surface Parameters for Time of Concentration Calculations

Parameter		Maintenance Yard North	Maintenance Yard South	Construction Depot North	Construction Depot South	Construction Depot West
Sheet Flow	Slope Length	50 m	50 m	50 m	50 m	50 m
	Surface Grade	0.5%	0.5%	0.5%	0.5%	0.5%
	Adopted t_c	8 min	8 min	8 min	8 min	8 min
Channel Flow	Slope Length	1400 m	420 m	1500 m	3000 m	450 m
	Surface Fall	1.5 m	0.5 m	5 m	12 m	2.5 m
	Adopted t_c	112 min	56 min	80 min	66 min	27 min
Total t_c		120 min	64 min	88 min	74 min	35 min

A summary of the parameters determined to calculate the 2, 5, 10, 20, 50 and 100 year ARI developed peak flow ratess (with no detention) from the contributing local catchment area of the maintenance yard and construction depot are provided in **Table 6-8** to **Table 6-12** below.

Table 6-8 Maintenance Yard North Developed Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.73	0.82	0.86	0.90	0.99	1.0
Area (ha)	33.6	33.6	33.6	33.6	33.6	33.6
Time of Concentration (min)	120	120	120	120	120	120
Rainfall Intensity (mm/hr)	24	31.3	35.7	41.4	49	55
Discharge (m^3/s)	1.64	2.39	2.87	3.49	4.52	5.13

Table 6-9 Maintenance Yard South Developed Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.73	0.82	0.86	0.90	0.99	1.0
Area (ha)	7.8	7.8	7.8	7.8	7.8	7.8
Time of Concentration (min)	64	64	64	64	64	64
Rainfall Intensity (mm/hr)	38	50	57	66	79	88
Discharge (m^3/s)	0.60	0.89	1.06	1.29	1.69	1.91

Table 6-10 Construction Depot North Developed Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.73	0.82	0.86	0.90	0.99	1.0
Area (ha)	145.9	145.9	145.9	145.9	145.9	145.9
Time of Concentration (min)	88	88	88	88	88	88
Rainfall Intensity (mm/hr)	30.8	40	45.5	52.5	63	72
Discharge (m^3/s)	9.12	13.24	15.86	19.21	25.25	29.18

Table 6-11 Construction Depot South Developed Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.73	0.82	0.86	0.90	0.99	1.0
Area (ha)	105	105	105	105	105	105
Time of Concentration (min)	74	74	74	74	74	74
Rainfall Intensity (mm/hr)	34.4	44.8	51.5	59.7	70.8	78.9
Discharge (m^3/s)	7.33	10.68	12.92	15.72	20.42	23.01

Table 6-12 Construction Depot West Developed Condition Discharge Parameters

Parameter	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
Coefficient of Runoff	0.73	0.82	0.86	0.90	0.99	1.0
Area (ha)	7.5	7.5	7.5	7.5	7.5	7.5
Time of Concentration (min)	35	35	35	35	35	35
Rainfall Intensity (mm/hr)	52.5	69	79	91.5	108.5	122
Discharge (m^3/s)	0.80	1.17	1.42	1.72	2.24	2.54

A comparison of the existing condition peak flows with the developed condition peak flows found that there is generally expected to be an increase in the peak flows discharging off site due to the increase in impervious area on site.

On-site detention is proposed to be incorporated into the development works. This is to avoid impacts on downstream properties and infrastructure and to maintain the existing peak flow rate of runoff discharging from the developed site for all rainfall events up to and including the local catchment 100 year ARI event. The proposed on-site detention will help control the rate of discharge leaving the site.

6.3 Preliminary On-Site Detention

A preliminary assessment of the on-site detention storage requirements for the maintenance yard and construction depot area has been carried out using the initial sizing techniques outlined in Section 5.05.1 of QUDM. Based on the comparison of results outlined in Section 6.2 above, it will be necessary to incorporate on-site detention storage in order to maintain peak outflows equivalent to the existing conditions.

The on-site detention storage proposed for each site will be sized to maintain the equivalent pre-developed condition peak flows for local catchment rainfall events up to and including the 100 year ARI rainfall event. To control the peak rates of discharge from the nominated storage volume it will be necessary for the outlet arrangements to be designed to maintain the existing peak flows.

A comparison of the existing and developed condition peak flows for each site indicated that either the 50 year or 100 year ARI storm event resulted in the greatest increase in peak discharge in each case. The results of the preliminary on-site detention analysis indicated the approximate detention storage volume required for each site to detain the increase in stormwater discharge and maintain the equivalent pre-developed peak flow discharging off site for events up to and including the 100 year ARI storm event. A summary of the volumes required for each site are provided in **Table 6-13** below.

Table 6-13 Minimum Detention requirements

Parameter	Required Volume (m^3)	Storm Event
Maintenance Yard North	10675	50 year
Maintenance Yard South	3189	50 year
Construction Depot North	44783	100 year
Construction Depot South	22684	50 year
Construction Depot West	2424	50 year

It should be noted that the volume outlined may be subject to change if the final catchment areas differ from those adopted for this assessment. The stage storage characteristics and outlet configuration of the detention basin will be verified as part of the detailed design for the maintenance yard and construction depot area.

It is proposed to incorporate the stormwater detention and treatment into one common basin. A comparison of the total storage volumes required for sediment retention as outlined in Section 5 of this report, and for on-site detention as outlined in section 6.3 above has indicated that the volume required for on-site detention is the greatest for the maintenance yard catchments, while the storage volume required for sediment control is the dictating event for the construction depot catchments. The minimum total storage volume adopted for each of the catchment areas is listed in **Table 6-14**, along with whether the detention or the sediment control volume was the critical volume. Refer to Cardno Sketch numbers 721769 SK14 and SK17 (Appendix B) for the indicative layout and configuration of the stormwater treatment and detention basins for the maintenance yard and construction depot area. As the maintenance yard will be treated with bio-retention basins rather than sediment basins, the size of the basins will be determined by the combined bio-retention and detention requirements.

In accordance with Section 5.11 of QUDM it is recommended that any ponding within the basin should be limited to 1.2 metres at the deepest point above the basin invert if there is perceived to be a public safety issue. For deeper basins, suitable safety provisions such as refuge mounds within large basins, fences and warning signs should be provided.

Table 6-14 Minimum Storage Volume requirements

Parameter	Required Volume (m^3)	Dictating event
Maintenance Yard North	10675*	50 year Detention
Maintenance Yard South	3189*	50 year Detention
Construction Depot North	47617	Sediment Control
Construction Depot South	34269	Sediment Control
Construction Depot West	2448	Sediment Control

*Detention volume to be provided in addition to bio-retention storage volume requirements.

6.4 Other Drainage Issues

6.4.1 Diversion of External Catchments

As the intent of this strategy is to manage the runoff from the maintenance yard and construction depot areas only, it is proposed to construct perimeter bunds along the upstream boundaries of the sites to divert the local external contributing catchment areas around the sites. Refer to Cardno Sketch numbers 721769 SK14 and SK17 (Appendix B) for the indicative locations of the external catchment diversion bunds proposed for the maintenance yard and construction depot area. The final alignment and profile required for the diversion bunds will be confirmed as part of the detailed design of each of sites.

For the Construction depot, a number of overland flowpaths have been identified running through the site that convey runoff from external catchments. It will not be possible to divert these flows around the proposed sites therefore an allowance will need to be made to divert these external flows through the sites, separate from the internal flows. The exact location, size and configuration of these external catchment overland flow paths should be confirmed as part of the detailed design. No treatment or detention allowance has been made for the external catchment runoff.

In order to maximise the use of the construction depot, it is proposed to re-align the existing overland flowpath further to the west. The grades in this area are fairly flat with differences in levels across the area in the vicinity of 1-2m. The relocated channel would need to enter and exit the site at the existing locations, and be designed to ensure the change does not increase flooding issues to the adjacent properties. Refer to Cardno Sketch number 721769 SK17 (Appendix B) for the indicative locations of the identified external catchment overland flow paths.

7 Monitoring and Maintenance Schedules

7.1 Monitoring Schedule

A monitoring program will be established for the stormwater management devices as outlined below and shown in **Table 7-1**, **Table 7-2**, **Table 7-3, Table 7-4, Table 7-5** and **Table 7-6**.

Due to the remote location of the sites, the turn-around time for the suspended solids test results may delay the release of captured surface runoff from the sediment basins. Measuring the turbidity may be an acceptable alternative, although this requires the correlation between turbidity and suspended solids to be established individually for each site. The relationship between the turbidity and suspended solids varies between soil types, so this will need to be determined at each site by measuring both parameters over the course of at least six events. Graphing the results and determining a line of best fit should provide a turbidity/suspended solids relationship suitable for estimating the turbidity level that corresponds to the suspended solids release criteria for each site. Once this has been established, suspended solids testing samples should continue to be collected prior to any controlled release, however the release may occur prior to the results being returned. Should the suspended solids test results be outside the release criteria given in Section 3 of this report, the acceptable turbidity level must be adjusted to reduce the chance of future non-compliance. The turbidity within the basins can be measured a number of ways, including a secchi disk or a water quality probe.

Table 7-1 Monitoring Program for Sediment Basins

MONITORING ACTIVITY	FREQUENCY
Inspect sediment basin	- During construction - After each runoff event - Prior to “stop work” or “site shutdown”
Inspect submerged inflow pipes	After each runoff event
Testing of Suspended Solids, pH, and Dissolved Oxygen	- Prior to controlled release - Immediately following rain events > 25mm in a 24 hour period

To maximise the effectiveness of the stormwater management measures for the roof drainage areas that do not connect directly to a piped drainage system, the following activities are suggested to regularly visually monitor the condition of the rainwater tanks and level spreader outlets.

Table 7-2 Monitoring Program for Rainwater Tanks

MONITORING ACTIVITY	FREQUENCY
Observe water surcharging from surcharge weir/pipe/pit of tank	After major storm events > 25mm in 24 hrs
Inspect silt / litter trap	After major storm events > 25mm in 24 hrs or 3 monthly
Inspect structural integrity / condition of device	6 monthly

Table 7-3 Monitoring Program for Level Spreader Devices

MONITORING ACTIVITY	RECOMMENDED FREQUENCY
Inspect for incidents of erosion / scour of soils at outlet	After major storm events > 25mm in 24 hrs or 3 monthly
Inspect for weed inundation / litter accumulation within receiving environment	3 monthly
Inspect for excessive wear & damage of receiving environment	
Inspect for build-up of sediments at outlet	
Inspect health of vegetation at outlet	

In the case of vegetated buffers and vegetated swales, the collection of water quality samples is unlikely to yield valuable results. Given this, no sample based monitoring is recommended for these treatment systems. Instead, an inspection based monitoring and maintenance scheme as detailed below is considered appropriate for these types of devices.

Table 7-4 Monitoring Program for Vegetated Swales

MONITORING ACTIVITY	FREQUENCY
Inspect for erosion / scour of invert & batters	After major storm events > 25mm in 24 hrs or 3 monthly
Inspect for weed inundation / litter & debris accumulation	3 monthly
Inspect for inappropriate access, excessive wear & damage to invert & batters	3 monthly
Inspect for build-up of sediments	3 monthly
Inspect condition of vegetation such as vegetation health & density	3 monthly
Inspect condition of inlet & outlet structures	After major storm events > 25mm in 24 hrs or 3 monthly

Table 7-5 Monitoring Program for GPT / Oil & Grip Separators

MONITORING ACTIVITY	FREQUENCY
Discharge Water Quality	After major storm events > 25mm in 24 hrs or 6 monthly
Debris / litter in trash rack / basket, blockages in device	3 monthly and / or after major storm events
Structural condition of device	3 monthly
Gross pollutant / coarse sediment accumulation within device	3 monthly
Odour within device	3 monthly

Table 7-6 Monitoring Program for Bio-retention Basins

MONITORING ACTIVITY	FREQUENCY
Inspect for erosion / scour of invert & batters	After major storm events > 25mm in 24 hrs or 3 monthly
Inspect for weed inundation / litter & debris accumulation	3 monthly
Inspect for inappropriate access, excessive wear & damage to invert & batters	3 monthly
Inspect for build-up of sediments	3 monthly
Inspect condition of vegetation such as vegetation health & density	3 monthly

7.2 Maintenance Schedule

The on-going performance of the stormwater management devices will be dependent on the maintenance conducted.

The maintenance programs as outlined below and detailed in **Table 7-7, Table 7-8, Table 7-9, Table 7-10, Table 7-11** and **Table 7-12** are to be implemented for the stormwater treatment devices.

Table 7-7 Maintenance Program for Sediment Basins

MAINTENANCE ACTIVITY	FREQUENCY
Clean out accumulated sediment	Every 2 years as per sediment basin calculations or as required by results of monitoring
Check visible pipes for leaks	6 monthly or as required by results of monitoring
Check embankment fill material for settlement	6 monthly or as required by results of monitoring
Remove all trash from basin and riser	6 monthly or as required by results of monitoring
De-silt submerged inflow pipes	6 monthly or as required by results of monitoring

Sediment basins must be operated and maintained in an effective operational condition. These structures must not be allowed to accumulate sediment volumes in excess of forty per cent (40%) sediment storage design capacity. Where sedimentation basins are used a marker shall be placed within the basin to show the level above which the design storage capacity occurs. Materials removed from sediment retention devices must be disposed of in a manner approved by the consent authority that does not cause pollution.

Table 7-8 Maintenance Program for Rainwater Tanks

MAINTENANCE ACTIVITY	FREQUENCY
Clean out silt / litter trap	6 monthly or as required by results of monitoring
Remove debris from surcharge weir / pipe / pit	
Dewater and clean out / de-silt tank	As required by monitoring

Table 7-9 Maintenance Program for Level Spreader Devices

MAINTENANCE ACTIVITY	FREQUENCY
Repairs to landscaping / level spreaders	As required by monitoring
Watering, re-vegetating, grass cutting of receiving environment	
Removal of litter, debris, weeds & excessive sediment build up within receiving environment	

Table 7-10 Maintenance Program for Vegetated Swales

MAINTENANCE ACTIVITY	FREQUENCY
Repairs to swale profile	As required by results of monitoring
Irrigating, infilling of vegetation to maintain sufficient cover	As required by results of monitoring
Removal of litter, debris, weeds & excessive sediment build up	6 monthly or as required by results of monitoring
Mowing / pruning of swale vegetation to maintain optimal vegetation height	As required by results of monitoring

Reforming of any swale profile will be required when the design flow area of the swale is reduced by 25%.

Table 7-11 Maintenance Program for GPT / Oil & Grit Sepatator

MAINTENANCE ACTIVITY	FREQUENCY
Remove sediment / litter / hydrocarbons	3 monthly and as required by monitoring

Table 7-12 Maintenance Program for Bio-retention Basins

MAINTENANCE ACTIVITY	FREQUENCY
Repairs to basin profile	As required by results of monitoring
Irrigating, infilling of vegetation to maintain sufficient cover	As required by results of monitoring
Removal of litter, debris, weeds & excessive sediment build up	Monthly or as required by results of monitoring
Mowing / pruning of basin vegetation to maintain optimal vegetation height	As required by results of monitoring
Tilling of filter media area if evidence of clogging	As required by results of monitoring

8 Emergency Flood Management Strategies

A regional flooding analysis to assess the impacts of the proposed Carmichael Rail Alignment on the existing major floodplains, river and creek crossings was undertaken by Calibre Operations Pty Ltd for the Carmichael Coal Mine and Rail project. Based on the results of the investigation (included in the Drainage Design Report (Reference No.CARP12033-REP-G-100, dated Dec 2012)), and the Hydrology Drawings, the construction depot and possibly the maintenance yard were identified as being partially inundated during a 50 year ARI storm event.

For the areas that may be inundated during a 50 year ARI storm event, it is recommended that the contractor operating the facility consider developing an Emergency Flood Management Strategy to minimise the risk to people, equipment and infrastructure during flood events.

The following information provides some strategies that the contractor may consider when developing an Emergency Flood Management Plan for the construction facility areas at risk of inundation. Procedures for flood emergency management in the case of a flood emergency could include communication based management or flood gauge based management. Strategies for remaining on site during a flood emergency have not been considered for the maintenance yard and construction depot site as no habitable buildings are expected to be incorporated into these areas.

Due to the remote location of these areas, flood gauged based management strategies may not be available to many of the facility sites. Based on this, a communication based management plan may be more appropriate for the sites.

Any materials that have the potential to cause environmental harm such as fuel, cement etc. should be either stored above the appropriate flood level or be able to be moved off site in a timely manner if the need arises.

8.1 Communication Based Management Strategies

Communication based management strategies generally rely on regular flood warnings and river height bulletins issued by the Bureau of Meteorology (BoM). These warnings and bulletins are sent to radio stations for broadcast, and to local authorities, police and emergency services. Flood warnings, river height bulletins and other weather related information is available on the BoM website and through telephone recorded information services.

The contractor should consider identifying the names of the creek and river systems that have the potential to inundate the sites as well as site access roads and tracks, and determine if the BoM has a warning system monitoring the identified watercourse. If available, the contractor should then document the appropriate contact details to enable access to the identified warning systems.

To gain more information on flood warning, the contractor may also consider registering the sites with the local council, the local branch of the state emergency services department and any local disaster management centres.

The contractor should ensure that all staff accessing the facility are informed of the flood characteristics of the site and surrounding area, the emergency evacuation protocols and processes, and the site evacuation routes in the event of a flood emergency.

If a flood event has been forecast for the area by the BoM or other local authority, then the contractor may want to consider some of the following procedures as part of the emergency evacuation protocols and processes for the sites.

> Securing the site by cleaning up materials and storing equipment / machinery that have the potential to be carried away during a flood event.

> Moving equipment / machinery that can be relocated off site to higher ground.

> Evacuate the facility site while low hazard level access is still available off site.

8.2 Flood Gauge Based Management Strategies

Flood gauge based management strategies generally incorporate the same communication based strategies as outlined above, however where flood gauges may be established for adjacent creek or river systems defined flood level information could be available.

The contractor may then consider utilising the available flood level information to set trigger levels for various actions to occur on site as part of the emergency evacuation protocols and processes developed for the construction facility.

9 Conclusions

In preparing this conceptual stormwater management strategy, preliminary water quality and quantity assessments were undertaken for maintenance yard and construction depot area.

The objectives of this stormwater management strategy were to meet the performance criteria outlined in **Table 3-1** of this report. The outcome of this preliminary investigation has recommended the inclusion of a number of stormwater quality and quantity management measures detailed herein and summarised as follows:

> Numerous vegetated swales for treatment and conveyance purposes as indicatively shown on Cardno Sketch numbers 721769 SK14 and SK17 (Appendix B); and

> Constructed sediment basins or bio-retention basins as described in Sections 5 and 6, and indicatively shown on Cardno Sketch numbers 721769 SK14 and SK17 (Appendix B).

The detailed design of the treatment and detention devices will need to comply with the information outlined within this stormwater management strategy, and with the relevant authority guidelines.

10 References

Department of Environment and Resource Management 2009, *Queensland Water Quality Guidelines (2009)*, Version 3 September 2009, Brisbane, QLD

Department of Natural Resources and Water 2007, *Queensland Urban Drainage Manual 2007 (QUDM)*, Volume 1 Second Edition 2007, Brisbane, QLD

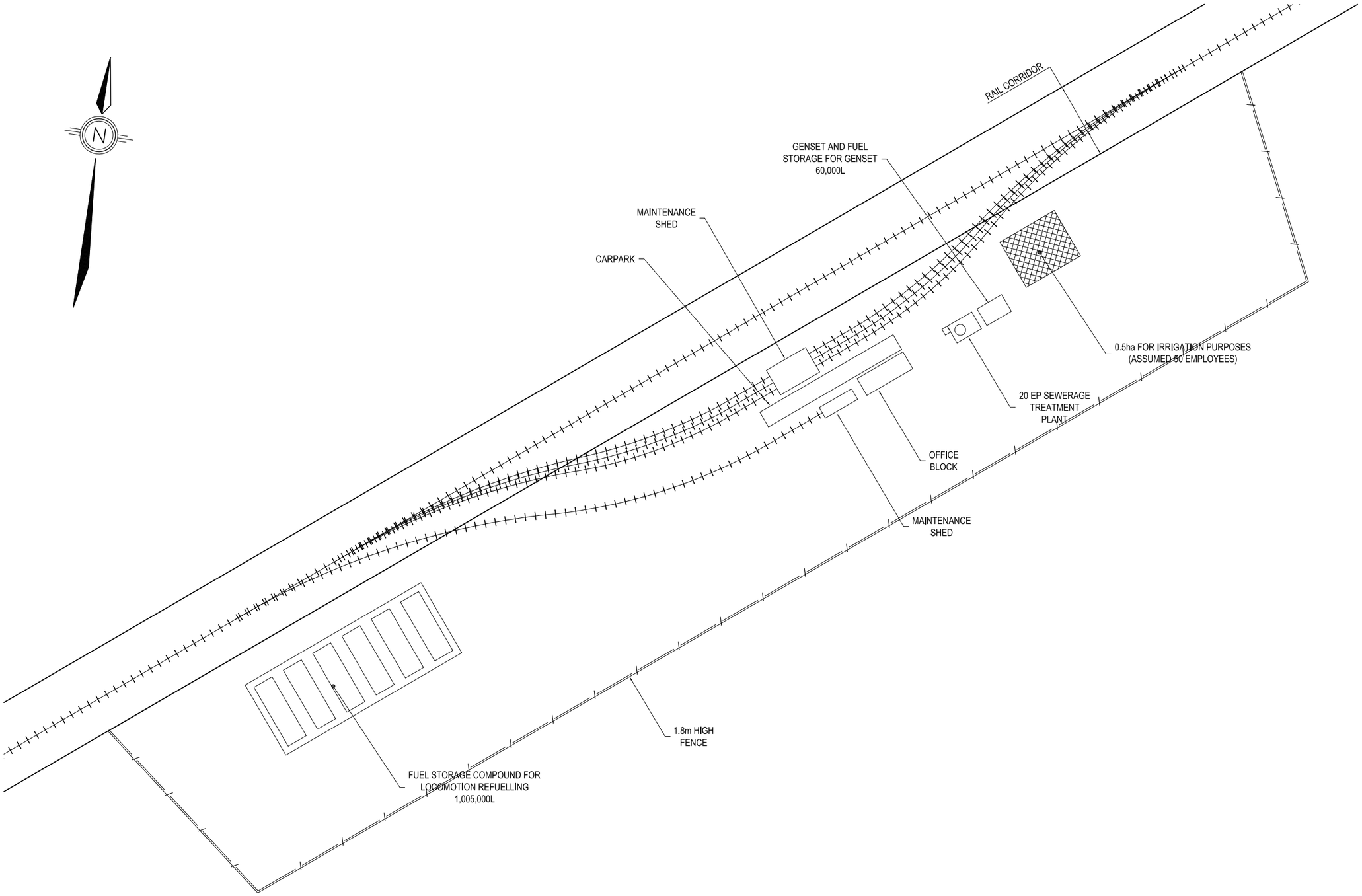
International Erosion Control Association (Australasia) 2008, *Best Practice Erosion and Sediment Control*, November 2008, Picton, NSW

Water by Design 2010, *MUSIC Modelling Guidelines Version 1.0 – 2010*, Brisbane, QLD

APPENDIX A

REFERENCE DRAWINGS

Cardno
Shaping the Future



50 0 50 100 150 200 250m
1:5000

Scale 1:5,000 (A3)

FIGURE 2
MAINTENANCE FACILITY INDICATIVE LAYOUT

Rev: 0 | Drawn: M.H | Checked: L.M. | Date: 12/07/2013

Adani Mining Pty Ltd

CAD FILE: P:\721769 Adani\03 Design\Cad\Brls Drawings\Figure 2 - Maintenance Facility Typical Layout.dwg
XREF's: 790344-X-BASE

Project No.: 7803/04

PRINT DATE: 18 July, 2013 - 5:07pm

APPENDIX B

FIGURES & SKETCHES

Cardno
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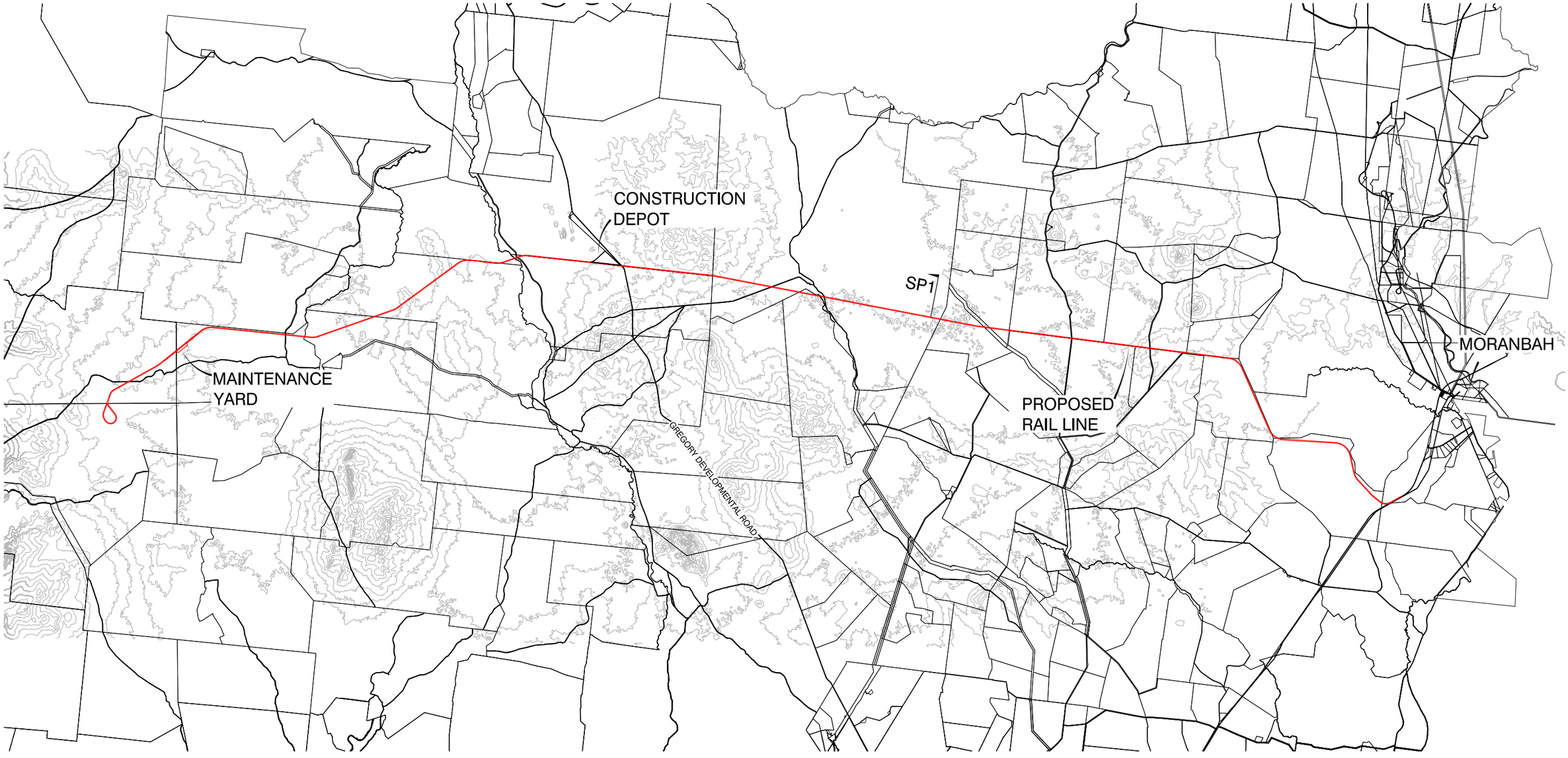

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1:500,000

Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Locality Plan for the Maintenance Yard and Construction Depot

Date: April 2013
Drawing Number: Sketch 721769 - 002
Revision: B

DATE PLOTTED: 29 July 2013 2:36 PM
CAD FILE: P:\721769 Adani\03 Design\Cad\03 Sketches\721769 Sk01-03 Locality Plans.dwg

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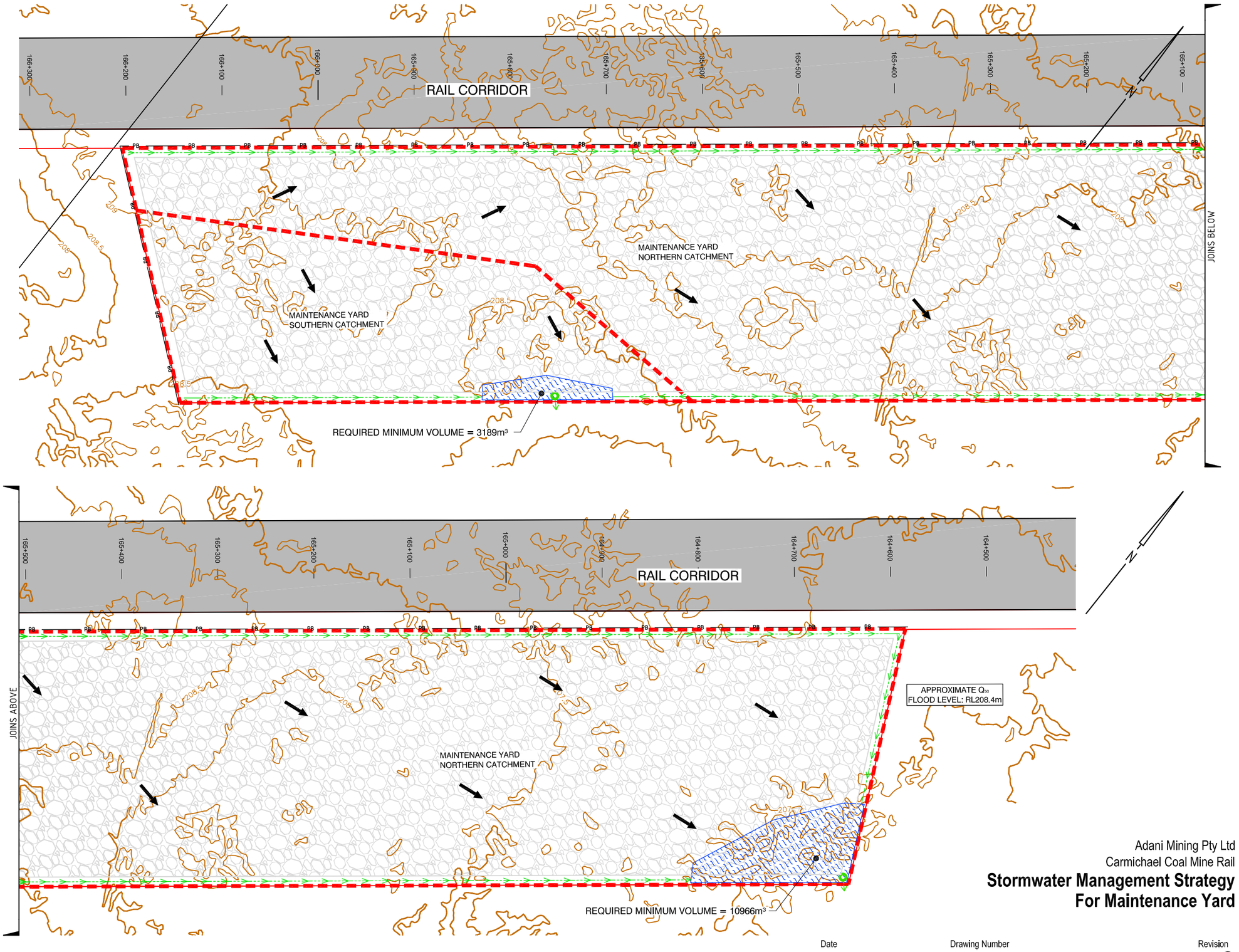
LEGEND

- EXISTING SURFACE CONTOURS (0.5m INTERVALS)
- DEVELOPED CATCHMENT BOUNDARY
- VEGETATED SWALES (INDICATIVE ONLY)
- PB — PERIMETER BUND
- OVERLAND FLOW DIRECTION
- PROPOSED MAINTENANCE FACILITY AREA
- PROPOSED TREATMENT/DETENTION BASIN AND OUTLET (INDICATIVE ONLY) REFER NOTE 7.

NOTES:

1. CONTOURS ARE BASED ON AERIAL SURVEY. DETAILED SURVEY WILL BE REQUIRED TO CONFIRM CONTRIBUTING CATCHMENT AREAS FOR DETAILED DESIGN.
2. WHERE THE ROOF AREA DRAINAGE CANNOT BE PROVIDED WITH A FREE DRAINING CONNECTION TO THE PROPOSED TREATMENT/DETENTION BASIN THE ROOF AREA DRAINAGE TO DISCHARGE TO RAINWATER TANK WITH A LEVEL SPREADER ATTACHED TO OUTLET.
3. SOME MINOR RE-GRADING WILL BE REQUIRED ONCE EXACT SITE CONDITIONS ARE DETERMINED.
4. WHERE A FREE DRAINING PIPED OUTLET CANNOT BE PROVIDED TO DRAIN THE TREATMENT/DETENTION BASIN WITHIN THE FOOTPRINT OF THE MAINTENANCE FACILITY AREA, A PUMP WILL NEED TO BE PROVIDED. ALTERNATIVELY APPROVAL WILL NEED TO BE SOUGHT TO PROVIDE A FREE DRAINING PIPED OUTLET EXTERNAL TO THE EXTENTS OF THE SITE.
5. ALL WATER TRAPPED WITHIN THE TREATMENT/DETENTION BASIN IS TO BE TESTED FOR COMPLIANCE WITH THE RELEASE CRITERIA OUTLINED IN THE SWMS PRIOR TO A CONTROLLED RELEASE OFF-SITE.
6. CONSTRUCT DIVERSION BUND TO DIVERT EXTERNAL LOCAL CONTRIBUTING CATCHMENTS AROUND THE MAINTENANCE FACILITY SITE. EXTENT AND SIZE OF THE BUND TO BE CONFIRMED AS PART OF THE DETAILED DESIGN. VELOCITY CONTROL MEASURES TO BE PROVIDED AT THE DOWNSTREAM END OF DIVERSION BUNDS TO DISPERSE CONCENTRATED FLOWS.
7. BASIN SPILLWAY LOCATION AND SIZE TO BE CONFIRMED AS PART OF THE DETAILED DESIGN.
8. REGIONAL Q50 FLOOD LEVEL DERIVED FROM RESULTS OF REGIONAL FLOODING INVESTIGATION UNDERTAKEN BY CALIBRE OPERATIONS PTY LTD FOR THE CARMICHAEL COAL MINE AND RAIL PROJECT, AND SUMMARISED IN THE DESIGN REPORT, REFERENCE NO. CARP12033-REP-C-003 (DATED DEC 2012)



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Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Stormwater Management Strategy For Maintenance Yard

Date: April 2013
Drawing Number: Sketch 721769 - 014
Revision: C

DATE PLOTTED: 29 July 2013 2:15 PM
CAD FILE: P:\721769 Adani\03 Design\Cad\03 Sketches\721769 Sk14-17 Maint SW Treatment.dwg

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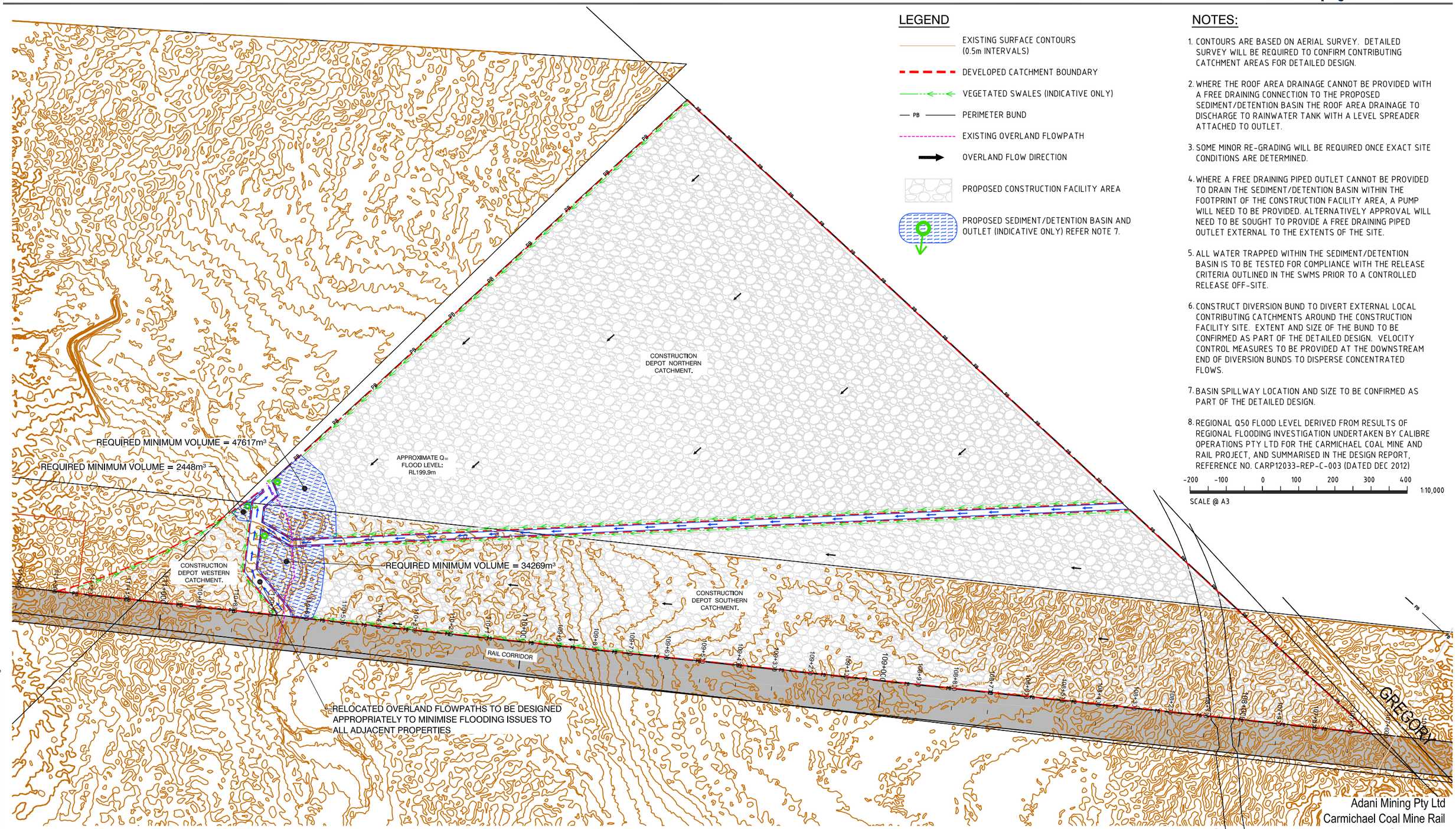

LEGEND

- EXISTING SURFACE CONTOURS (0.5m INTERVALS)
- DEVELOPED CATCHMENT BOUNDARY
- VEGETATED SWALES (INDICATIVE ONLY)
- PB — PERIMETER BUND
- EXISTING OVERLAND FLOWPATH
- OVERLAND FLOW DIRECTION
- PROPOSED CONSTRUCTION FACILITY AREA
- PROPOSED SEDIMENT/DETENTION BASIN AND OUTLET (INDICATIVE ONLY) REFER NOTE 7.

NOTES:

1. CONTOURS ARE BASED ON AERIAL SURVEY. DETAILED SURVEY WILL BE REQUIRED TO CONFIRM CONTRIBUTING CATCHMENT AREAS FOR DETAILED DESIGN.
2. WHERE THE ROOF AREA DRAINAGE CANNOT BE PROVIDED WITH A FREE DRAINING CONNECTION TO THE PROPOSED SEDIMENT/DETENTION BASIN THE ROOF AREA DRAINAGE TO DISCHARGE TO RAINWATER TANK WITH A LEVEL SPREADER ATTACHED TO OUTLET.
3. SOME MINOR RE-GRADING WILL BE REQUIRED ONCE EXACT SITE CONDITIONS ARE DETERMINED.
4. WHERE A FREE DRAINING PIPED OUTLET CANNOT BE PROVIDED TO DRAIN THE SEDIMENT/DETENTION BASIN WITHIN THE FOOTPRINT OF THE CONSTRUCTION FACILITY AREA, A PUMP WILL NEED TO BE PROVIDED. ALTERNATIVELY APPROVAL WILL NEED TO BE SOUGHT TO PROVIDE A FREE DRAINING PIPED OUTLET EXTERNAL TO THE EXTENTS OF THE SITE.
5. ALL WATER TRAPPED WITHIN THE SEDIMENT/DETENTION BASIN IS TO BE TESTED FOR COMPLIANCE WITH THE RELEASE CRITERIA OUTLINED IN THE SWMS PRIOR TO A CONTROLLED RELEASE OFF-SITE.
6. CONSTRUCT DIVERSION BUND TO DIVERT EXTERNAL LOCAL CONTRIBUTING CATCHMENTS AROUND THE CONSTRUCTION FACILITY SITE. EXTENT AND SIZE OF THE BUND TO BE CONFIRMED AS PART OF THE DETAILED DESIGN. VELOCITY CONTROL MEASURES TO BE PROVIDED AT THE DOWNSTREAM END OF DIVERSION BUNDS TO DISPERSE CONCENTRATED FLOWS.
7. BASIN SPILLWAY LOCATION AND SIZE TO BE CONFIRMED AS PART OF THE DETAILED DESIGN.
8. REGIONAL Q50 FLOOD LEVEL DERIVED FROM RESULTS OF REGIONAL FLOODING INVESTIGATION UNDERTAKEN BY CALIBRE OPERATIONS PTY LTD FOR THE CARMICHAEL COAL MINE AND RAIL PROJECT, AND SUMMARISED IN THE DESIGN REPORT, REFERENCE NO. CARP12033-REP-C-003 (DATED DEC 2012)

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Adani Mining Pty Ltd
Carmichael Coal Mine Rail

Stormwater Management Strategy For Construction Depot

Date: June 2013
Drawing Number: Sketch 721769 - 017
Revision: B

DATE PLOTTED: 29 July 2013 2:17 PM
CAD FILE: P:\721769 Adani\03 Design\Cad\03 Sketches\721769 Sk14-17 Maint SW Treatment.dwg

APPENDIX

C

WATER QUALITY CALCULATIONS

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VOLUME OF SEDIMENT BASIN: TYPE D SOILS

PROJECT: Carmichael Coal Mines Maintenance Yard
JOB No:- 7217/69
DESIGNER:- SW
DATE:- 12/Apr/13

Sediment Storage Zone Volume

Input Value	Catchment/Basin Name		
	Maintenance Yard North	Maintenance Yard South	
S	10.5	10.5	
R (Calculated)	2411.4	2411.4	
R (from chart)			
R (adopted)	2411.4	2411.4	
K	0.02	0.02	
LS	0.17	0.17	
P	1.3	1.3	
C	1	1	
A - Soil Loss (tonnes/ha/yr)	10.7	10.7	
Volume (m^3/ha/yr)	8.2	8.2	
Disturbed Area (ha)	33.6	7.8	
Calculated Soil Loss (m^3/yr)	275.52	63.96	
Sediment Storage Zone (m^3)*	45.9	10.7	

*Assumes regeneration after 2 months

Settling Zone Volume

Cv	1	1	
Catchment Area (ha)	33.6	7.8	
R(y%ile, 5day) (mm)	32.5	32.5	
Settling Zone (m^3)	10920	2535	
Basin Vol. per Hectare (m^3)	326	326	

Preliminary Basin Sizing

Depth of Basin (m)	1	1	
Total Basin Vol (m^3)	10966	2546	
Approx. Width (m)	60	29	
Approx. Length (m)	181	87	

VOLUME OF SEDIMENT BASIN: TYPE D SOILS

PROJECT: Carmichael Coal Mines Construction Depot
JOB No:- 7217/69
DESIGNER:- SW
DATE:- 25/Jul/13

Sediment Storage Zone Volume

Input Value	Catchment/Basin Name		
	Construction Depot North	Construction Depot South	Construction Depot West
S	10.5	10.5	10.5
R (Calculated)	2411.4	2411.4	2411.4
R (from chart)			
R (adopted)	2411.4	2411.4	2411.4
K	0.02	0.02	0.02
LS	0.17	0.17	0.17
P	1.3	1.3	1.3
C	1	1	1
A - Soil Loss (tonnes/ha/yr)	10.7	10.7	10.7
Volume (m^3/ha/yr)	8.2	8.2	8.2
Disturbed Area (ha)	145.9	105	7.5
Calculated Soil Loss (m^3/yr)	1196.38	861	61.5
Sediment Storage Zone (m^3)*	199.4	143.5	10.3

*Assumes regeneration after 2 months

Settling Zone Volume

Cv	1	1	1
Catchment Area (ha)	145.9	105	7.5
R(y%ile, 5day) (mm)	32.5	32.5	32.5
Settling Zone (m^3)	47418	34125	2437.5
Basin Vol. per Hectare (m^3)	326	326	326

Preliminary Basin Sizing

Depth of Basin (m)	1	1	1
Total Basin Vol (m^3)	47617	34269	2448
Approx. Width (m)	126	107	29
Approx. Length (m)	378	321	86

APPENDIX

D

WATER QUANTITY CALCULATIONS

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Carmichael Coal Mine Rail SP1
Maintenance Yard North - 50 year ARI flow

Existing Case

Area	33.6	ha
C_{10}	0.66	
$F_{50}xC_{10}$	0.76	
C_{50}	0.76	
Time of conc	98	mins
Intensity	56	mm/hr
Flow	3.97	m^3/s
Total Flow	3.97	m^3/s
Volume	23326.2	m^3

Sheet flow - 50m over 0.5% grade, poorly grassed - 14 mins
Channel flow - 1400m, 1.5m fall, natural channel - 84 mins
Total 98 mins

Developed Case

Area	33.6	ha
C_{10}	0.86	
$F_{50}xC_{10}$	0.99	
C_{50}	0.99	
Time of conc	120	mins
Intensity	49	mm/hr
Flow	4.52	m^3/s
Total Flow	4.52	m^3/s
Volume	32565.8	m^3

Sheet flow - 50m over 0.5% grade, compacted earth surface - 8 mins
Channel flow - 1400m, 1.5m fall, grassed swales - 112 mins
Total 120 mins

Detention Basin Sizing (preliminary)

Peak inflow	4.52	m^3/s
Peak outflow	3.97	m^3/s
Volume	43421.06	m^3
r	0.12	

Required storage volume

Culp	Boyd	Carroll	Basha	Maximum
2216.56	5337.47	2411.62	3777.02	5337.47

Peak flow only factor: 2

Required volume is - 10675 m^3.

Assuming a rectangular basin with 1 in 2 side slopes,
required surface area is:

Depth (m)	Length (m)	Width (m)	Area (m^2)	Volume (m^3)
0.0	44.0	149.0	6556.0	
1.5	50.0	155.0	7750.0	10729.5

Carmichael Coal Mine Rail SP1
Maintenance Yard South - 50 year ARI flow

Existing Case

Area	7.8	ha
C_{10}	0.66	
$F_{50}xC_{10}$	0.76	
C_{50}	0.76	
Time of conc	56	mins
Intensity	84	mm/hr
Flow	1.38	m^3/s
Total Flow	1.38	m^3/s
Volume	4641.4	m^3

Sheet flow - 50m over 0.5% grade, poorly grassed - 14 mins
Channel flow - 420m, 0.5m fall, natural channel - 42 mins
Total 56 mins

Developed Case

Area	7.8	ha
C_{10}	0.86	
$F_{50}xC_{10}$	0.99	
C_{50}	0.99	
Time of conc	64	mins
Intensity	79	mm/hr
Flow	1.69	m^3/s
Total Flow	1.69	m^3/s
Volume	6500.5	m^3

Sheet flow - 50m over 0.5% grade, compacted earth surface - 8 mins
Channel flow - 420m, 0.5m fall, grassed swales - 56 mins
Total 64 mins

Detention Basin Sizing (preliminary)

Peak inflow	1.69	m^3/s
Peak outflow	1.38	m^3/s
Volume	8667.33	m^3
r	0.18	

Required storage volume

Culp	Boyd	Carroll	Basha	Maximum
727.15	1594.67	781.37	1160.91	1594.67

Peak flow only factor: 2

Required volume is - 3189 m^3.

Assuming a rectangular basin with 1 in 2 side slopes,
required surface area is:

Depth (m)	Length (m)	Width (m)	Area (m^2)	Volume (m^3)
0.0	22.0	82.0	1804.0	
1.5	28.0	88.0	2464.0	3201.0

Carmichael Coal Mine Rail SP1
Construction Depot North - 100 year ARI flow

Existing Case

Area	145.9	ha
C_{10}	0.66	
$F_{100}xC_{10}$	0.79	
C_{100}	0.79	
Time of conc	74	mins
Intensity	81	mm/hr
Flow	26.00	m^3/s
Total Flow	26.00	m^3/s
Volume	115437.2	m^3

Developed Case

Area	145.9	ha
C_{10}	0.86	
$F_{100}xC_{10}$	1.03	
C_{100}	1.00	
Time of conc	88	mins
Intensity	72	mm/hr
Flow	29.18	m^3/s
Total Flow	29.18	m^3/s
Volume	154070.4	m^3

Detention Basin Sizing (preliminary)

Peak inflow	29.18	m^3/s
Peak outflow	26.00	m^3/s
Volume	205427.2	m^3
r	0.11	

Required storage volume

Culp	Boyd	Carroll	Basha	Maximum
9090.98	22391.56	9922.26	15741.27	22391.56

Peak flow only factor: 2

Required volume is - 44783 m^3.

Assuming a rectangular basin with 1 in 2 side slopes,
required surface area is:

Depth (m)	Length (m)	Width (m)	Area (m^2)	Volume (m^3)
0.0	105.0	274.0	28770.0	
1.5	111.0	280.0	31080.0	44887.5

Carmichael Coal Mine Rail SP1
Construction Depot South - 50 year ARI flow

Existing Case

Area	105	ha
C_{10}	0.66	
$F_{50}xC_{10}$	0.76	
C_{50}	0.76	
Time of conc	58	mins
Intensity	83.6	mm/hr
Flow	18.51	m^3/s
Total Flow	18.51	m^3/s
Volume	64404.2	m^3

Developed Case

Area	105	ha
C_{10}	0.86	
$F_{50}xC_{10}$	0.99	
C_{50}	0.99	
Time of conc	74	mins
Intensity	70.8	mm/hr
Flow	20.42	m^3/s
Total Flow	20.42	m^3/s
Volume	90677.5	m^3

Detention Basin Sizing (preliminary)

Peak inflow	20.42	m^3/s
Peak outflow	18.51	m^3/s
Volume	120903.3	m^3
r	0.09	

Required storage volume

Culp	Boyd	Carroll	Basha	Maximum
4490.06	11342.13	4918.31	7916.09	11342.13

Peak flow only factor: 2

Required volume is - 22684 m^3.

Assuming a rectangular basin with 1 in 2 side slopes,
required surface area is:

Depth (m)	Length (m)	Width (m)	Area (m^2)	Volume (m^3)
0.0	74.0	194.0	14356.0	
1.5	80.0	200.0	16000.0	22767.0

Carmichael Coal Mine Rail SP1
Construction Depot West - 50 year ARI flow

Existing Case

Area	7.5	ha
C_{10}	0.66	
$F_{50}xC_{10}$	0.76	
C_{50}	0.76	
Time of conc	32	mins
Intensity	114	mm/hr
Flow	1.80	m^3/s
Total Flow	1.80	m^3/s
Volume	3461.0	m^3

Developed Case

Area	7.5	ha
C_{10}	0.86	
$F_{50}xC_{10}$	0.99	
C_{50}	0.99	
Time of conc	35	mins
Intensity	108.5	mm/hr
Flow	2.24	m^3/s
Total Flow	2.24	m^3/s
Volume	4694.7	m^3

Detention Basin Sizing (preliminary)

Peak inflow	2.24	m^3/s
Peak outflow	1.80	m^3/s
Volume	6259.5	m^3
r	0.19	

Required storage volume

Culp	Boyd	Carroll	Basha	Maximum
560.56	1212.20	601.29	886.38	1212.20

Peak flow only factor: 2

Required volume is - 2424 m^3.

Assuming a rectangular basin with 1 in 2 side slopes,
required surface area is:

Depth (m)	Length (m)	Width (m)	Area (m^2)	Volume (m^3)
0.0	22.0	62.0	1364.0	
1.5	28.0	68.0	1904.0	2451.0