Galilee Power Station

Concept Design

Concept Stormwater Management Plan

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Revision: A

PHRONIS CONSULTING

Document Control Status

Revision Record

Revision	Date	Purpose
A	23-12-2019	For review

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1 INTRODUCTION

1.1 Background

Phronis Pty Ltd has been commissioned by Waratah Coal to undertake the Civil Engineering Design to Concept Stage for the proposed Galilee Power Station project near Alpha, Central Queensland. Part of the design work is a Concept/High Level Stormwater Management Plan.

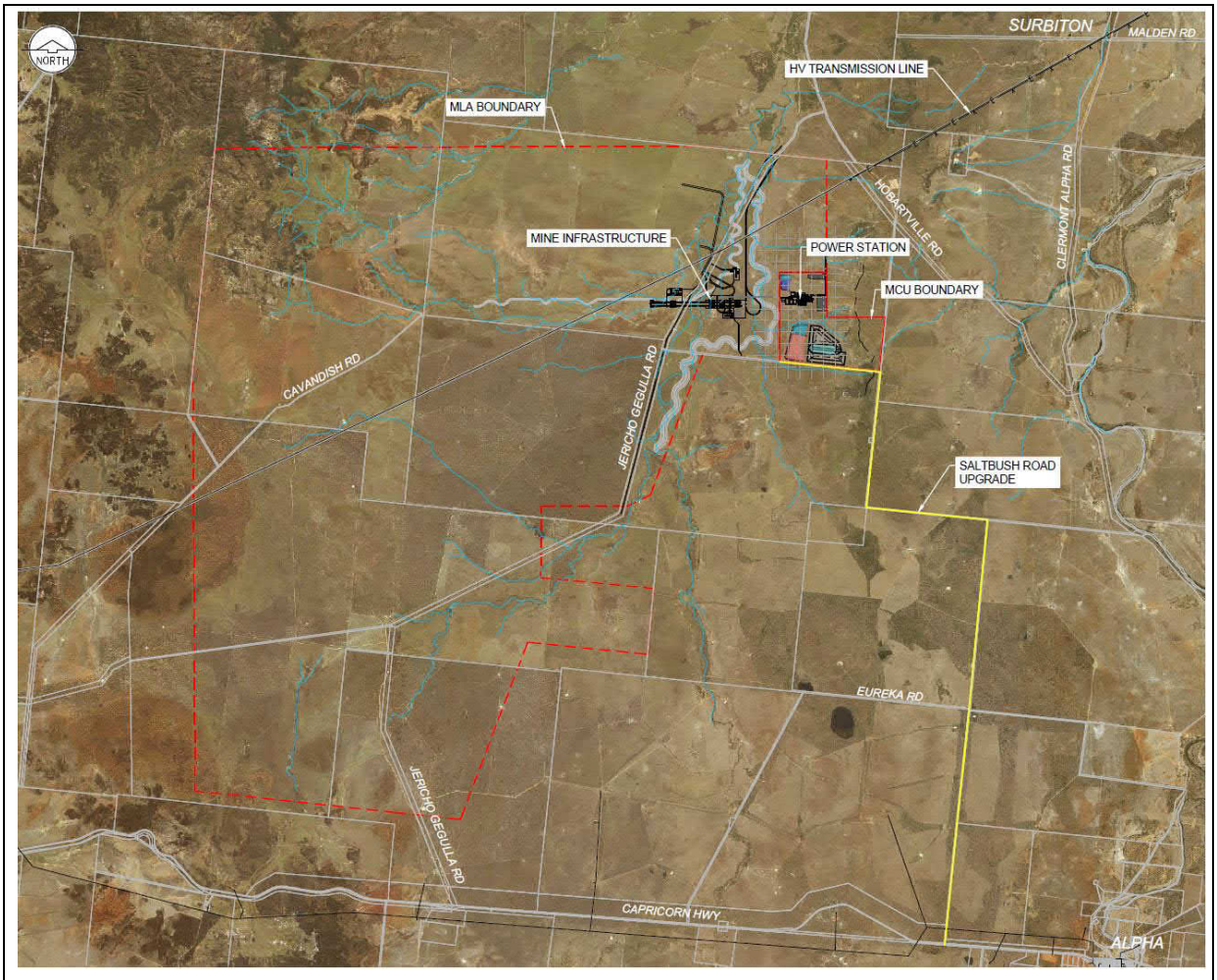
1.2 Overview

A 1,400 MW Ultra Super Critical Coal Fired Power Plant is proposed at the mouth of the Galilee Coal Project, near Alpha in Central Queensland. The proposed power plant is composed of 2 x 700 MW air cooled generating units.

An ash storage and associated infrastructure is required for the planned 50 year life of the power station.

The location of the proposed power station is shown in the following figure.

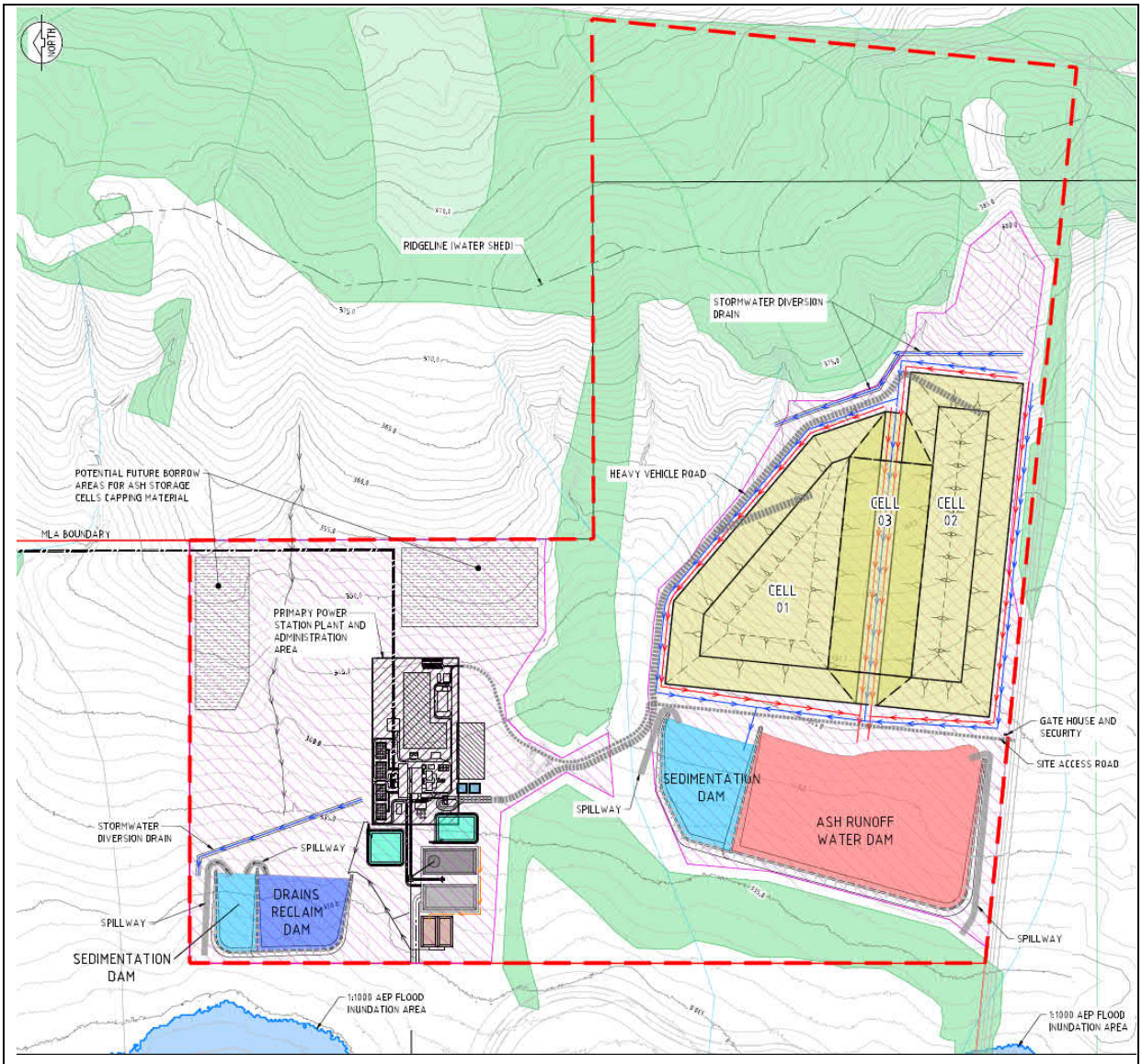
Figure 1.1: Site Location



(Reference: Drawing 144-2-GA-DWG-0001 – C - LOCALITY PLAN)

The site general arrangement is shown in the following figure.

Figure 1.2: Site General Arrangement



(Reference: Drawing 144-2-GA-DWG-0002 – C - SITE LAYOUT PLAN)

The Power Station site is not affected by a 1 in 1,000 year AEP rainfall event.

Table 1.1 lists the Concept Design Drawings and stormwater management related details illustrated/noted on each drawing.

Table 1.1: Drawings and Stormwater Management Details

Drawing Number	Rev	Description	Key Stormwater Management Details
144-2-GA-DWG-0001	C	LOCALITY PLAN	▪ Site Location
144-2-GA-DWG-0002	C	SITE LAYOUT PLAN	▪ Layout of Dams ▪ 1:1000 AEP Flood Inundation Area in relation to the site.
144-2-GA-DWG-0003	B	PLANT PLAN	▪ Plant details including Coal Stockpile Runoff Ponds.
144-2-GA-DWG-0004	A	PLANT ELEVATIONS	
144-2-GA-DWG-0005	A	SITE STORMWATER MANAGEMENT	▪ Stormwater catchment areas. ▪ Stormwater diversion drains.
144-2-CI-DWG-0001	A	ASH STORAGE CELL 1 STAGING PLAN	▪ Stormwater diversion drains. ▪ Ash runoff water drains. ▪ Clean water drains. ▪ Ash Cell capping and rehabilitation.
144-2-CI-DWG-0002	A	ASH STORAGE CELL 2 STAGING PLAN	▪ Stormwater diversion drain. ▪ Ash runoff water drains. ▪ Clean water drains. ▪ Rehabilitation areas.
144-2-CI-DWG-0003	A	ASH STORAGE CELL 3 STAGING PLAN	▪ Stormwater diversion drain. ▪ Ash runoff water drains. ▪ Clean water drains. ▪ Rehabilitation areas.
144-2-CI-DWG-0004	A	ASH STORAGE CELL DETAILS PLAN	▪ Stormwater diversion drain. ▪ Ash runoff water drains. ▪ Clean water drains.
144-2-CI-DWG-0005	B	ASH STORAGE CELL SECTIONS	▪ Typical cross section detail of ash storage cell base lining and ash runoff water drain and clean water drain.
144-2-CI-DWG-0006	B	WATER BALANCE SCHEMATIC	▪ Rainfall runoff water management within the overall water management system.

1.3 Objectives

This Concept Stormwater Management Plan provides details on how stormwater will be managed throughout the site of the proposed Galilee Power Station, including in relation to:

- Potential sources of waterborne contaminants associated with the proposed Power Station operations.
- Any areas where stormwaters may come into contact with contaminants (e.g. stockpiled materials).
- Management of water quality of any release water to ensure environmental values in any receiving waters are protected or enhanced.
- Maximising reuse of water on site.

2 LEGISLATION & STORMWATER MANAGEMENT METHODOLOGY

2.1 Legislation

The key legislation relevant to stormwater management for the proposed Power Station site are as follows.

- The Queensland Environment Protection Act 1994 and associated regulations and publications.
- The Queensland Water Act 2000 and associated regulations and publications.
- The Queensland Fisheries Act 1994 and associated regulations and publications.

Dams or levees constructed as part of an activity under an environmentally relevant activity (ERA), are regulated under the Queensland Environment Protection Act 1994, principally via the following Queensland Department of Environment and Science (DES) publications:

- Guideline - Structures which are dams or levees constructed as part of environmentally relevant activities – ESR/2016/1934 - Version 9.00 – Effective 01 APR 2019 - DES
- Manual for Assessing Consequence Categories and Hydraulic Performance of Structures – ESR/2016/1933 – Version 5.01 – Effective 26 MAR 2016 - DES

The Manual for Assessing Consequence Categories and Hydraulic Performance of Structures sets out the requirements of the administering authority, for consequence category assessment and certification of the design of 'regulated structures', constructed as part of environmentally relevant activities (ERAs) under the Environmental Protection Act 1994 (EP Act).

Structures are assessed using this manual as being in one of three consequence categories: low, significant or high. Where categorised as a significant or high hazard, the structure is referred to as a "regulated structure".

2.2 Water Management Methodology

The methodology for stormwater management is outlined as follows.

- Minimise flooding risk by location of the Power Station Infrastructure away from high flood risk areas where practicable.
- Minimise stormwater overland flow impact by diversion of natural/undisturbed stormwater catchments away from the main Power Station infrastructure where practicable.
- Avoid the contamination of stormwater in the first place, for example by:
    - Roofing areas where contaminants and or wastes are stored or handled.
    - Diverting uncontaminated stormwater runoff away from areas where potential contaminants or wastes are stored or handled.
    - Preventing the contact of incident rainfall with potential contaminants or wastes.

- Minimise the quantity and or hazardous nature of the contaminated stormwater generated, for example by minimising the size of areas where contaminants or wastes are stored or handled.

- Recycling of contaminated stormwater produced, for example by incorporating reuse, reprocessing, and utilisation of the stormwater for a worthwhile purpose.

- Treatment of any contaminated stormwater to render it less or non-hazardous.

- Measures to minimise risk of release of any contaminated stormwater, such as wet season containment allowance and/or storm event containment allowance at dams.

3 SITE CONDITIONS

3.1 Climate

The proposed Power Station site is located in a region with a subtropical climate featuring hot, humid and wet summers. Winters are warm with clear skies and low rainfall. From the Claremont Bureau of Meteorology (BOM) monitoring station data, the average maximum temperature varies from 34.8° C in December to 23.1 ° C in July, and the minimum temperature ranges from 21.6° C in December to 6.7 ° C in July.

Median rainfall is 513.8 mm based on data collected by the Bureau of Meteorology at Alpha monitoring station. Refer to detailed rainfall data in table below.

Figure 3.1: Rainfall Data

Monthly Rainfall (millimetres)

ALPHA POST OFFICE

Station Number: 035000 · State: QLD · Opened: 1886 · Status: Open · Latitude: 23.65°S · Longitude: 146.64°E · Elevation: 355 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	95.9	88.3	60.8	34.0	28.8	30.8	24.0	19.6	21.7	35.0	50.4	75.8	557.9
Lowest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	205.4
5th percentile	4.9	9.2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	7.8	303.8
10th percentile	14.9	16.4	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.8	3.4	12.7	322.6
Median	70.2	62.2	36.8	17.2	15.8	20.0	10.9	9.1	6.5	26.0	41.0	60.8	513.8
90th percentile	198.5	183.2	155.0	78.2	72.1	69.9	68.5	54.6	60.3	78.5	108.0	168.8	820.6
95th percentile	268.7	253.1	190.6	126.1	106.7	99.2	91.1	65.4	83.8	99.4	135.2	217.9	955.4
Highest	438.6	441.9	388.5	293.8	235.8	352.1	201.9	172.1	280.2	262.7	268.6	384.3	1576.8

(Reference: Bureau of Bureau of Meteorology (BOM) Alpha Post Office 1887 to 2017)

3.2 Site Topography

Topography within and surrounding the project area is shown in figure 3.2 and is dominated by level to gently undulating land, which is intercepted by a network of drainage lines and a ridge to the east, with gently inclined to steep slopes.

The proposed Galilee Power Station site is crossed by two gullies running from east to west. These gullies flow into a creek located to the west of the power station site and running from south to north.

Topographical elevations within the project area range from 327 m Australian Height Datum (AHD) to approximately 373 m AHD with the project alignment intersects the adjoining hill slopes.

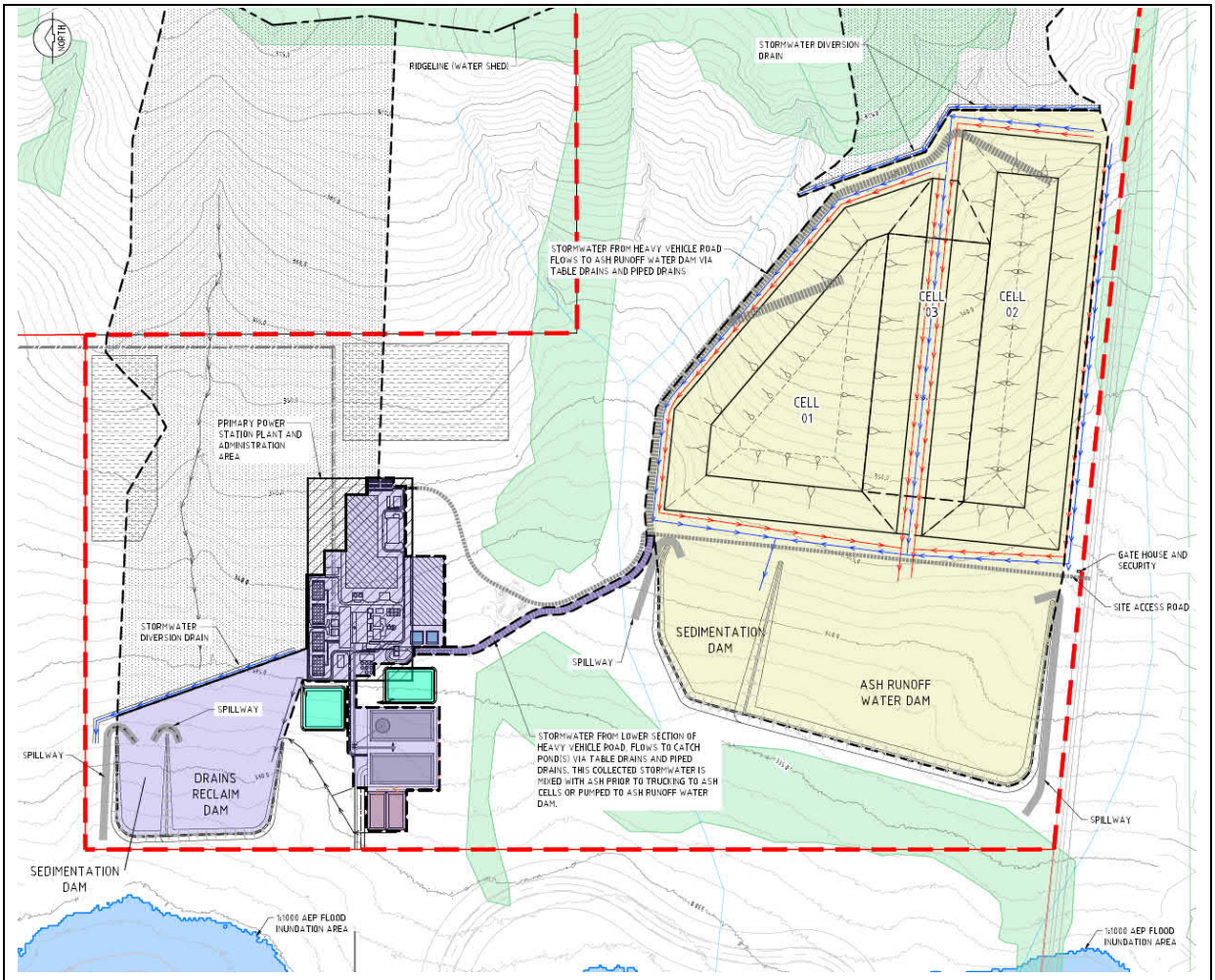
3.3 Catchments

The site comprises two main stormwater catchments as follows.

- The primary Power Station plant area on the north side of the site.
- The ash storage area and associated dams on the south side of the site.

These catchments are shown on shown on Drawing 142-2-GA-DWG-0005-A – Stormwater Management. Figure 3.1 below, an extract from the above drawing, illustrates the two main catchment areas.

Figure 3.2: Stormwater Catchment Areas



(Reference: Drawing 144-2-GA-DWG-0002 – C - SITE LAYOUT PLAN)

4 DAMS

An overview of the proposed four water management dams is provided in Table 4.1.

Table 4.1: Dams

Dam	Primary Purposes	Other Purposes
Ash Runoff Water Dam	Collection of runoff water from exposed ash areas of operational ash cells and heavy vehicle road. Reuse water within the Power Station and for dust suppression at active Ash Cells.	Excess process flows from the Power Station.
Sedimentation Dam 1 (Adjacent to Ash Runoff Water Dam)	Sedimentation of suspended solids from stormwater flows from capped and rehabilitated areas of Ash Cells.	Potential additional water supply for reuse within the Power Station.
Drains Reclaim Dam (DRD)	Collection of relatively good quality water from areas of low contamination risk and the Coal Stockpile Area via Runoff Ponds. Water for reuse within the Power Station.	Secondary containment for contaminant spill risk reduction.
Sedimentation Dam 2 (Adjacent to Drains Reclaim Dam)	Sedimentation of suspended solids from any overflow from the DRD.	Potential additional water supply for reuse within the Power Station. Tertiary containment for contaminant spill risk reduction.

The ash runoff water dam, sedimentation dams and drains reclaim dam arrangement and sizes are shown on the drawings in concept only, and subject to further engineering assessment, including requirements as per the “Manual for Assessing Consequence Categories and Hydraulic Performance of Structures” (the Manual), Queensland Department of Environment and Science (DES), as outlined below.

- Further water balance assessment incorporating power station process water balance assessment.
- Consequence category assessment.

5 STORMWATER MANAGEMENT DETAILS

5.1 Natural Stormwater Catchment Exclusion

Spill risk from the Power Station dams is reduced by exclusion of areas of natural catchment to the east of the Primary Power Station Area and to the east of the Ash Storage Area via Stormwater Diversion Drains.

5.2 Water Balance

A concept level water balance assessment has been conducted for the proposed Power Station site.

Drawing 144-2-CI-DWG-006 – “Concept Design - Water Balance Schematic” details water flows throughout the Power Station site, including Rainfall Runoff / Stormwater and evaporation.

5.3 Primary Power Station Stormwater Catchment Area

Stormwater is managed within the Primary Power Station Stormwater Catchment Area as follows.

5.3.1 Areas of Low Contamination Risk

Areas within the Primary Power Station Stormwater Catchment Area of low contamination risk, such as general access/maintenance roads, administration area and roof drainage are drained to the Drains Reclaim Dam.

Areas such as carparks will be drained via an underflow baffle & weir arrangement to the Drains Reclaim Dam. Surface water from the baffle & weir arrangement will be directed to an oil separator to trap potential oil/fuel spills.

5.3.2 Coal Stockpile Areas

The coal stockpile areas will be bunded. Collected stormwater will flow to two sedimentation ponds to collect coal fines. The water then flows by gravity from the sedimentation ponds to the Drains Reclaim Dam.

5.3.3 Drains Reclaim Dam (DRD)

The water draining to the DRD (from Areas of Low Contamination Risk and the Coal Stockpile Area via Runoff Ponds will be of relatively good quality. This provides for reuse of the water in many parts of the Power Station.

Water Pumps at the DRD will return water to the Power Station for reuse.

The water levels in the DRD and Sedimentation Dam will be maintained at a level to reduce risk of spillage.

The DRD also acts as secondary containment for contaminant spill risk reduction.

A spill risk assessment has not been undertaken as part of concept design for the Drains Reclaim Dam. However, the dam size as indicated in the concept design is similar to a Drains Reclaim Dam for a typical Coal Fired Power Station of similar size. The Drains Reclaim Dam is a type of sedimentation dam for relatively good quality water. There is good scope for optimisation of the Drains Reclaim Dam size due to the potential of recycling of the relatively good quality water within Power Station operations.

During preliminary/detailed design, a Consequence Category Assessment will be carried out to determine spill risk requirements, and a detailed water balance/spill risk assessment using the method of operational simulation as outlined in the Manual is planned to be undertaken to optimise dam storage capacity, and dam design adjusted accordingly. Water can also be transferred to the large Ash Runoff Water Dam to further optimise water balance.

5.3.4 Sedimentation Dam 2

Sedimentation Dam 2, adjacent to the Drains Reclaim Dam, will provide for sedimentation of suspended solids from any overflow from the DRD.

This dam also acts as tertiary containment for contaminant spill risk reduction.

A Consequence Category Assessment will be carried out during preliminary/detailed design to determine any spill risk management requirements, including water quality parameters.

5.3.5 Areas of High Potential Contamination Risk

For areas of high potential contamination risk, such as storage areas for hazardous chemicals, oils and petroleum fuels (e.g. diesel), measures such as bunding and roofing shall be utilised to minimise risk.

Overflow of stormwater from areas of high potential contamination risk will drain to the Waste Water Pond. This water will be utilised for reuse in the Power Station operations, such as mixing with ash for dust management prior to trucking to Ash Cells.

5.3.6 Heavy Vehicle Road – Lower Section

Stormwater from the heavy vehicle road has potential for contamination with ash from ash haulage trucks.

Stormwater from the lower section of the heavy vehicle road will be flow to catch pond(s) via table drains and piped drains. This collected stormwater will be mixed with ash prior to trucking to Ash Cells or pumped to the Ash Runoff Water Dam.

5.4 Ash Storage Area

Stormwater is managed within the Ash Storage Catchment Area as follows.

5.4.1 Ash Cells

The ash storage cell bases will be lined as indicated on drawing 44-2-CI-DWG-0005 B Ash Storage Cell Sections. The lining shall be either high clay content material or a geomembrane liner (e.g. polyethylene (PE) liner), subject to geotechnical assessment and detailed design.

Rainwater runoff from exposed areas of ash will flow via the base of the active Ash Cell and/or ash runoff water drains to the Ash Runoff Water Dam.

The Ash Cells will contain minimal free water. Any free water, such as from rainfall runoff will drain via gravity quite quickly to the Ash Runoff Water Dam.

Ash Cell staging is indicated on drawings 144-2-CI-DWG-0001, 0002 & 0003.

Ash Cells will be progressively capped and rehabilitated to minimise the area of exposed ash within the catchment of the Ash Runoff Water Dam.

Stormwater runoff from Ash Cell areas following capping and rehabilitation will be redirected via the clean water drains to the Sedimentation Dam 1. The water will then flow via the spillway to the creek.

The Ash Cell staging and progressive capping & rehabilitation process will allow the operational catchment area of the Ash Runoff Water Dam to be minimised.

5.4.2 Heavy Vehicle Road – Upper Section

Stormwater from the heavy vehicle road has potential for contamination with ash from ash haulage trucks carrying ash from the Power Station to the Ash Cells.

Stormwater from the upper section of the heavy vehicle road will flow to the Ash Runoff Water Dam via table drains and piped drains.

5.4.3 Ash Runoff Water Dam

Runoff water from the ash cells will be managed by:

- Return to the Power Station for reuse including mixing with ash for dust management.
- Dust suppression sprays at the Ash Cells.
- Natural evaporation from the water surface.
- Evaporation sprays.

The Ash Runoff Water Dam, has been assumed as part of concept design to have a high consequence category, subject to a consequence category assessment in accordance with the Manual. This is considered a conservative assumption. A high consequence category dam is required to have a spill risk less than 1:100 Annual Exceedance Probability (AEP) over a 3-month critical wet period during the wet season. The Ash Runoff Water Dam has been sized on this spill risk basis, with consideration of the active ash cell deposition areas.

During preliminary/detailed design, a Consequence Category Assessment will be carried out. Should the Consequence Category Assessment result in a lower consequence category, than the spill risk requirement would reduce and the dam size could be reduced accordingly (e.g. For a significant consequence category the spill risk requirement is 1:20 AEP).

The consequence category assessment and detailed design (including geotechnical assessment of natural ground conditions) will incorporate assessment of seepage management. If determined to be required, a lining will be included the detailed design by either compaction of existing/insitu high clay content material (0.5m thick min.); importing, placement and compaction of high clay content material (0.5m thick min.); or installation of a geomembrane liner (polyethylene (PE) liner or similar).

5.4.4 Sedimentation Dam 1

Stormwater runoff from Ash Cell areas following capping and rehabilitation will be redirected via the clean water drains to Sedimentation Dam 1, which will provide for sedimentation of potential suspended solids (e.g. clays).

The water will then flow via the spillway to the creek.

A Consequence Category Assessment will be carried out during preliminary/detailed design to determine any spill risk management requirements, including water quality parameters.

6 DEFINITIONS AND REFERENCES

6.1 Definitions

The following table contains abbreviations and definitions relevant to this document.

Table 6.1: Definitions

Term	Definition
AEP	Annual Exceedance Probability – the probability of exceedance of a given magnitude storm or flood within a one-year period
AHD	Australian Height Datum
BOM	Bureau of Meteorology
DES	Queensland Department of Environment and Science
DRD	Drains Reclaim Dam
DSA	Design Storage Allowance
ERA	Environmentally Relevant Activity
the Manual	Manual for Assessing Consequence Categories and Hydraulic Performance of Structures - Queensland Department of Environment and Science

6.2 References

- Guideline - Structures which are dams or levees constructed as part of environmentally relevant activities – ESR/2016/1934 - Version 9.00 – Effective 01 APR 2019 - Queensland Department of Environment and Science

- Manual for Assessing Consequence Categories and Hydraulic Performance of Structures – ESR/2016/1933 – Version 5.01 – Effective 26 MAR 2016 – (the Manual) - Queensland Department of Environment and Science

APPENDIX A DRAWINGS

This Appendix contains key drawings associated with Stormwater Management.

Table A1: Key Drawings associated with Stormwater Management

Drawing Number	Rev	Description	Key Stormwater Management Details
144-2-GA-DWG-0002	C	SITE LAYOUT PLAN	▪ Layout of Dams ▪ 1:1000 AEP Flood Inundation Area in relation to the site.
144-2-GA-DWG-0003	B	PLANT PLAN	▪ Plant details including Coal Stockpile Runoff Ponds.
144-2-GA-DWG-0005	A	SITE STORMWATER MANAGEMENT	▪ Stormwater catchment areas. ▪ Stormwater diversion drains.
144-2-CI-DWG-0001	A	ASH STORAGE CELL 1 STAGING PLAN	▪ Stormwater diversion drains. ▪ Ash runoff water drains. ▪ Clean water drains. ▪ Ash Cell capping and rehabilitation.
144-2-CI-DWG-0002	A	ASH STORAGE CELL 2 STAGING PLAN	▪ Stormwater diversion drain. ▪ Ash runoff water drains. ▪ Clean water drains. ▪ Rehabilitation areas.
144-2-CI-DWG-0005	B	ASH STORAGE CELL SECTIONS	▪ Typical cross section detail of ash storage cell base lining and ash runoff water drain and clean water drain.
144-2-CI-DWG-0006	B	WATER BALANCE SCHEMATIC	▪ Rainfall runoff water management within the overall water management system.

144-2-GA-DWG-0002

NORTH

RIDGELINE (WATER SHED)

STORMWATER DIVERSION DRAIN

HEAVY VEHICLE ROAD

POTENTIAL FUTURE BORROW AREAS FOR ASH STORAGE CELLS CAPPING MATERIAL

MLA BOUNDARY

PRIMARY POWER STATION PLANT AND ADMINISTRATION AREA

CELL 01

CELL 02

CELL 03

GATE HOUSE AND SECURITY

SITE ACCESS ROAD

SEDIMENTATION DAM

SPILLWAY

ASH RUNOFF WATER DAM

STORMWATER DIVERSION DRAIN

SPILLWAY

DRAINS RECLAIM DAM

SPILLWAY

SEDIMENTATION DAM

SPILLWAY

1:1000 AEP FLOOD INUNDATION AREA

1:1000 AEP FLOOD INUNDATION AREA

LEGEND

- EXISTING CONTOURS (1.0m)
- SITE BOUNDARY
- STORMWATER DIVERSION DRAIN
- CLEAN WATER DRAIN
- ASH RUNOFF WATER DRAIN
- DRAINS TO DRAINS RECLAIM DAM
- ASH STORAGE AREA
- REMANANT VEGETATION AREA
- POWER STATION INFRASTRUCTURE AREA

REV	DATE	BY	DESCRIPTION	CHK	APPD
C	18.12.19	CAG	PRELIMINARY ISSUE	LC	SWN
B	09.10.19	CAG	PRELIMINARY ISSUE	PB	SWN
A	04.10.19	SAS	PRELIMINARY ISSUE	PB	SWN

REFERENCE COORDINATION DRAWINGS

DESCRIPTION	DRAWING NO.	REV	CHK

SURVEY DATUM

HORIZONTAL DATUM: VERTICAL DATUM:

SCALES

0 100 200 400 600

Full Size 1:10000 ; Half Reduction 1:20000
SCALE (m)

A1 ORIGINAL
DO NOT SCALE THIS DRAWING

APPROVED

SIGNED:

DATE: RPEQ:

PHRONIS CONSULTING
Lvl 5 Bldg 2 50 McDougall St, Milton, Qld 4064
T (07) 3506 1100 Fax (07) 3229 8177
Website: www.phronis.com.au

CLIENT: Waratah Coal THE NEW ENERGY IN COAL

PROJECT: GALILEE POWER STATION PROJECT
CONCEPT DESIGN

TITLE: GALILEE POWER STATION
CONCEPT DESIGN
SITE
LAYOUT PLAN

DRAWING STATUS: PRELIMINARY
NOT FOR CONSTRUCTION

DESIGNED:	CHECKED:	APPROVED:
LC	PB	SWN
PROJECT No:	DRAWN:	DATE:
144-2	CG	26.09.19

DRAWING No: 144-2 - GA - DWG - 0002 REV: C

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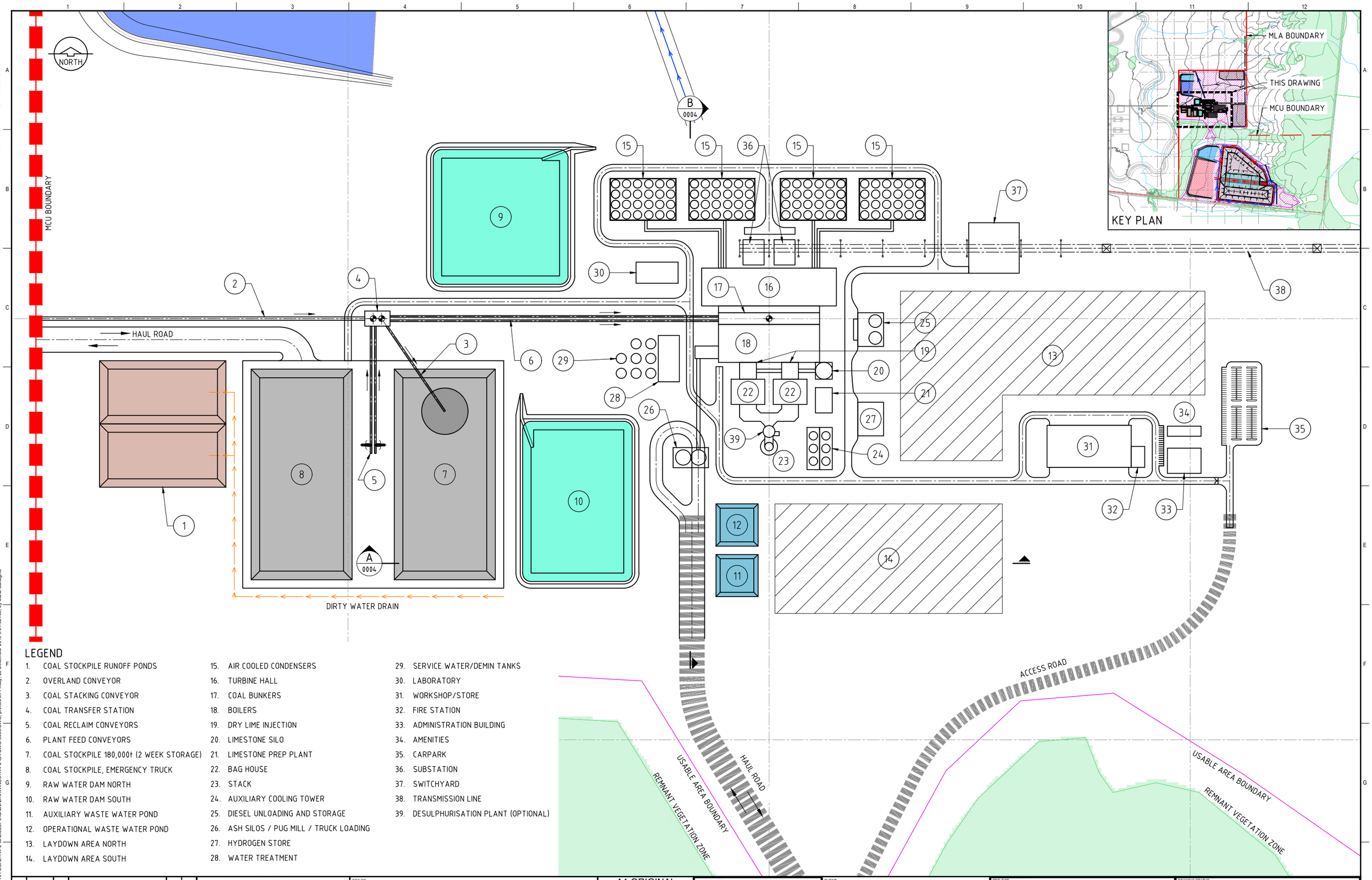
144-2-GA-DWG-0003



LEGEND

1. COAL STOCKPILE RUNOFF PONDS
2. OVERLAND CONVEYOR
3. COAL STACKING CONVEYOR
4. COAL TRANSFER STATION
5. COAL RECLAIM CONVEYORS
6. PLANT FEED CONVEYORS
7. COAL STOCKPILE 180,000t (2 WEEK STORAGE)
8. COAL STOCKPILE, EMERGENCY TRUCK
9. RAW WATER DAM NORTH
10. RAW WATER DAM SOUTH
11. AUXILIARY WASTE WATER POND
12. OPERATIONAL WASTE WATER POND
13. LAYDOWN AREA NORTH
14. LAYDOWN AREA SOUTH
15. AIR COOLED CONDENSERS
16. TURBINE HALL
17. COAL BUNKERS
18. BOILERS
19. DRY LIME INJECTION
20. LIMESTONE SILO
21. LIMESTONE PREP PLANT
22. BAG HOUSE
23. STACK
24. AUXILIARY COOLING TOWER
25. DIESEL UNLOADING AND STORAGE
26. ASH SILOS / PUG MILL / TRUCK LOADING
27. HYDROGEN STORE
28. WATER TREATMENT
29. SERVICE WATER/DEMIN TANKS
30. LABORATORY
31. WORKSHOP/STORE
32. FIRE STATION
33. ADMINISTRATION BUILDING
34. AMENITIES
35. CARPARK
36. SUBSTATION
37. SWITCHYARD
38. TRANSMISSION LINE
39. DESULPHURISATION PLANT (OPTIONAL)

REV	DATE	BY	DESCRIPTION	CHK	APPD
B	18.12.19	SAS	MINOR NUMBER CHANGES	PB	SWN
A	04.10.19	SAS	PRELIMINARY ISSUE	PB	SWN

REFERENCE COORDINATION DRAWINGS

DESCRIPTION	DRAWING NO.	REV	CHK

SURVEY DATUM

HORIZONTAL DATUM: VERTICAL DATUM:

SCALES
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Full Size 1:2000 ; Half Reduction 1:4000
SCALE (m)

A1 ORIGINAL
DO NOT SCALE THIS DRAWING

APPROVED
SIGNED:
DATE: RPEQ:

PHRONIS CONSULTING
Lvl 5 Bldg 2 50 McDougall St, Milton, Qld 4064
T (07) 3506 1100 Fax (07) 3229 8177
Website: www.phronis.com.au

CLIENT: Waratah Coal THE NEW ENERGY IN COAL

PROJECT: GALILEE POWER STATION PROJECT
CONCEPT DESIGN

TITLE: GALILEE POWER STATION
CONCEPT DESIGN
PLANT
PLAN

DRAWING STATUS: PRELIMINARY
NOT FOR CONSTRUCTION

DESIGNED:	CHECKED:	APPROVED:
SAS	PB	SWN
PROJECT No:	DRAWN:	DATE:
144-2	SAS	26.09.19

DRAWING No: 144-2 - GA - DWG - 0003 REV: B

144-2-GA-DWG-0005

NORTH

RIDGELINE (WATER SHED)

STORMWATER DIVERSION DRAIN

STORMWATER FROM HEAVY VEHICLE ROAD FLOWS TO ASH RUNOFF WATER DAM VIA TABLE DRAINS AND PIPED DRAINS

PRIMARY POWER STATION PLANT AND ADMINISTRATION AREA

STORMWATER DIVERSION DRAIN

SPILLWAY

SPILLWAY

DRAINS RECLAIM DAM

SEDIMENTATION DAM

CELL 01

CELL 03

CELL 02

SEDIMENTATION DAM

ASH RUNOFF WATER DAM

SPILLWAY

GATE HOUSE AND SECURITY

SITE ACCESS ROAD

SPILLWAY

STORMWATER FROM LOWER SECTION OF HEAVY VEHICLE ROAD, FLOWS TO CATCH POND(S) VIA TABLE DRAINS AND PIPED DRAINS. THIS COLLECTED STORMWATER IS MIXED WITH ASH PRIOR TO TRUCKING TO ASH CELLS OR PUMPED TO ASH RUNOFF WATER DAM.

1:1000 AEP FLOOD INUNDATION AREA

1:1000 AEP FLOOD INUNDATION AREA

LEGEND

- 370.0 EXISTING CONTOURS (1.0m)
- SITE BOUNDARY
- STORMWATER DIVERSION DRAIN
- CLEAN WATER DRAIN
- ASH RUNOFF WATER DRAIN
- DRAINS TO DRAINS RECLAIM DAM
- REMANANT VEGETATION AREA
- NATURAL STORMWATER CATCHMENT AREA DIVERTED VIA STORMWATER DIVERSION DRAINS
- PRIMARY POWER STATION STORMWATER CATCHMENT AREA
- ASH STORAGE STORMWATER CATCHMENT AREA

REV	DATE	BY	DESCRIPTION	CHK	APPD
A	18.12.19	CAG	PRELIMINARY ISSUE	LC	SWN

REFERENCE COORDINATION DRAWINGS

DESCRIPTION	DRAWING NO.	REV	CHK

SURVEY DATUM

HORIZONTAL DATUM: VERTICAL DATUM:

SCALES

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Full Size 1:7500 ; Half Reduction 1:15000
SCALE (m)

A1 ORIGINAL
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APPROVED

SIGNED:

DATE: RPEQ:

PHRONIS CONSULTING
Lvl 5 Bldg 2 50 McDougall St, Milton, Qld 4064
T (07) 3506 1100 Fax (07) 3229 8177
Website: www.phronis.com.au

CLIENT: Waratah Coal THE NEW ENERGY IN COAL

PROJECT: GALILEE POWER STATION PROJECT
CONCEPT DESIGN

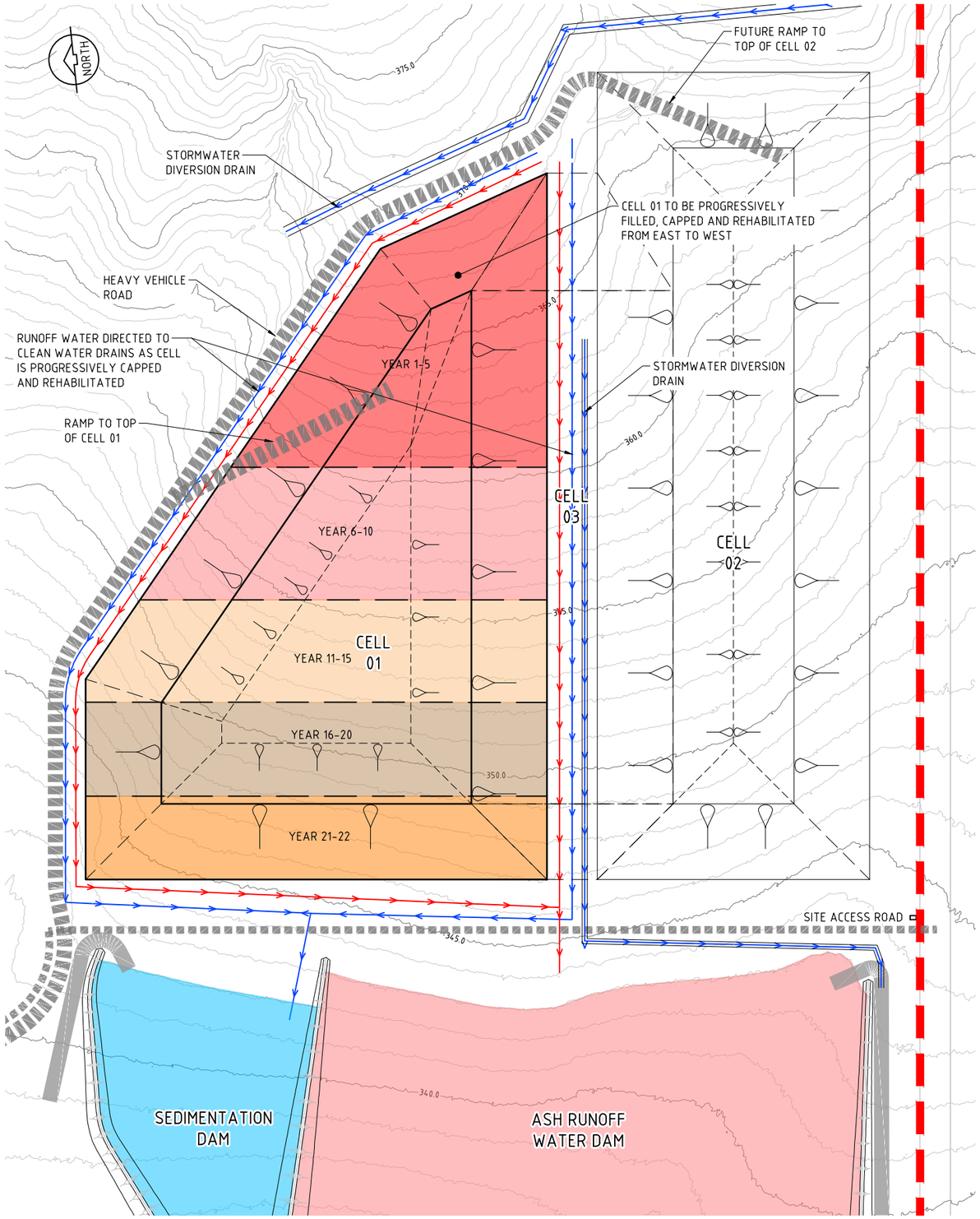
TITLE: GALILEE POWER STATION
CONCEPT DESIGN
SITE
STORMWATER MANAGEMENT

DRAWING STATUS: PRELIMINARY
NOT FOR CONSTRUCTION

DESIGNED:	CHECKED:	APPROVED:
LC	LC	SWN
PROJECT No:	DRAWN:	DATE:
144-2	CAG	18.12.19

DRAWING No: 144-2 - GA- DWG-0005 REV: A

File name P:\CLIENT\SWARATAH-COAL\144-2 GALILEEPS\CADD\DRAWINGS\144-2-GA-DWG-0005.DWG, printed on Friday, 20 December 2019 9:02:14 AM, by Carla Gallagher



NOTES

1. THE ASH STORAGE CELL SIZES, ARRANGEMENT AND INDICATIVE STAGING CAPACITIES/TIMING ARE SHOWN IN CONCEPT ONLY AND ARE SUBJECT TO FURTHER ENGINEERING ASSESSMENT, INCLUDING GEOTECHNICAL ASSESSMENT.
2. THE ASH RUNOFF WATER DAM, SEDIMENTATION DAMS AND DRAINS RECLAIM DAM ARRANGEMENT AND SIZES ARE SHOWN IN CONCEPT ONLY, AND SUBJECT TO FURTHER ENGINEERING ASSESSMENT, INCLUDING REQUIREMENTS AS PER THE "MANUAL FOR ASSESSING CONSEQUENCE CATEGORIES AND HYDRAULIC PERFORMANCE OF STRUCTURES", QUEENSLAND DEPARTMENT OF ENVIRONMENT AND SCIENCE, AS OUTLINED BELOW.
   - FURTHER WATER BALANCE ASSESSMENT INCORPORATING POWER STATION PROCESS WATER BALANCE ASSESSMENT
   - CONSEQUENCE CATEGORY ASSESSMENT
3. MINIMUM ASH CELL CAPPING THICKNESS INCLUDING TOPSOIL TO BE 0.5 M ON PLATEAU AREAS WITH SLOPES < 5% AND 1.0 m ON BATTER SLOPES OF 1V:6H MAXIMUM. REHABILITATION TRIALS TO BE UNDERTAKEN WHEN A SUITABLE FILLED AREA OF CELL 01 IS AVAILABLE TO CONFIRM ADEQUATE CAPPING THICKNESS. FINAL CAPPING THICKNESS IS SUBJECT TO THE RESULTS OF THE REHABILITATION TRIALS.
4. FINAL ASH CELL REHABILITATION WORKS TO INCLUDE MAXIMUM SLOPES OF 1V:6H, SWALES AND RIP-RAP LINED DRAINAGE CHUTES FOR EROSION PROTECTION AND STABLE LONG TERM DRAINAGE.

LEGEND

- 370.0 EXISTING CONTOURS (1.0m)
- SITE BOUNDARY
- STORMWATER DIVERSION DRAIN
- CLEAN WATER DRAIN
- ASH RUNOFF WATER DRAIN
- INTERIM CAPPING AND REHABILITATION AREA
- FINAL CAPPING AND REHABILITATION AREA

144-2-CI-DWG-0001

File name P:\CLIENT\SWARATAH-COAL\144-2 GALILEE PS\CADD\DRAWINGS\144-2-CI-DWG-0001.DWG , printed on Friday, 20 December 2019 8:58:45 AM, by Carla Gallagher

REV	DATE	BY	DESCRIPTION	CHK	APPD
A	04.10.19	SAS	PRELIMINARY ISSUE	PB	SWN

REFERENCE COORDINATION DRAWINGS

DESCRIPTION	DRAWING NO.	REV	CHK

SURVEY DATUM

HORIZONTAL DATUM:	VERTICAL DATUM:

SCALES

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Full Size 1:5000 ; Half Reduction 1:10000
SCALE (m)

A1 ORIGINAL
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Lvl 5 Bldg 2 50 McDougall St, Milton, Qld 4064
T (07) 3506 1100 Fax (07) 3229 8177
Website: www.phronis.com.au

CLIENT: Waratah Coal THE NEW ENERGY IN COAL

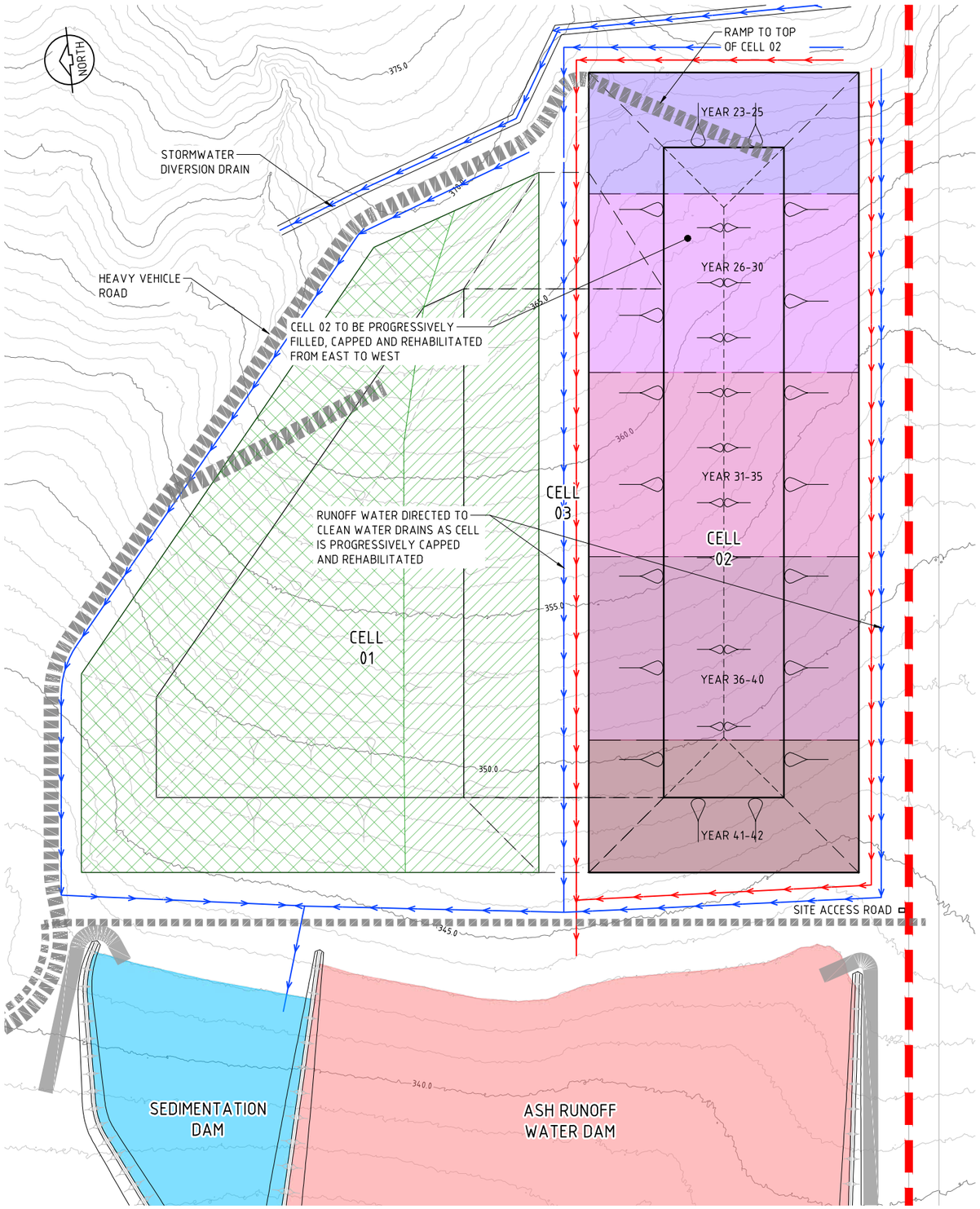
PROJECT: GALILEE POWER STATION PROJECT
CONCEPT DESIGN

TITLE: GALILEE POWER STATION
CONCEPT DESIGN
ASH STORAGE
CELL 1 STAGING PLAN

DRAWING STATUS: PRELIMINARY
NOT FOR CONSTRUCTION

DESIGNED:	CHECKED:	APPROVED:
LC	PB	SWN
PROJECT No:	DRAWN:	DATE:
144-2	CG	26.09.19

DRAWING No: 144-2 - CI - DWG-0001 REV: A



NOTES

1. FOR GENERAL NOTES REFER DRAWING 144-2-CI-DWG-0001.

LEGEND

- 370.0 EXISTING CONTOURS (1.0m)
- SITE BOUNDARY
- STORMWATER DIVERSION DRAIN
- CLEAN WATER DRAIN
- ASH RUNOFF WATER DRAIN
- INTERIM CAPPING AND REHABILITATION AREA
- FINAL CAPPING AND REHABILITATION AREA

REV	DATE	BY	DESCRIPTION	CHK	APPD
A	04.10.19	SAS	PRELIMINARY ISSUE	PB	SWN

REFERENCE COORDINATION DRAWINGS

DESCRIPTION	DRAWING NO.	REV	CHK

SURVEY DATUM

HORIZONTAL DATUM:	VERTICAL DATUM:

SCALES

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Full Size 1:5000 ; Half Reduction 1:10000
SCALE (m)

A1 ORIGINAL
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DATE: RPEQ:

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T (07) 3506 1100 Fax (07) 3229 8177
Website: www.phronis.com.au

CLIENT: Waratah Coal THE NEW ENERGY IN COAL

PROJECT: GALILEE POWER STATION PROJECT
CONCEPT DESIGN

TITLE: GALILEE POWER STATION
CONCEPT DESIGN
ASH STORAGE
CELL 2 STAGING PLAN

DRAWING STATUS: PRELIMINARY
NOT FOR CONSTRUCTION

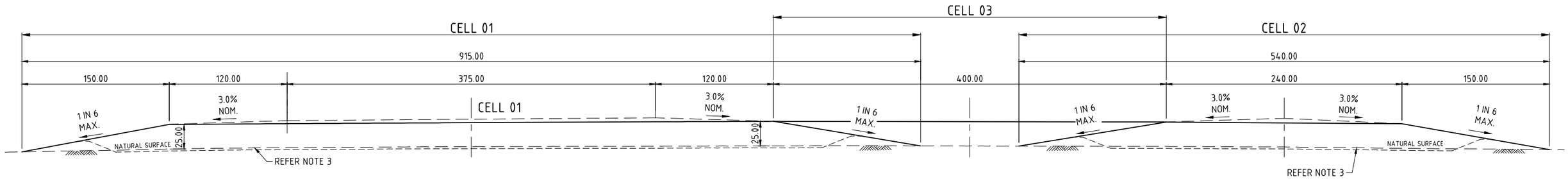
DESIGNED:	CHECKED:	APPROVED:
LC	PB	SWN
PROJECT No:	DRAWN:	DATE:
144-2	CG	26.09.19

DRAWING No: 144-2 - CI - DWG-0002 REV: A

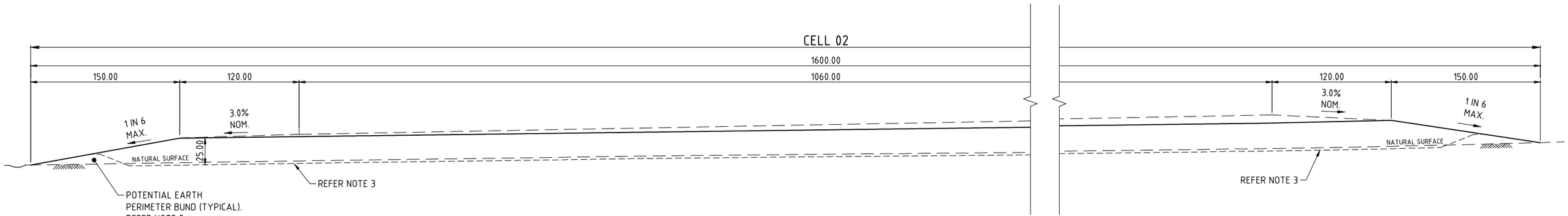
144-2-CI-DWG-0002

File name P:\CLIENTS\WARATAH-COAL\144-2 GALILEEPS\CADD\DRAWINGS\144-2-CI-DWG-0002.DWG, printed on Friday, 20 December 2019 8:59:08 AM, by Carla Gallagher

144-2-CI-DWG-0005



SECTION A
SCALE 1:1:2000
0004



SECTION B
SCALE 1:1:2000
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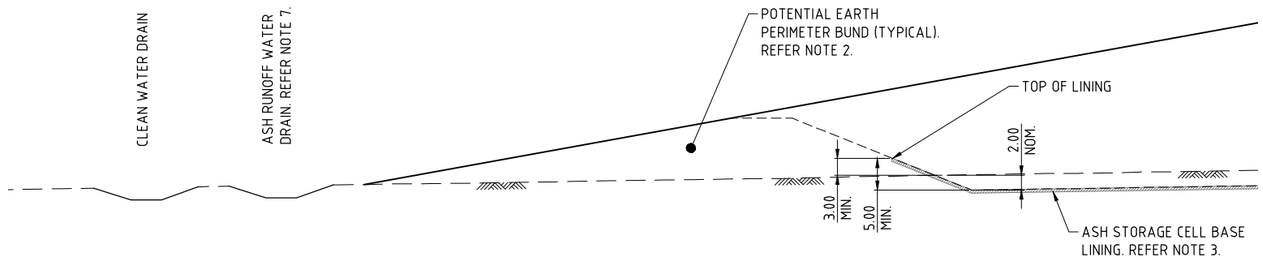

ASH STORAGE CELL BASE LINING AND DRAINAGE DETAIL (TYPICAL)

DETAIL 1
SCALE 1:500
-

NOTES

1. FOR GENERAL NOTES REFER TO DRAWING 144-2-CI-DWG-0003.
2. POTENTIAL, SIZE AND EXTENT OF EARTH PERIMETER BUNDS TO ASSIST WITH CONTROL OF ASH FILLING ARE SUBJECT TO FURTHER ENGINEERING ASSESSMENT, INCLUDING GEOTECHNICAL ASSESSMENT.
3. PRIOR TO ASH PLACEMENT, CELL BASE TO BE PREPARED AS FOLLOWS:
   - REMOVAL OF TOPSOIL AND OTHER MATERIAL FOR POTENTIAL EARTH PERIMETER BUNDS AND FUTURE CAPPING, TO DEPTH UP TO 2.0 m NOMINAL. STOCKPILES OF THESE MATERIALS TO BE ESTABLISHED FOR THE FUTURE ASH CELL CAPPING WORK.
   - ESTABLISHMENT OF BASE LINING BY EITHER:
     - COMPACTION OF EXISTING/INSITU HIGH CLAY CONTENT MATERIAL (0.5m THICK MIN.);
     - IMPORTING, PLACEMENT AND COMPACTION OF HIGH CLAY CONTENT MATERIAL(0.5m THICK MIN.); OR
     - INSTALLATION OF A POLYETHYLENE (PE) LINER, OR SIMILAR GEOMEMBRANE.

   LINING SUBJECT TO DETAILED DESIGN.
4. SLOPE ON PLATEAU AREAS TO BE 3.0% NOMINAL WITH RANGE OF 0.5% TO 5.0% MAXIMUM.
5. CELL TOP SURFACES SHOWN INDICATE FINAL ASH SURFACES, EXCEPT FOR AREAS OF POTENTIAL EARTH PERIMETER BUNDS.
6. FINAL CAPPING MATERIAL NOT SHOWN.
7. ASH RUNOFF WATER DRAIN MAY BE LOCATED AT TOP OF POTENTIAL EARTH PERIMETER BUND, SUBJECT TO FURTHER ENGINEERING ASSESSMENTS DURING DETAILED DESIGN PHASE.

REV	DATE	BY	DESCRIPTION	CHK	APPD
B	18.12.19	CAG	PRELIMINARY ISSUE	LC	SWN
A	04.10.19	SAS	PRELIMINARY ISSUE	PB	SWN

REFERENCE COORDINATION DRAWINGS

DESCRIPTION	DRAWING NO.	REV	CHK

SURVEY DATUM

HORIZONTAL DATUM:	VERTICAL DATUM:

SCALES
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Full Size 1:500 ; Half Reduction 1:1000
SCALE (m)
0 20 40 80 120
Full Size 1:2000 ; Half Reduction 1:4000
SCALE (m)

A1 ORIGINAL
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PHRONIS CONSULTING
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T (07) 3506 1100 Fax (07) 3229 8177
Website: www.phronis.com.au

CLIENT: Waratah Coal THE NEW ENERGY IN COAL

PROJECT: GALILEE POWER STATION PROJECT
CONCEPT DESIGN

TITLE: GALILEE POWER STATION
CONCEPT DESIGN
ASH STORAGE
CELL SECTIONS

DRAWING STATUS: PRELIMINARY
NOT FOR CONSTRUCTION

DESIGNED:	CHECKED:	APPROVED:
LC	PB	SWN
PROJECT No:	DRAWN:	DATE:
144-2	CG	26.09.19

DRAWING No: 144-2 - CI - DWG-0005 REV: B

144-2-CI-DWG-0006

MINE DEWATERING
3740 ML/Y AVAILABLE
1374

687
RAW WATER DAM NORTH

687
RAW WATER DAM SOUTH

60

WATER
PRE-TREATMENT
PLANT

SLUDGE BLOW DOWN

1434
SERVICE WATER
TANK(S)

625
RO WATER
TREATMENT PLANT

254
BRINE

PERMEATE TANK(S)

DEMIN WATER
TREATMENT PLANT
(EDI OR SIMILAR)

371
DEMIN WATER TANK(S)

BOILERS
2 x 700 MW

POWER STATION SITE
RAINFALL RUNOFF

COAL STOCKPILE
RAINFALL RUNOFF

COAL STOCKPILE
RUNOFF PONDS

CLEAN DRAIN

EVAPORATION

221
AUXILIARY COOLING
TOWER

54
COOLING TOWER BLOW DOWN

71
FGD SYSTEM
(OPTIONAL)

40
GENERAL SERVICE
WATER
REQUIREMENTS

EVAPORATION

315
COAL PLANT
(INCLUDES DUST
SPRAYS)

POLISHER REGEN WASTE

100
PLANT WASH
SYSTEM

EXCESS WATER

50
TRUCK WASH BAYS

OIL, WATER AND
SEDIMENTATION
SEPARATORS

EVAPORATION

TOP UP WATER (CONTINGENCY ONLY)

AUXILIARY WATER UPPLY

12
POTABLE WATER
TREATMENT PLANT

POTABLE
WATER TANK(S)

AMENITIES AND
LABORATORY

SEWAGE
TREATMENT
PLANT

60
RECLAIM
WATER

DRAINS RECLAIM DAM
(DRD)

INTERMITTENT

FIRE FIGHTING
SYSTEM

AUXILIARY FIRE WATER SUPPLY

LANDSCAPING

SEDIMENTATION DAM 2

CREEK

SLUDGE

WASTE

ASH PLANT
(INCLUDING PUG MILL
AND TRUCK LOADING)

WASTE WATER
PONDS (OPERATIONAL
AND AUXILIARY)

OCCASIONAL

EVAPORATION

DUST SUPPRESSION
SPRAYS

EVAPORATION

EVAPORATION
SPRAYS
(PROVISIONAL)

ASH STORAGE CELLS
CAPPED /
REHABILITATED

121

ASH STORAGE CELLS
ACTIVE

RAINFALL RUNOFF

187 PROCESS FLOWS
(REFER NOTE 4)

EVAPORATION

ASH WATER RECLAIM

HIGH LEVEL OVERFLOW (EXTREME RAIN EVENTS ONLY)

RAINFALL RUNOFF

SEDIMENTATION DAM 1

CREEK

CREEK

ASH RUNOFF WATER DAM
(ARWD)

NOTES

1. WATER FLOW UNITS ARE IN ML PER YEAR U.N.O.
2. THIS WATER BALANCE INCORPORATES ESTIMATED AVERAGE ANNUAL FLOWS AND DOES NOT INCLUDE SPILL RISK ASSESSMENTS FOR DAMS. DAM SPILL RISK ASSESSMENTS ARE TO BE UNDERTAKEN SEPARATELY.
3. ABBREVIATIONS:
   - RO REVERSE OSMOSIS
   - EDI ELECTRODEIONISATION
   - FGD FLUE GAS DESULPHERISATION
4. EXCESS PROCESS FLOWS TO ASH RUNOFF WATER DAM EVAPORATED VIA DAM SURFACE EVAPORATION, DUST SUPPRESSION SPRAYS AT ACTIVE ASH CELL(S).
5. THE ESTIMATED ANNUAL FLOWS SHOWN ARE PRELIMINARY ESTIMATES AS PART OF CONCEPT DESIGN, AND ARE SUBJECT TO FURTHER ENGINEERING ASSESSMENT.

REV	DATE	BY	DESCRIPTION	CHK	APPD
B	25.10.19	SAS	PRELIMINARY ISSUE	LC	SWN
A	18.10.19	SAS	PRELIMINARY ISSUE	PB	SWN

REFERENCE COORDINATION DRAWINGS

DESCRIPTION	DRAWING NO.	REV	CHK

SURVEY DATUM

HORIZONTAL DATUM:	VERTICAL DATUM:

SCALES
NTS

A1 ORIGINAL
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PHRONIS CONSULTING
Lvl 5 Bldg 2 50 McDougall St, Milton, Qld 4064
T (07) 3506 1100 Fax (07) 3229 8177
Website: www.phronis.com.au

CLIENT:
Waratah Coal
THE NEW ENERGY IN COAL

PROJECT:
GALILEE POWER STATION PROJECT
CONCEPT DESIGN

TITLE:
GALILEE POWER STATION
CONCEPT DESIGN
WATER BALANCE
SCHEMATIC

DRAWING STATUS:
PRELIMINARY
NOT FOR CONSTRUCTION

DESIGNED:	CHECKED:	APPROVED:
LC	PB	SWN
PROJECT No:	DRAWN:	DATE:
144-2	SAS	17.10.19

DRAWING No: 144-2 - CI - DWG-0006
REV: B

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