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CHAIN VALLEY COLLIERY

Miniwall S5 and Northern Pillar Area EXTRACTION PLAN (CVC-EP-MWS5&NPA)

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1 Title block

Title block requirements	
Name of applicant company	Great Southern Energy Pty Ltd trading as Delta Coal
Name of mine	Chain Valley Colliery
Development consent	SSD-5465
Mining lease(s)	ML1632, ML1370
Extraction Plan title	Miniwall S5 and Northern Pillar Area Extraction Plan
Version	1
Date	10 March 2021
Author (Responsible for accuracy and comprehensiveness of information contained in plan)	
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2 Development of the plan

2.1 Purpose

The primary objective of the Chain Valley Colliery (CVC) Miniwall S5 (MWS5) and Northern Pillar Area (NPA) Extraction Plan (EP) is to satisfy the requirements set out in Condition 7, Schedule 4 of State significant development (SSD) consent SSD-5465 (as modified). This EP outlines the actions and procedures to be undertaken to ensure compliance with CVC's statutory requirements. This EP applies to Miniwall S5 and the Northern Pillar Area (Appendix 12-Graphical Plans, Plan 1).

Overall, the purpose of this EP is to:

- identify potential environmental impacts associated with the proposed extraction activities within the MWS5 and NPA; and
- identify the monitoring and management controls and mitigation measures that will be implemented to minimise the potential environmental impacts.

2.2 Background

CVC is an underground coal mine on the southern side of Lake Macquarie approximately 60 km south of Newcastle and 80 km north of Sydney. The pit-top is located 3 km south of the township of Mannering Park.

Great Southern Energy Pty Ltd (trading as Delta Coal (DC)) commenced as owner and operator of CVC and as the operator of neighbouring Mannering Colliery (MC) on 1 April 2019.

CVC operates under SSD-5465, as modified, which was originally granted on 23 December 2013 by the then Minister for Planning and Infrastructure under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

2.3 Key legislation, policy and guidelines

Both State and Commonwealth environmental legislation applies to DC's operation and activities at CVC. A number of legislative requirements, government policies and guidelines are applicable. Key items of legislation, policy and guidelines relevant to this EP are:

- Draft *Guidelines for the Preparation of Extraction Plans* – Version 5;
- EP&A Act;
- NSW *Protection of the Environment Operations Act 1997* (POEO Act); and
- NSW *Mining Act 1992* (Mining Act).

2.4 Development consent

In accordance with Schedule 2, Condition 2a of SSD-5465 (as modified), in addition to carrying out the works in accordance with the conditions of SSD-5465, DC will carry out works generally in accordance with the Environmental Impact Statement (EIS); Statement of Environmental Effects (SEE) (Mod 1); SEE (Mod 2); SEE (Mod 3), project layout plans; and Statement of Commitments.

As required by Schedule 4, Condition 7 of SSD-5465, this EP has been prepared in consultation with NSW Department of Planning, Industry and Environment (DPIE) and by suitably qualified and experienced persons whose appointment was endorsed by the Secretary on 22 October 2020.

The specific requirements within SSD-5465 that are of relevance to this EP and where they have been addressed are listed in **Appendix 2**.

2.5 Consultation

In accordance with Schedule 4, Condition 7 of SSD-5465, as part of the preparation of this EP, DC has consulted with the local community (via the CVC and MC Community Consultative Committee (CCC) in February, May, August and November 2020. A copy of the meeting minutes are available on the Delta Coal Website (https://www.deltacoal.com.au/community/community-consultative-committee). The November 2021 CCC presentation is also on the Delta Coal website and it provides some detail of the Extraction Plan consultation in slides 9 and 25.

A hyperlink of the draft EP was provided to the following stakeholders on 17 December 2020 for downloading on the Delta Coal website:

- DPIE – Resource assessments;
- DPIE – Resources Regulator – Subsidence Engineer;
- DPIE – Resource Regulator – Environment Inspector;
- DPIE – Biodiversity and Conservation Division (BCD);
- DPI – Water;
- DPI – Cabinet;
- Heritage NSW
- NSW-EPA;
- NSW Department of Primary Industries – Fisheries (DPI – Fisheries);
- Roads and Maritime Services (RMS);
- Lake Macquarie City Council;
- Central Coast Council;
- NSW National Parks and Wildlife Service (NPWS);
- Subsidence Advisory NSW;
- Registered Aboriginal Parties and
- CVC and MC CCC members

A summary of the comments received and amendments are detailed in **Table 1**. Evidence of consultation is provided in **Appendix 1**.

Table 1: Consultation summary

Stakeholder	Comments	Response
DPIE – Resource Assessments	• Request for information (RFI) provided on 5 March 2020. See attached DPIE RFI letter and attachment (Appendix 1).	• Updated Extraction Plan, Plan 2 and Subsidence Management TARP (Appendix 1 - DPIE Consultation tables)
DPIE – Resource Regulator – Subsidence Engineer	• No comments provided on the draft Extraction Plan or Subsidence Monitoring Program	• None required
DPIE – Resources Regulator – Environment Inspector	• No comments provided on Extraction Plan	• None required
DPIE – BCD	• No comments provided on Extraction Plan	• None required
DPI – Water	• No comments provided on Extraction Plan	• None required

Stakeholder	Comments	Response
DPI Cabinet	• No comments provided on Draft	• None required
NSW EPA	• Encourages plans but does not make comments or conducts reviews	• None required
DPI – Fisheries	• Based on the previous mining activities and the changes to the mining methods in the current proposal the Department (i.e Fisheries) has no objections to the works proceeding as described.	• None required
Lake Macquarie City Council	• No comments provided on the Extraction Plan • Comments received from LMCC on the Benthic Communities Management Plan via tracked changes in a word document. Two main points in this consultation were; • identifying tests of significance (using ANOSIM) for changes in benthic communities as a result of subsidence vs other environmental variables. • clarification on when exactly a 'significant' change will be determined to have been caused by subsidence, as opposed to being attributed to other things (like water temp, turbidity, DO, etc). • Comments received from LMCC on the Seagrass Management Plan via tracked changes in a word document. Two main points in this consultation were; • A couple of typos • Missing figure numbers and • Alternative options for remediation of seagrass where that may be required	• Benthic Communities Management Plan (Appendix 7) updated considering LMCC comments. EMM Consulting marine ecologist provided comments statistical analysis and significance of change. Seagrass Management Plan (Appendix 8) updated for typos and missing figure numbers and included alternative seagrass remediation option
Central Coast Council	• No comments provided	• None required
NPWS	• No comments provided	• None required
Transport for NSW - Maritime	• Comments provided by TfNSW-Maritime on Navigational Markers (Appendix 1). • Work boat and vessel TfNSW requirements nominated • Acceptable limits of navigational markers, fixed and buoys • No further action required if within subsidence predictions • Seeked further information on Pelican Navigational marker subsidence predictions.	• Email response provided to TfNSW on 1 February 2021 to answer queries (Appendix 1) • Mine survey contractors notified of TfNSW vessel and boating requirements • Built Features Management Plan (Appendix 10) and Subsidence Management TARP updated (Appendix 4)
Subsidence Advisory NSW	• No comments	• None required
RAPs	• No comments	• None required
CVC and MC CCC members	• No comments	• None required.

Landholders with registered water bores around Chain Valley Colliery were contacted as part of the preparation of the EIS. No currently active water bores were identified at this time as requiring management. No further

impacts to landholders are anticipated from the proposed extraction within the MWS5 and NPA and thus no further consultation is required.

2.6 Subsidence predictions and impact review

David Hill from Strata 2 undertook a geotechnical and subsidence prediction assessment in 2020 for MWS5 and NPA (Appendix 15). This report built upon the previous nearby subsidence assessments and site subsidence monitoring results.

The original subsidence assessment was completed by Ditton Geotechnical Services in 2015 to support the MOD 2 SEE. This assessment reviewed updated subsidence data for Miniwalls 1–8, along with existing historic subsidence data from surrounding extracted areas. Later, subsidence data over Miniwalls 1–12 revealed that actual subsidence was approximately 0.37 m above the maximum predicted values (DGS 2018a).

It was assessed that time-dependent subsidence associated with chain pillar overloading in soft floor conditions was resulting in subsidence above original predictions (0.78 m maximum predicted), with the data and associated analyses indicating that the subsidence is likely to be driven by the:

- increased span of the Munmorah Conglomerate and subsequent decrease in overburden stiffness; and
- increased stress applied to the central chain pillars by the deflecting conglomerate likely to having exceeded the bearing strength of the moisture sensitive claystone floor strata.

These learnings have subsequently been incorporated into the design of the S5 miniwall and Northern Pillar area, namely:

- the subsidence assessment considers the 'bank' of Miniwalls S2-S5, thereby assessing the potential increase in subsidence due to the spanning capabilities of the overlying Munmorah Conglomerate; and
- the S3 to S4 inter-panel chain pillar width was increased from 32.6 m to 40 m to limit pillar system deformation (Strata2 2019)
- the S4 to S5 inter-panel chain pillar width is 40m and
- the S5 Maingate chain pillar is 32.6m wide

Updated subsidence predictions have been developed for the revised layout based on empirical modelling techniques (Strata2 2020).

A number of surface and subsurface features of significance were identified from the assessments and inspections within the zone of predicted subsidence (Plan 2 of Appendix 14) as having potential to be affected by far-field movements as a result of the proposed Fassifern Seam workings, including:

- Lake Macquarie and its bed sediments;
- benthic fauna communities;
- seagrass beds;
- groundwater;
- navigational markers and rock outcrops on Lake Macquarie;
- jetties and moorings;
- minor cliffs and steep slopes;
- high water mark (RL 0 m–2.44 m AHD) along the lake foreshore;
- residential buildings and other built features adjacent the foreshore;

These have all been reassessed in terms of the updated subsidence predictions (Strata2 2020), following a similar process to the previous applications and via the Extraction Plan Risk Assessment (Appendix 3).

3 Overview

3.1 Mine planning and design

Area covered by this extraction plan

The area adjacent to the proposed workings has been extensively mined over the past 60 years, within the overlying Wallarah seam and Great Northern seam and currently the Fassifern Seam (Plan 4 of Appendix 14). The North Mains first workings access the mining area on the Fassifern Seam, noting that previously extracted miniwall and bord and pillar panels are outside the angle of draw.

As noted previously, the mining area covered by this EP consists of a single miniwall panel (S5) and areas of secondary pillar extraction with a total surface effect area covering approximately 207 ha wholly beneath Lake Macquarie (Appendix 14). The panel is aligned with the previously approved S2/S3/S4 panels in an east-south-east to west-north-west orientation. Miniwall S5 is planned to be extracted at the completion of mining in the previously approved Miniwall S4 panel.

All extraction and subsidence impacts of relevance to MWS5 and the NPA are beneath Lake Macquarie. Therefore, surface features are limited to the lake bed. Impacts to the lake foreshore, cliffs and/or seagrass beds are not predicted.

Mine design has been the primary control to limit impacts and prevent potential for subsidence exceedances. The proposed mine design has included consideration of the high water mark and seagrass communities.

Proposed mine layout

In 2016, CVC encountered large-scale faulting in the Northern Domain. Subsequently, alternative mining areas were required, mine plans needed to be re-evaluated and relevant planning and environmental approvals sought. The primary considerations in this plan have been:

- applying the learnings with respect to subsidence resulting from previous miniwall and pillar extraction (refer Section 2.6);
- minimising the likely exposure of the miniwall panel to normal faults for safety, productivity and subsidence management purposes; and
- controlling the height of fracturing above the extracted area to meet rockhead thickness constraints.

Mining domains

The extraction plan area is covered by mining lease (MLs) ML1632 and ML1370 (Plan 5 of Appendix 14). Historical, approved and proposed workings of relevance to this EP are described below.

3.1.1.1 Overlying Wallarah Seam workings

Partial extraction within the Wallarah Seam (overlying the Fassifern Seam) has been undertaken (Plan 4 of Appendix 14) historically within the vicinity of Miniwall S5. There are no historical workings directly above MWS5 or the NPA. The closest Wallarah Seam first workings are approximately 360 m south of the starting position of Miniwall S5.

Wallarah Seam workings are generally 80–85 m above the Fassifern Seam, with the interburden consisting of claystone, sandstone, coal seams and thick conglomerate beds. Due to the large barrier pillar, no subsidence or abutment loading interaction is expected between the Fassifern and Wallarah Seam workings.

3.1.1.2 Existing first workings and secondary extraction

CVC is currently undertaking secondary extraction in the Fassifern Seam Miniwall S4, south of the proposed MWS5 and NPA (Plan 1 of Appendix 14). The first workings currently used to access CVC and the proposed MWS5 adjoin these areas.

Due to the compounding nature of subsidence in adjacent extraction panels, a combined subsidence assessment has been prepared, which considers S5 and the NPA (Strata2 2020) in Appendix 15.

3.1.1.3 Proposed mining activities

It is proposed to limit extraction in the approval area to the nominated miniwall panel (ie MWS5) and NPA. This is intended to enable CVC to:

- gain additional monitoring data to validate subsidence predictions;
- improve knowledge on subsidence development mechanisms and controls; and
- optimise the future layout.

This will provide continuity of operations and minimise risks associated with exceedances of predicted subsidence.

Any extraction beyond MWS5 and the NPA will be subject to a separate EP.

Mining parameters

Mining within MWS5 will be via miniwall methods with panel widths of 97 m (total extracted void) accessed by a combination of twin gateroads separated by either:

- 40 m (solid width) chain pillars in the case of the S5 tailgate and
- 32.6 m (solid width) chain pillars in the case of the maingate S5

A miniwall is essentially a longwall with a reduced face width. The reduced panel widths allow for the maintenance of bridging overburden conditions, reducing subsidence and improving face conditions. Secondary extraction in the Northern Pillar Area will be conducted with continuous miners.

The Fassifern Seam in the MWS5 and Northern Pillar area ranges between 4.8 m and 6.0 m thick, with depth of cover (including sediment) between approximately 140 m and 180 m. It is proposed to extract a maximum of 3.5 m on the miniwall and pillar extraction with 3.2 m in development, leaving coal both on the floor and in the immediate roof.

Floor coal provides a protective layer above the underlying claystones, which are highly susceptible to deterioration if exposed to water or atmosphere. They are also readily broken up by mining equipment, greatly impacting roadway conditions (where exposed). The roof coal is of significantly higher ash content and would negatively impact on the saleability of the coal product. Left in place, it contributes to improved roadway roof conditions on development.

A summary of the key mining parameters for MWS5 is provided in Table 3 to Table 6.

Table 3 – Projected coal recovery within MWS5 and NPA

Extraction Area	MWS5	NPA
Total resource (assumes 21.5 ha area for S5)	1.20 million tonnes (Mt)	10.40 million tonnes (Mt)
Total development extraction	0.07 Mt	2.17 Mt
Total secondary extraction	0.46 Mt	1.47 Mt
Total reserves extracted	0.53 Mt	3.64 Mt
Percentage recovery	44%	35%

Table 4 – Miniwall S5 panel geometry

Panel length (m)	Void width (m)	Extraction height (m)	ROM tonnes (Mt)
1008	97	3.5	0.53

Table 5- Fassifern Seam parameters and development roadway geometry

Panel	Working Seam thickness (m)	Depth of cover (m)	Drivage width (m)	Drivage height (m)
MWS5	3.8 – 4.0	160–171	5.4	3.2
NPA	3.6 – 4.0	170 - 140	5.5	3.2

Table 6- Estimated mining schedule

Panel	Extraction Start date	Extraction End date	Estimated duration (months)
MWS5	April 2021	September 2021	6
HB-W1	July 2021	Oct 2021	4
HB-W2	June 2022	Nov 2022	5
HB-E1A	Sep 2023	Oct 2023	2

HB-E1B	July 2023	Sep 2023	3
HB-E2	Jan 2023	May 2023	5
HB-E2A	Nov 2022	Jan 2023	3
HB-E3	May 2023	Aug 2023	4

Consideration of previous working and multi-seam interactions

As part of the preparation of the EP's for S2/S3 and S4, MSEC (2018) and Strata2 (2019), respectively, prepared subsidence assessments, which included consideration of previous Wallarah Seam workings and multi-seam interactions. The assessment acknowledged that:

- Historic partial extraction workings have been carried out south-west of S2/S3 (Plan 4 of Appendix 12). The workings comprise 42-m-wide goafs (i.e. extracted pillars) between 18 m by 18 m remnant pillars. These historic workings are 300 m from S2 at their closest point (i.e. twice the depth of cover). At this distance, it was considered very unlikely that the extraction of S2/S3 would affect the load on or the stability of these historic workings.
- Historic first workings have been carried out south-east of MWS5/NPA and beneath the foreshore of Lake Macquarie (Plan 4 of Appendix 12). These workings were found to be outside the 26.5^{o} and 35^{o} angles of draw. It was therefore considered unlikely that the extraction of MWS5 and NPA would affect the load on or the stability of these historic first workings.

No further impacts have been identified from overlying Wallarah Seam workings as part of the geotechnical assessment for MWS5 and NPA (Strata2, 2020).

Consideration of other features

Thin beds of claystone in the Fassifern Seam floor have been attributed to increases in floor heave under higher pillars loads associated with the extraction of multiple panels. The potential for increased subsidence effects associated with softening and lateral squeezing of the claystone has been noted and accounted for in the updated analyses prepared as part of this EP.

The limited final pillar stresses and high Stability Factors associated with the S2/S3, S3/S4, S4/S5 panel chain pillars and NPA barrier pillars are not anticipated to have any adverse or irregular subsidence effects (Strata2 2020).

3.2 Subsidence predictions

Overview

Subsidence magnitudes and impacts have previously been estimated as part of the preparation of the life of mine design for CVC, which included the MWS5 and NPA area covered by this EP (DGS 2015). The methodology used to predict subsidence was originally based on the results of the Australian Coal Industry's Research Program (ACARP) (Ditton and Frith 2003), *Review of industry subsidence data in relation to the influence of overburden lithology on subsidence and an initial assessment of a sub-surface fracturing model for groundwater analysis*, as well as a review of subsidence data from MW 1–9 at CVC and LW17–23 at MC. This information was re-analysed for the MW 1–12 exceedance investigation at CVC (DGS 2018a), leading to a revised subsidence assessment for the S1 and N1 Panels (DGS 2018b).

In assessing factors that could influence subsidence for MMS5 and NPA, a geotechnical mine design investigation (combining an assessment of pillar stability, surface subsidence and height of connective fracturing) has been completed (Strata2 2020). This document was used to inform the mine design and

management plans (refer Chapter 4). This assessment builds on the previous learnings with respect to subsidence impacts from previous miniwall extraction at the mine. As part of the assessment, specific consideration was given to:

- depth of cover,
- rock head cover;
- panel width;
- chain pillar geometry;
- extraction height;
- spanning capabilities of the conglomerate-dominated overburden;
- floor properties (in particular weak and moisture sensitive claystone units);
- potential for additional long-term subsidence/creep;
- the location of the proposed extraction outside of both the high water mark subsidence barrier (HWMSB) and identified seagrass communities (Plan 2 of Appendix 12); and
- the location of the workings with regard to previous workings in the same seam.

Predicted subsidence effect parameters are summarised in Table 7.

Table 7 - Predicted Subsidence Effects (Strata2 2019)

Panel	Subsidence (m)	Angle of draw
MWS5	0.5m	<26.5º
NPA	0.5m	<26.5º

Lake bed fracturing

Ditton (2015) indicated that, based on previous experience at nearby mines, it can be assumed that any surface cracking to the rock head below the lake bed sediments is likely to be minor for the predicted range of surface subsidence magnitudes. Tensile strains were predicted to be up to 1.5 mm/m and maximum crack widths were estimated to be <20 mm at rock head. MSEC (2018) arrived at a similar conclusion, with fractures of ≤10 mm at the rock head extending to a depth of up to 3 m.

It is likely that any cracks that occur will be naturally 'filled' by lake bed sediments with no impact on the lake bed itself. The strains at the lake bed surface itself will also be more uniformly distributed and are therefore more likely to be absorbed by the plastic nature of the sediments.

Sub-surface fracturing

Two methods have been adopted for estimating the height of sub-surface fracturing, namely:

- a model developed by Ditton and Merrick (2014) that has been used successfully for all previous secondary extraction at CVC; and
- a model developed by SCT (2008) as part of an ACARP project investing aquifer inflow predictions above longwall panels.

3.2.1.1 Ditton and Merrick (2014)

The approach adopted by Ditton and Merrick (2014) builds on the work of Whittaker and Reddish (1989) and Forster (1995). The nomenclature of the sub-surface fracturing model is described in Figure 1. The predicted height of connective cracking is termed the “A Horizon” (Whittaker and Reddish) or “Fractured Zone” (Forster 1995).

The Ditton & Merrick (2014) model includes data from Forster (1995) and can be used to assess both sub-critical and supercritical panel geometries, whereas the original Forster (1995) work focussed on super-critical panels. DgS (2018b) back analysed sub-critical and supercritical behaviour relating to height of fracturing for previous MC and CVC panels and found these models to provide reliable height of fracturing predictions.

The results for an extraction height (T) of 3.5 m are summarised in Table 8.

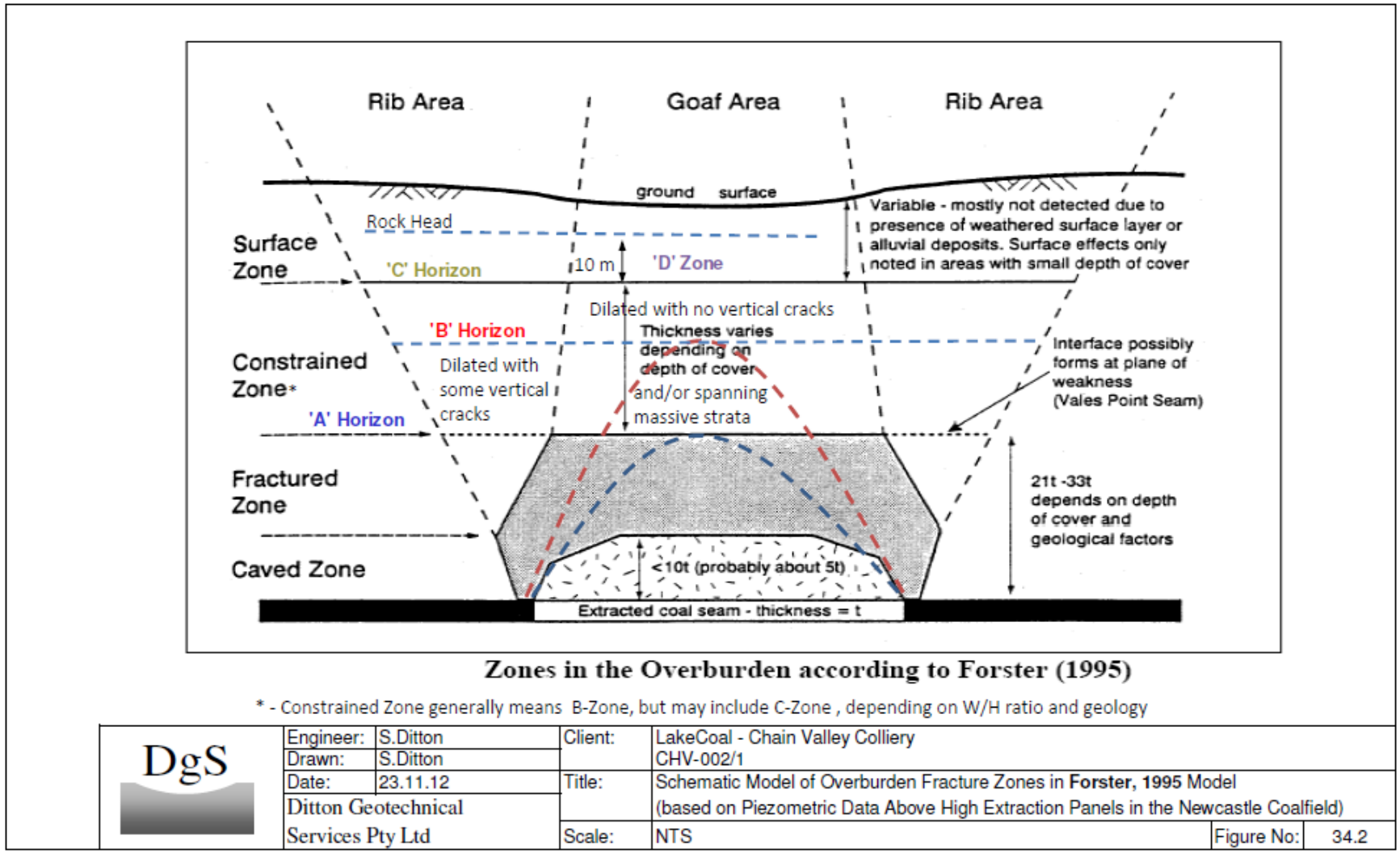


Figure 1 - Overburden fracture zones (Source: Ditton 2013)

To obtain accurate rock head cover values, the mine conducted a detailed geophysical survey of lake bed sediment thickness over the northern mining domain in early 2018. This survey has shown that the sediment is often thicker than previously estimated, particularly in the central lake area.

The predicted heights of fracturing above Miniwall S5 the Northern Pillar area is <81m and <74m respectively. The Ditton and Merrick (2014) model indicates that there is sufficient cover to meet a minimum constrained zoned thickness of 12T (Forster 1995). This is considered acceptable given the quality of the data, the absence of major geological structures and the sub-critical nature of the panels.

This is consistent with the successful application of the model in the MW1-12, CVB1, S1, N1, S2 and S3 areas, noting that MW 11 and 12 involve similar depths of cover and haven't experienced any signs of interconnectivity.

3.2.1.2 SCT (2008)

The approach adopted by SCT (2008) also builds on the work of Whittaker and Reddish (1989) as it links inflow experiences to subsidence and systematic tensile strains. Essentially, no issues are expected at strains of <4 mm/m and major difficulties are anticipated at strains of >10 mm/m (assuming a 'k' value of 0.6). These findings are consistent with those of Whittaker and Reddish (1989), as well as Wardell (1975).

Experience at CVC and MC is consistent with that from elsewhere, with no inflow issues at low strain values. The predicted subsidence and systematic strain values for the proposed MWS5 and NPA are at the low end of the database, such that no issues are anticipated.

3.2.1.3 Summary

The maintenance of a sub-critical panel geometry with subsidence at the low end of the historical range for miniwall operations at CVC results in acceptable outcomes in terms of the height of connective fracturing for the combined S2, S3, S4,S5 and NPA panels.

Potential environmental consequences

Based on predicted maximum panel subsidence, tilt and strain values for Miniwall S5 and NPA, potential subsidence-related impacts and their likely effect on nearby natural and man-made features have been considered, including:

- changes to the lake bed level;
- surface cracking beneath the lake bed;
- height of sub-surface fracturing above the panels (direct and indirect hydraulic connection zones);
- impacts on groundwater; and
- impacts on the foreshore of Lake Macquarie and surrounding natural and man-made features inclusive of public safe risks.

Extraction Plan Risk Assessment (Appendix 3) evaluated overall environmental risk (as it relates to subsidence impact) for MWS5 and NPA. From this and via application of mine design controls (refer Section 3.1) along with monitoring and response management systems (eg trigger action response plans (TARPs)), the risk of irregular subsidence impacting the foreshore or sensitive environmental features was considered highly unlikely.

Subsidence-related changes to the lake bed level and resultant impacts on benthic and seagrass communities and wave climate were assessed as part of the marine ecology assessments prepared by JSA Environmental in support of the CVC Mod 2 SEE (EMM 2015) and CVC Mine Extension Project EIS (EMM 2013).

As part of the previous Mod 2 Statement of Environment Effects environmental assessment, an aquatic biological survey was conducted, which included consideration of soft bottom benthic communities and seagrass mapping. Ground truthing of the seagrass beds since the original mapping has been utilised along with additional mapping data and satellite imagery to provide the most accurate location of seagrass beds at the time of this EP and inform the location of protection barrier offsets for mine design.

Considering the survey results, the proposed mine plan and the modelled subsidence predictions, JSA Environmental concluded as part of previous assessments that there would be no more than minor impacts on benthic communities and negligible impacts on seagrass levels as a result of proposed mining. This has been supported through the results of ongoing monitoring activities.

Given the additional mine plan controls that have been implemented since the time of the marine ecology assessments, these impacts are not expected to increase. In addition, bathymetric surveys conducted by Astute Surveying have been increased to six monthly intervals to validate and update predictions and control effectiveness (including survey prior to any secondary extraction at CVC). The results of the bathymetric surveys will be used to confirm predicted subsidence levels and mapping of seagrass levels and benthic communities will be ongoing throughout the period of extraction within Miniwall S5 and NPA. These results will be used to confirm whether subsidence and associated impacts are maintained within predicted levels.

Leading wave climate experts from University of NSW's Water Research Laboratory concluded that the predicted subsidence will not affect the wave climate sufficiently to have adverse shoreline impacts.

In regard to surface cracking beneath the lake bed, the strains at the lake bed surface itself are expected to be more uniformly distributed and are therefore more likely to be absorbed by the plastic nature of the sediments. Any cracks are therefore likely to be naturally filled by lake sediments with no significant impact on the lake bed itself.

The predicted height of continuous and discontinuous fracturing above the proposed miniwall is below the logged rock head thickness above the panels and provides for sufficient constrained zone thickness at the adjusted extraction heights. As such, it is considered very unlikely that hydraulic connection between the lake and the mine workings will occur or that connection between mining-related fractures and the lake will cause significant impacts on the lake. Additional monitoring (including an extension of CVC's subsidence management TARP) will be put in place to monitor for early signs of unexpected subsidence.

In regard to surface features, namely the lake foreshore and features surrounding the foreshore, both the HWMSB and seagrass protection barrier have been applied as part of the mine design process.

Routine monitoring and TARPs will continue to be implemented to identify and respond to any unanticipated changes as a result of extraction in Miniwall S5 and NPA further adaptive management and contingency controls will be implemented as required.

Predicted subsidence and tilt for Miniwall S5 (Table 9) at the Pelican Rock Navigational marker are considered manageable and will be managed via the Subsidence Management TARP (Appendix 4).

Table 9 - Navigation marker predicted subsidence parameters

Navigational Marker	Vertical Subsidence Predictions	Tilt predictions
Pelican Rock (NLM045)	• 155mm	• <4mm/m
Sugar Bay Rock (NLM062)	• < 20mm	• Negligible
Fishery Point (NLM063)	• <20mm	• Negligible
Casuarina Point (NLM064)	• <20mm	• Negligible

3.3 Performance objectives

Development consent conditions

Condition 1, Schedule 4 of SSD-5465 states:

The Applicant must ensure that vertical subsidence within the High Water Mark Subsidence Barrier and within seagrass beds is limited to a maximum of 20 millimetres (mm). If at any stage predicted subsidence levels are exceeded within these areas, an ecological monitoring program shall be initiated to assess the impacts to ecological communities and threatened species and if appropriate, offsets are to be provided for any impacts detected.

At present there is no expectation that predicted subsidence levels will be exceeded based on actual subsidence monitoring and subsidence predictions. The adopted mine design has been developed with the aim of achieving no additional subsidence impact due to Fassifern Seam extraction within the high water mark or seagrass areas. Nonetheless, a Subsidence Management TARP will be implemented as outlined in Section 3.4 to deal with unanticipated subsidence impacts in a proactive manner (in the unlikely event they occur).

Condition 2, Schedule 4 of SSD-5465 states:

> The Applicant must ensure that the development does not cause any exceedance of the performance measures in Table 6 to the satisfaction of the Planning Secretary.

Biodiversity	
Threatened species or endangered populations	*Negligible environmental consequences.*
Seagrass beds	*Negligible environmental consequences including:* • *negligible changes in size and distribution of seagrass beds;* • *negligible change in the function of seagrass beds; and*

	• *negligible change to the composition or distribution of seagrass species within seagrass beds.*
Benthic communities	*Minor environmental consequences, including minor changes to species composition and/or distribution.*
Mine workings	
First workings under an approved Extraction Plan beneath any feature where performance measures in this table require negligible environmental consequences	*To remain long term stable and non-subsiding*
Second workings	*To be carried out only in accordance with an approved Extraction Plan.*

Notes:

The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) for each of these performance measures in the various management plans that are required under this consent (see Condition 7 below).

Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Planning Secretary will be the final arbiter.

The requirements of this condition only apply to the impacts and consequences of mining operations, construction or demolition undertaken following the date of approval of this consent.

Fassifern Seam first workings in the Miniwall S5 and NPA area are not beneath any of the features listed in Table 6 of SSD-5465. Should a change to first workings necessitate this, the first workings will be designed to be long-term stable.

In the unlikely event that greater than negligible/minor impacts occur, the Subsidence Management TARP (Appendix 4) will be implemented. The TARP includes detailed performance indicators.

Condition 4 of Schedule 4 of SSD-5465 states:

> The Applicant must ensure that the development does not cause any exceedances of the performance measures in Table 7, to the satisfaction of the Planning Secretary.

Built features	
Trinity Point Marina Development *Other built features*	• *Always safe.* • *Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated.* • *Damage must be fully compensated.*
Public safety	
Public safety	*Negligible additional risk.*

Notes:

The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) for each of these performance measures in measures in the Built Features Management Plans or Public Safety Management Plan (see Condition 7 below).

Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Planning Secretary will be the final arbiter.

The requirements of this condition only apply to the impacts and consequences of mining operations, construction or demolition undertaken following the date of approval of this consent.

Requirement's regarding safety or serviceability do not preclude preventative actions or mitigation being taken prior to or during mining in order to achieve or maintain these outcomes.

Requirement's under this condition may be met by measures undertaken in accordance with the Coal Mine Subsidence Compensation Act 2017

MWS5 and NPA are outside any zones that may affect the Trinity Point Marina Development and other built features.

In the unlikely event that greater than negligible/minor impacts occur, the Subsidence Management TARP (Appendix 4) will be implemented. The TARP includes detailed performance indicators.

Other regulatory requirements

Prior to commencement of secondary extraction activities within MWS5 and/or NPA, a Secondary Extraction High Risk Activity Notification is required under Clause 33(1) of the NSW Work Health and Safety (Mines) Regulation 2014.

3.4 Subsidence management strategies and measures

Overview

The overall framework for subsidence monitoring and management of impacts is summarised in Figure 2.

Details of relevant triggers and performance indicators (including measured subsidence and inspections for environmental impact) are provided in relevant component plans. These management plans also include specific information regarding subsidence monitoring requirements (including baseline monitoring), remediation, adaptive management techniques and contingency plans. A summary is provided in the Subsidence Management TARP (Appendix 4), which aims to consolidate all subsidence management requirements into a central location, triggering a response or set of responses commensurate with the nature of the measurement or the impact that has been identified.

Mine design elements

Mine design parameters such as panel start and finish position, panel width, chain pillar width and barrier pillar width in conjunction with an assessment of overlying strata, depth of cover and depth of rock head all contribute to the management of vertical subsidence effect and impacts.

MWS5 and NPA has been designed to ensure that no secondary extraction will occur within the HWMSB or seagrass protection barrier. This will help to avoid any potential significant impacts on the foreshore of Lake Macquarie or seagrass communities in shallow foreshore areas.

The outcomes of the updated subsidence predictions have further informed the mine design strategies to be undertaken as outlined in Section 3.1. Adaptive management recommendations have been applied to the final mine design.

Remediation strategies

Remediation strategies are incorporated into the Subsidence Management TARP (Appendix 4). These also follow the principles outlined in the Rehabilitation Management Plan (Appendix 10).

The current Mining Operations Plan includes Miniwalls S5 and the NPA and was approved in August 2020.



Figure 2 – Subsidence monitoring and management framework

Adaptive management strategy

CVC's Subsidence Management TARP includes a series of triggers and responses when subsidence levels exceed those predicted.

The extensive mining history in and around CVC's operations has greatly improved the accuracy of CVC to predict subsidence levels and allowed CVC to develop mine design guidelines to protect against foreshore, seagrass and lake bed impacts.

Based on recent history at CVC (using similarly-designed miniwall panels), exceedances of predicted subsidence effects and impacts are unlikely. However, the routine collection of data such as regular bathymetric surveys, foreshore subsidence surveys, groundwater assessments, seagrass mapping and benthic community surveys will allow rapid and proactive verification of both initial and final subsidence effects and impacts such that adaptive measures (eg mine design changes, increased barrier pillars, widening of protection zones, etc) can be undertaken in a timely manner to mitigate against and minimise the impact of any unforeseen exceedances.

4 Extraction Plan Guidelines and Component plans

4.1 Overview

The Draft *Guidelines for the Preparation of Extraction Plans* (DPE) specify that six component plans should be prepared as part of an EP.

The high-level structure for the extraction plan should be as key component plans/programs (in bold) listed in the draft Guidelines and include the following:

- **Water Management Plan** (Appendix 5);
- **Land Management Plan** (Omitted as not required in CVC consent and Extraction area is located under Lake Macquarie);
- **Biodiversity Management Plan** (Appendix 6)

  Benthic Communities Management Plan (Appendix 7)

  Seagrass Management Plan (Appendix 8);
- **Heritage Management Plan** (Appendix 9);
- **Built Features Management Plan** (Appendix 10)
- **Public Safety Management Plan** (Appendix 11)
- **Rehabilitation Management Plan** (Appendix 12)
- **Subsidence Monitoring Program** (Appendix 13)
- **Implementation**
- **Graphical Plans** (Appendix 14); and
- **Attachments** –
- Extraction Plan Risk Assessment (Appendix 3)
- Subsidence Prediction Report (Appendix 15)

As MWS5 and NPA is located beneath Lake Macquarie there are management plans specific to the Lake Macquarie marine environment (Benthic Communities Management Plan and Seagrass Management Plan).

Management of impacts identified via the Subsidence Monitoring Program (Chapter 5) are commensurate with the nature of the measurement or the identified impact. This EP relies on the aforementioned component plans to address these impacts to particular environmental or built features within the Miniwall S5 area.

A summary of the intent of each component plan and how it relates to Miniwall S5 is provided below.

4.2 Water Management Plan

CVC's Water Management Plan (Appendix 5) which includes the updated Groundwater Management Plan considers the potential for extraction within Miniwall S5 to contribute to regional groundwater drawdown and a reduction of private water bore yields.

Due to the existing large extent of depressurisation from historical mining, impacts from mining within MWS5 are considered negligible. Nonetheless, controls have been adopted, which include:

- continuation of the groundwater monitoring program;

- faults or dykes within Miniwall S5 are to be assessed case-by-case as to whether an extraction barrier is required to prevent hydraulic connection; and
- where access is available, monitoring of bore yields, saturated thickness and quality (if mining-related impacts can be proven, an alternative water supply will be provided until the bore recovers).

The Groundwater Management Plan has been updated as part of this EP. Other potential water-related impact risks due to extraction are either not applicable due to the extraction being contained wholly below Lake Macquarie or not relevant due to no risk of impact.

4.3 Biodiversity Management Plan

CVC's Biodiversity Management Plan (Appendix 6) was reviewed in 2016 and a draft for consultation was provided to DPIE and stakeholders on the 1 December 2019. Only the Benthic Communities Management Plan (BCMP) (Appendix 7) and Seagrass Management Plan (SMP)(Appendix 8) components are applicable to this EP. The Seagrass Management Plan also includes consideration of potential biodiversity impacts to sea turtles.

The BCMP and SMP have been reviewed and updated and provided to stakeholders on 4 December 2020 and 27 November 2020 respectively.

Bathymetric surveys and benthic and seagrass monitoring will be undertaken prior to and post extraction. Monitoring locations are tailored to confirm that negligible changes are being recorded as required by SSD-5465.

If impacts are identified that are outside CVC's approved performance criteria, DC will investigate and undertake an assessment of the impacts. If the impacts cannot be remediated, a suitable offset will be provided in accordance with Condition 3 of Schedule 4 of SSD-5465.

4.4 Heritage Management Plan

CVC's Heritage Management Plan was reviewed and a draft for consultation was provided to stakeholders on the 6 November 2020 (Appendix 9). The Heritage Management Plan includes location and consideration of potential impacts to indigenous and non-heritage items.

All mining activities within MWS5 and NPA will occur beneath Lake Macquarie and as such will have no predicted direct impact on heritage features.

4.5 Built Features Management Plan

CVC's Built Features Management Plan (Appendix 10) was reviewed and updated as a part of this EP. This management plan was submitted for consultation with the relevant stakeholders as required by SSD-5465. Survey monitoring will be undertaken as per the Subsidence Monitoring Program. There are no built features identified above MWS5 and NMA.

If impacts are identified that are outside CVC's approved performance criteria, DC will investigate and undertake an assessment of the impacts.

4.6 Public Safety Management Plan

All mining activities within MWS5 and NPA will occur beneath Lake Macquarie and as such will have no direct impact on surface facilities and infrastructure.

One navigational marker (Plan 2 of Appendix 15) is predicted to have negligible subsidence impacts from MWS5. As noted previously, RMS has been consulted in relation to this and have concluded that no direct management will be required and the marker will be able to be monitored as a part of routine inspections.

All proposed secondary extraction is outside of the HWMSB and Seagrass Protection Barrier and as such, no adverse impacts are anticipated on the immediate foreshore of Lake Macquarie as a result of extraction in MWS5 or NPA.

Based on CVC's approved mine design, mining is not expected to result in any noticeable impacts along foreshore areas. Despite this, CVC will monitor the foreshore zone for any sign of change and if impacts as a result of mining are observed, a review of public safety measures will be triggered via the Subsidence Management TARP (Appendix 4).

Actions will be implemented by DC to reduce the risk to the public in the unlikely circumstance that impacts are identified outside those predicted and approved.

No other immediate increase in public safety risks have been identified.

4.7 Rehabilitation Management Plan

All mining activities within MWS5 and NPA will occur beneath Lake Macquarie and as such will have no direct impact on surface facilities and infrastructure.

See **Appendix 12** for the CVC Rehabilitation Management Plan.

4.8 Risk assessment

A risk assessment was conducted on 27 August 2020 and prepared as part of this EP (Appendix 3).

Each of the component management plans prepared for this EP include consideration of risk management.

4.9 Compensation and offsets

Based on predicted impacts, no compensation and/or offset requirements are anticipated.

5 Subsidence monitoring program

5.1 Overview

A copy of the Subsidence Monitoring Program is appended to this EP (Appendix 13) and environmental monitoring programs are provided in each of the relevant component plans. The proposed shoreline subsidence monitoring locations are shown on Plan 7 of Appendix 15.

Subsidence management at CVC is achieved through a combination of mine design and continual monitoring of key subsidence-related effects and impacts via the Subsidence Management TARP (Appendix 4). Regular and routine monitoring of the foreshore, lake bed, seagrass communities and benthic communities provide a means to verify and validate that predicted subsidence levels are not being exceeded and that the resultant levels of subsidence are not resulting in excessive impacts beyond those predicted. The mine design can be adapted and refined (as required) if exceedances occur or are likely to occur.

Bathymetric surveys of the lake bed and surveys of the foreshore will be used to validate and confirm predicted vertical subsidence around MWS5 and NPA. Ongoing environmental monitoring (benthic and seagrass community surveys) will ensure that resultant vertical subsidence levels are not resulting in greater impacts than predicted.

As Lake Macquarie lies above MWS5 and NPA, measurement of sub-surface fracture heights above the proposed miniwall is not recommended due to risks associated with drilling from a barge and potential intersection with goafs from barge-mounted drilling rigs after mining a given panel. Monitoring of groundwater inflow rates will be utilised to provide an indirect measure of connectivity between the lake and mine workings.

Ongoing inspections, monitoring and mapping of the stability of underground workings will continue along with assessments of groundwater monitoring data. In particular, the presence of a fault, dyke or joint shear zone that may have the potential to cause a hydraulic connection between the fracture zones, resulting in abnormal inflows, will be assessed on a case-by-case basis.

As stated previously, any strains at the lake bed surface itself will likely be more uniformly distributed and are therefore more likely to be absorbed by the plastic nature of the sediments. Accordingly, no monitoring or remediation for the potential minor cracking will be required as may be undertaken for land based cracking.

5.2 Monitoring frequency and review

As described in the Subsidence Monitoring Program, subsidence monitoring will include a combination of bathymetric surveys and foreshore level monitoring. Subsidence monitoring frequencies are defined in Table 11 and will be established to:

- validate model outcomes;
- enable early detection of subsidence impacts over those predicted; and
- allow early application of containment, adaptive and contingency measures to prevent impacts outside approved (particularly any potential increased impacts to the foreshore).

Table 11: Subsidence monitoring frequency

Monitoring type	Pre-extraction	During extraction	Post extraction
Bathymetric surveys	Single baseline survey prior to extraction.	End of panel survey for Miniwall S5.	Annual for 3 years unless TARP triggered.
Foreshore level monitoring	Baseline survey prior to commencement of extraction.		Annual for 3 years unless TARP triggered.

6 Implementation

6.1 Incidents and non-compliances

Procedure for investigation of incidents

In accordance with Condition 7 of Schedule 6 of Development Consent SSD-5465, CVC will notify and other relevant agencies of any incident, non-compliance or exceedance of performance criteria associated with this EP immediately after CVC becomes aware of the incident.

Within 7 days of the date of the incident or non-compliance, CVC will provide a detailed report on the incident to the Secretary and other relevant agencies. The incident investigation will follow CVC's Incident Reporting and Investigation procedure.

Procedure for quality assurance and review

The results of monitoring undertaken as part of the implementation of this EP will be provided to CVC's CCC at each meeting (occur quarterly).

Regular review of the EP and component plans is required by the conditions in Schedule 6 of SSD-5465. CVC is required to review and, if necessary, revise, the EP and relevant strategies, plans and programs within three months of the submission of:

- an audit under Condition 9 of Schedule 6 of SSD-5465;
- an incident report under Condition 7 of Schedule 6 of SSD-5465;
- an annual review under Condition 4 of Schedule 6 of SSD-5465; or
- any modification to the conditions of SSD-5465.

Any revisions to this EP (including component plans) must be completed to the satisfaction of the Secretary.

Complaints

Complaints in relation to the management of subsidence will be managed using the established protocols in Delta Coal's *Environmental Management System*.

Regular reporting

Regular reporting will be undertaken in accordance with the conditions within SSD-5465 and the relevant component management plans. Reports will be provided to DPIE and relevant agencies and will be posted on DC's website and discussed at CCC meetings. The results of monitoring undertaken as part of the implementation of this EP will be provided to CVC's CCC at each meeting (occur quarterly).

Annual reporting

As per Condition 4 of Schedule 6 of SSD-5465, by the end of March each year (or other timing as may be agreed by the Secretary), DC will review environmental performance at CVC for the previous year and submit an annual review, including:

- a description of the development (including any rehabilitation) that was carried out in the past calendar year, and the development that is proposed to be carried out over the current calendar year;

- a comprehensive review of the monitoring results (including subsidence) and complaints records of the development over the past calendar year, which includes a comparison of these results against the:
    - relevant statutory requirements, limits or performance measures/criteria;
    - requirements of any plan or program required under this consent (including this EP and the component plans);
    - monitoring results of previous years; and relevant predictions in the EIS;
- any non-compliance over the past calendar year and a description of what actions were (or are being) taken to ensure compliance;
- any trends in the monitoring data over the life of the development;
- any discrepancies between the predicted and actual impacts of the development (including with regards to subsidence) and an analysis of the potential cause of any significant discrepancies; and
- a description of what measures will be implemented over the coming year to improve the environmental performance of the development.

6.2 Document review

In addition to routine auditing and review of environmental management plans, environmental management systems at CVC will be independently reviewed every three years by external experts suitably qualified to undertake such a review.

Regular review of the EP and component plans is required by the conditions in Schedule 6 of SSD-5465. CVC is required to review and, if necessary, revise, the EP and relevant strategies, plans and programs within three months of the submission of:

- an audit under Condition 9 of Schedule 6 of SSD-5465;
- an incident report under Condition 7 of Schedule 6 of SSD-5465;
- an annual review under Condition 4 of Schedule 6 of SSD-5465; or
- any modification to the conditions of SSD-5465.

Any revisions to this EP (including component plans) must be completed to the satisfaction of the Secretary.

6.3 Responsibilities

The overall responsibility for the implementation of this extraction plan sits with the Manager of Mining Engineering; however, other DC employees will have responsibilities under this EP to ensure that it is effectively implemented (Table 12).

Table 12: Roles and responsibilities for the implementation of this EP

Role	Responsibilities
Managing Director	- Ensure that adequate financial and personnel resources are made available for the implementation of the EP
Manager of Mining Engineering	- Maintain overall responsibility for environmental compliance with Mining Lease, EPL, SSD-5465 and other mining approvals as they pertain to subsidence management - Ensure all operations are undertaken in accordance with this EP - Ensure all mining is undertaken in accordance with approved mine plans
Technical Services Manager	- Provide adequate resources for the activities required under this EP - Provide technical review and assistance during the development of the EP and appendices - Coordinate technical sub consultants used as part of this EP
Environment Compliance Coordinator	- Coordinate and undertake all environmental monitoring required under this EP - Ensure all reporting and monitoring is completed to an appropriate standard and in a timely manner - Ensure any discrepancies between actual monitoring results and predicted outcomes are reported to appropriate stakeholders as soon as practicable - Manage the implementation of all environmental management plans under this EP - Be responsible for all environmental reports, management plans, community consultation and communication with stakeholders and regulatory authorities
Mine Surveyor	- Preparation of the Subsidence Monitoring Program - Coordinate and undertake all subsidence monitoring requirements - Maintain plans and records of all subsidence monitoring - Distribute survey data to relevant stakeholders within agreed timeframes - Report any discrepancies and/or exceedances of actual survey results from expected/predicted data to the Environment and Community Coordinator and Manager of Mining Engineering - Prepare all subsidence-related reporting to an appropriate standard
All employees and contractors	- Comply with the requirements of this EP

7 Document control

7.1 Records

Generally, the Environment and Community Coordinator will maintain all Environmental Management System records which are not of a confidential nature. Records that will be maintained include:

- monitoring data and equipment calibration;
- environmental inspections and auditing results;
  environmental incident reports;
- complaints register; and
- licences and permits.

All records will be stored so that they are legible, readily retrievable and protected against damage, deterioration and loss. Records will be maintained for a minimum of four years or as otherwise required under any legislation, licence, lease, permit or approval.

7.2 Document control

This document and all others associated with CVC's Environmental Management System shall be maintained in a document control system which is in compliance with CVC's Document Control Standard. Any proposed changes to this document will be via the Environment and Community Coordinator.

Details on document revisions are provided in Table 13.

Table 13: Document revision details

Version	Date	Details of revision	Company	Reviewed by/ Authorised by
1	17/12/2020	Draft EP	Delta Coal	C. Armit
1.1	18/01/2020	Comments incorporated from stakeholders	Delta Coal	C. Armit
1.2	10/03/2021	EP updated with comments from DPIE Request for Information letter (05/03/21)	Delta Coal	C.Armit

8 References

DgS (Ditton Geotechnical Services Pty Ltd) 2015, *Subsidence Predictions and General Impact Assessment for Chain Valley Colliery – Modification 2* (CHV-002/4). Report prepared by DGS for LakeCoal.

- 2018a, *Updated Investigation Report into the Maximum Subsidence Prediction Exceedances over the Miniwalls 1 to 12 at Chain Valley Colliery* (CHV-002-10b). Report prepared by DGS for LakeCoal.

- 2018b*, Subsidence Impact Assessment of the Proposed Northern Area Miniwalls (S1 and N1) at Chain Valley Colliery,* (DGS CHV-002-11a). Report prepared by DGS for LakeCoal.

Ditton, S and Frith, R 2003, *Review of industry subsidence data in relation to the influence of overburden lithology on subsidence and an initial assessment of a sub-surface fracturing model for groundwater analysis*. Report prepared for the Australian Coal Industry's Research Program.

Ditton, S and Merrick, N 2014, *A New Sub-Surface Fracture Height Prediction Model for Longwall Mines in the NSW Coalfields,* presentation given at the Australian Earth Sciences Convention.

DPE (NSW Department of Planning and Environment) no date, Draft *Guidelines for the Preparation of Extraction Plans,* Version 5.

EMM (EMM Consulting Pty Limited) 2013, *Chain Valley Colliery Mining Extension Project – Environmental Impact Statement*. Report prepared by EMM for LakeCoal.

- 2014, *Chain Valley Colliery Modification 1 – Statement of Environmental Effects*. Report prepared by EMM for LakeCoal.

- 2015, *Chain Valley Colliery Modification 2 – Statement of Environmental Effects*. Report prepared by EMM for LakeCoal.

- 2019, *Chain Valley Colliery Modification 3 – Statement of Environmental Effects*. Report prepared by EMM for Delta Coal.

Forster, I 1995, *Impact of Underground Coal Mining on the Hydrogeological Regime, Central Coast, NSW,* Proceedings of Conference on Engineering Geology of the Newcastle-Gosford Region, Australian Geomechanics Society, Newcastle.

MSEC 2018, *Subsidence Predictions and Impact Assessments for the Natural and Built Features due to the Extraction of the Proposed Miniwalls S2 and S3 in Support of the Extraction Plan* (979 Rev. 2). Report prepared by MSEC for Lake Coal.

SCT (SCT Operations Pty Ltd) 2008, *Aquifer Inflow Prediction above Longwall Panels* (C13013). Report prepared for the Australian Coal Industry's Research Program.

Strata2 2018, Geotechnical Aspects of S2 and S3 Panel Design (CHV-006-Rev1). Report prepared by Strata2 for Delta Coal.

- 2019, *Geotechnical Aspects of S4 Panel Design* (CHV-010-Rev0). Report prepared by Strata2 for Delta Coal.
- 2020, *Miniwall S5 and Northern Mining Area* (CHV-024-Rev2):Geotechnical Environment, Subsidence Estimates and Ipmacts. Report prepared by Strata2 for Delta Coal.

Whittaker, BN and Reddish, DJ 1989, *Subsidence: Occurrence, Prediction and Control,* Development in Geotechnical Engineering Series 56, Elsevier Science Publishing.

9 Abbreviations

ACARP	Australian Coal Industry Research Program
CCC	Community Consultative Committee
CVC	Chain Valley Colliery
DC	Delta Coal
DPIE	NSW Department of Planning, Industry and Environment
EIS	Environmental impact statement
EMS	Environmental Management System
EP	extraction plan
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
MC	Mannering Colliery
Mining Act	NSW *Mining Act 1992*
POEO Act	NSW *Protection of the Environment Operations Act 1997*
ROM	run-of-mine
Secretary	Planning Secretary of DPIE (or nominee)
SEE	Statement of environmental effects
SSD	State significant development

Appendix 1 Consultation

Chris Armit

From: Chris Armit
Sent: Thursday, 17 December 2020 3:15 PM
To: rog.hcc@environment.nsw.gov.au; Resources Regulator; Margaret MacDonald-Hill; scott.carter@dpi.nsw.gov.au; Geoffrey Keech; Melissa Sawatsky; Council@lakemac.nsw.gov.au; dpi.cabinet@dpi.nsw.gov.au; cassandra.mcnamara@dpi.nsw.gov.au; Matthew.Montgomery@finance.nsw.gov.au; Ray Ramage; dan.adams@planning.nsw.gov.au; Robert Gibson; Joanna Pajkowska; landuse.enquiries@industry.nsw.gov.au; water.referrals@dpi.nsw.gov.au; Mitchell Isaacs; Danielle.Allen@centralcoast.nsw.gov.au; Jenny Mewing; EPA RSD Hunter Region Mailbox; Steve Clair; HERITAGEMailbox@environment.nsw.gov.au
Cc: Tim Chisholm; Chris Nicholas; Dave McLean; David Hill; Melissa Anderson; Matthew Sprott
Subject: Miniwall S5 and Northern Pillar Area Extraction Plan draft for comment and associated MP status

Dear All,

The draft Miniwall S5 and Northern Pillar Area Extraction Plan document (as a word doc) has been uploaded onto the Delta Coal website (https://www.deltacoal.com.au/environment/chain-valley-colliery/ch) for your comment. After 14 January 2021 (i.e. 28 days) and the inclusion/consideration of your comments this Extraction Plan document will be uploaded onto the DPIE planning portal.
Also available in this part of the website is the Subsidence Prediction report for your review.

By way of an update the mine is continuing with secondary extraction beneath Lake Macquarie with current miniwall production being in MWS4 and are planning to commence mining in Miniwall S5 in April 2021. Bord and Pillar (Herringbone) commenced in August 2020 with Pillar Extraction planned in July 2021.

The associated management plan reviews have been and are being submitted to relevant stakeholders and comments are being received, thank you for your comments on these.

Associated Management Plan	Submitted to stakeholders
CVC Benthic Communities MP	November 2020
CVC Seagrass MP	November 2020
DC Heritage MP	November 2020
CVC Rehabilitation MP	December 2020
CVC Public Safety MP	December 2020
CVC Built Features MP	December 2020
CVC Water MP	December 2020

As always, happy to go through any comments you have in person or over the phone.

Thanks for your collective assistance over 2020 and look forward to working with you all again in 2021. Happy Holidays !

Regards,
Chris

Chris Armit
Approvals Coordinator
Phone: 02 4358 0800
Mobile: 0409 070 233

Chain Valley Colliery

Off Construction Rd (Off Ruttleys Rd)
Mannering Park NSW 2259



DPIE Request for Information Letter

Planning, Industry & Environment
NSW GOVERNMENT

Chris Armit
Approvals Coordinator
Chain Valley Colliery

Off Construction Rd (Off Ruttleys Rd)
MANNERING PARK, NSW, 2259

05/03/2021

Dear Mr Armit

Chain Valley Colliery
Extraction Plan – Miniwall S5 and Northern Pillar Area

I refer to the Extraction Plan dated January 2021 for Miniwall S5 and the Northern Pillar Area (NPA) at the Chain Valley Colliery, submitted in accordance with condition 7 of Schedule 4 of the Chain Valley Extension Project development consent (SSD 5465).

The Department has reviewed the Extraction Plan and identified several clarifications and minor matters that must be addressed by way of improvements to various parts of the Extraction Plan and its sub-plans (see Attachment A). The Department is satisfied that these matters can be addressed in a timely manner and would not materially change the ability of Delta Coal to effectively manage subsidence impacts.

In summary, the revised Extraction Plan should:

- include the detailed plans of existing and proposed first and second workings that clearly indicate the High Water Mark Subsidence Barrier (Plan 2) and show that all areas of proposed extraction are outside of the Seagrass Protection Barrier;
- where necessary refer to the proposed extraction of Miniwall S5 and the NPA, not previously extracted miniwalls;
- include detailed performance indicators and contingencies for Threatened Species or Endangered Populations, as required by Table 6 of the conditions of consent;
- include timeframes for the implementation of contingency measures set out in the Subsidence Management TARP;
- include evidence of further consultation, including specific details of the comments received from agencies and the actions taken in response to those comments; and
- align with the current consolidated conditions of consents, including alignment with the timing of document reviews and revisions.

The attached comments on the Extraction Plan and its sub-plans must be addressed to the satisfaction of the Secretary prior to the Department granting its final approval of the Extraction Plan. As noted above, the Department believes that they can be readily addressed in a timely manner. It would be appreciated if Delta Coal provides an electronic copy of the revised document, with tracked changes, allowing for a more expedient review.

If you require any more information, please contact James McDonough on 9585 6313.

Yours sincerely

DPIE Request for Information Letter - Response Summary Table

DPIE Review	Response
include the detailed plans of existing and proposed first and second workings that clearly indicate the High Water Mark Subsidence Barrier (Plan 2) and show that all areas of proposed extraction are outside of the Seagrass Protection Barrier	Plan 2 updated to include clear indication of the High Water Subsidence Barrier. All secondary workings extraction areas are located outside of Seagrass Protection Barrier.
where necessary refer to the proposed extraction of Miniwall S5 and the NPA, not previously extracted miniwalls	Document updated for legacy miniwall naming (see tracked changes)
include detailed performance indicators and contingencies for Threatened Species or Endangered Populations, as required by Table 6 of the conditions of consent	Subsidence Management TARP updated to include Threatened Species or Endangered Populations
include timeframes for the implementation of contingency measures set out in the Subsidence Management TARP	Incident and non-compliance reporting timeframes included. Timeframes of contingency measures implementation added to the Subsidence Management TARP
include evidence of further consultation, including specific details of the comments received from agencies and the actions taken in response to those comments	See updates in section 2.5 Table 1 and Appendix 1 which includes specific stakeholder comment details and communications.
align with the current consolidated conditions of consents, including alignment with the timing of document reviews and revisions	Consent references updated to changes in SSD5465 Modification 3 numbering and conditions.
It would be appreciated if Delta Coal provides an electronic copy of the revised document, with tracked changes, allowing for a more expedient review	A Microsoft Word document has been provided with tracked changes included at the start of the document change process. Plan 2 amendment and Subsidence Management TARP were not able to be tracked changed as they were drafted in software without the tracked changes option.

DPIE Request for Information Table – Attachment A Response Summary Table

Delta Coal – Chain Valley Colliery
Miniwall S5 and Northern Pillar Area Extraction Plan Review – March 2021

Extraction Plan, Schedule 4, Condition 7	Satisfactory (Yes/No)	Comment	Action Required	Delta Coal Response
The Applicant must prepare an Extraction Plan for all second workings on site, to the satisfaction of the Planning Secretary. Each Extraction Plan must:	No	The Extraction Plan (EP) is considered a well-structured and written document, which includes good quality figures. The EP includes clear summaries of subsidence predictions, impacts, monitoring, management and performance measures.	See actions in the rows below.	
(a) be prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary;	Yes	Section 2.4 indicates that the EP has been prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Department of Planning, Industry and Environment (DPIE) (see letter dated 22/10/2020, provided as an attachment to the EP).	Nil	
(b) be approved by the Planning Secretary before the Applicant carries out any second workings covered by the plan;	N/a	N/a	N/a	
(c) include detailed plans of existing and proposed first and second workings and any associated surface development, including any applicable adaptive management measures;	No	Section 3.4 of the EP states that MWS5 and NPA has been designed to ensure that no secondary extraction will occur within the High Water Mark Subsidence Barrier (HWMSB) or Seagrass Protection Barrier (SPB). Plan 2 indicates there is a small area of proposed secondary extraction within the NPA, to the north-west of MWS5, that encroaches into the seagrass protection barrier. Further, the HWMSB is not clearly shown, despite being shown as a layer in the legend of this plan.	Update Plan 2 to show • all proposed secondary extraction occurring outside of the seagrass protection barrier; and • the HWMSB.	Plan 2 updated
(d) include detailed performance indicators for each of the performance measures in Tables 6 and 7;	No	Section 3.3 of the EP states that the Fassifern Seam first workings in the Miniwall S4 area are not beneath any of the features listed in Table 6 of SSD-5465. Should a change to first workings necessitate this, the first workings will be designed to be long-term stable. In the unlikely event that greater than negligible/minor impacts occur, the Subsidence Management TARP (Appendix 4) will be implemented. The TARP includes detailed performance indicators. The TARP does not include detailed performance indicators for Threatened Species or Endangered Populations (as listed in Table 6).	Update Section 3.3 of the EP to refer to Miniwall S5 and the NPA. Update the TARP to include detailed performance indicators for Threatened Species or Endangered Populations.	Section 3.3 updated Subsidence Management TARP updated
(e) provide revised predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed	Yes	Long-term vertical subsidence is predicted to be 500 mm, compared to the approved limit for subsidence of 780 mm beneath the waters of Lake Macquarie.	Nil	

Extraction Plan, Schedule 4, Condition 7	Satisfactory (Yes/No)	Comment	Action Required	Delta Coal Response
second workings, incorporating any relevant information obtained since this consent;		No impacts to sensitive environmental features or the built environment are predicted.		
(f) describe the measures that would be implemented to ensure compliance with the performance measures in Tables 6 and 7, and manage or remediate any impacts and/or environmental consequences;	Yes	The TARP does not include detailed performance indicators for Threatened Species or Endangered Populations (as listed in Table 6). It is therefore also lacking any description of the measures that would be implemented to ensure compliance with such indicators.	Update the TARP to include measures to ensure compliance with detailed performance indicators for Threatened Species or Endangered Populations.	Subsidence Management TARP updated for TS and Endangered populations
(g) include a Built Features Management Plan, which has been prepared in consultation with RR and the owners of affected public infrastructure, to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings, and which • addresses in appropriate detail all items of public infrastructure and all classes of other built features; • has been prepared following appropriate consultation with the owner/s of potentially affected feature/s; • recommends appropriate remedial measures and includes commitments to mitigate, repair, replace or compensate all predicted impacts on potentially affected built features in a timely manner; and;	No	The plan was submitted for consultation with the relevant stakeholders as required by the conditions of consent. However, consultation with the CCC is discussed in terms of the planned development of Miniwalls S2, S3 and S4. Further, no details of consultation are provided in Table 1.	Update Section 2.3 Consultation to refer to Miniwall S5 and the NPA and include within Table 1 the specific comments made by consultees and a summary of how they were addressed within the plan.	Evidence of CCC consultation of MWS5/NPA presentation provided in Appendix 1 Consultation Summary added to Table 1
(h) include a Benthic Communities Management Plan, which has been prepared in consultation with BCD, LMCC, and DPI Fisheries, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on benthic communities, and which includes: • surveys of the lake bed to enable contours to be produced and changes in depth following subsidence to be accurately measured; • benthic species surveys within the area subject to second workings, as well as control sites outside the area subject to second workings (at similar depths) to establish baseline data on species number and composition within the communities;	No	The plan was submitted for consultation with the relevant stakeholders as required by the conditions of consent. Table 1 presents a summary of the consultation undertaken. It notes comments were made by LMCC and that Delta Coal (DC) updated Section 5.2 of the plan in response to those comments. There are no specific details on the comments made by LMCC or how they were addressed by updating Section 5.2.	Update Table 1 to include the specific comments made by LMCC and a summary of how they were addressed within the plan.	Evidence of LMCC consultation provided in Appendix 1 Consultation included in Appendix 1 Consultation Summary added to Table 1

Extraction Plan, Schedule 4, Condition 7	Satisfactory (Yes/No)	Comment	Action Required	Delta Coal Response
• a program of ongoing seasonal monitoring of benthic species in both control and impact sites; • development of a model to predict likely impact of increased depth and associated subsidence impacts and effects, including but not limited to light reduction and sediment disturbance, on benthic species number and benthic communities composition, incorporating the monitoring and survey data collected; and • updating the model every 2 years using the most recent monitoring and survey data;				
(i) include a Seagrass Management Plan, which has been prepared in consultation with BCD, LMCC, and DPI Fisheries, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on seagrass beds, and which includes: • a program of ongoing monitoring of seagrasses in both control and impact sites; and • a program to predict and manage subsidence impacts and environmental consequences to seagrass beds to ensure the performance measures in Table 6 are met;	No	The plan was submitted for consultation with the relevant stakeholders as required by the conditions of consent. Table 1 presents a summary of the consultation undertaken. It notes comments were made by LMCC and that DC updated Section 4.3 of the plan in response to those comments. There are no specific details on the comments made by LMCC or how they were addressed by updating Section 4.3. Section 8.1 Review and improvement. The proposed timing of reviews and revisions to the plan set out in this section do not align with the wording in condition 5 of Schedule 6 of the conditions of consent.	Update Table 1 to include the specific comments made by LMCC and a summary of how they were addressed within the plan. Update Section 8.1 to align with the requirements of condition 5 of Schedule 6 of the conditions of consent.	Evidence of LMCC consultation provided in Appendix 1 Consultation Summary added to Table 1 Consultation included in Appendix 1
(j) include a Public Safety Management Plan, which has been prepared in consultation with RR, to ensure public safety;	No	The plan was submitted for consultation with RR as required by the conditions of consent. However, no details of consultation, including any comments received and changes made in response to those comments, are provided in the table in Appendix 1. Section 8.1 Review and improvement. The proposed timing of reviews and revisions to the plan set out in this section do not align with the wording in condition 5 of Schedule 6 of the conditions of consent.	Update the table in Appendix 1 to include the specific comments made by RR (if any) and a summary of how they were addressed within the plan. Update Section 8.1 to align with the requirements of condition 5 of Schedule 6 of the conditions of consent.	Evidence of Resource Regulator provided in Appendix 1 Consultation included in Appendix 1 Consultation Summary added to Table 1

Extraction Plan, Schedule 4, Condition 7	Satisfactory (Yes/No)	Comment	Action Required	Delta Coal Response
(k) include a Subsidence Monitoring Program which has been prepared in consultation with RR, to: • provide data to assist with the management of the risks associated with subsidence; • validates the subsidence predictions; • analyses the relationship between the predicted and resulting subsidence effects and predicted and resulting impacts under the plan and any ensuing environmental consequences; and • informs the contingency plan and adaptive management process;	No	The monitoring program was submitted for consultation with RR as required by the conditions of consent. However, no details of consultation, including any comments received and changes made in response to those comments, are provided in the document.	Update the program to include the specific comments made by RR (if any) and a summary of how they were addressed within the plan.	Evidence of RR consultation provided in Appendix 1
(l) include a contingency plan that expressly provides for adaptive management where monitoring indicates that there has been an exceedance of any performance measure in Tables 6 and 7, or where any such exceedance appears likely;	No	The EP states that in the unlikely event that greater than negligible/minor impacts occur, the Subsidence Management TARP (Appendix 4) will be implemented. The TARP includes detailed performance indicators. However, the TARP does not include detailed performance indicators for Threatened Species or Endangered Populations, as required by Table 6 of the conditions of consent. The contingency measures set out in the Subsidence Management TARP do not include timeframes for implementation. Further, under EP Appendix 2 Development Consent Requirements, the conditions set out in the table are out of date. The table has not been updated to include the most recent conditions of consent following the approval of Mod 3 in June 2020.	Update the TARP to include detailed performance indicators for Threatened Species or Endangered Populations. Update the Subsidence Management TARP to include timeframes for implementation of contingency measures. Update Appendix 2 to include the current conditions of consent.	Subsidence Management TARP updated for TS and Endangered populations Appendix 2 updated for current conditions of consent
(m) include appropriate revisions to the Rehabilitation Management Plan required under Condition 27 of Schedule 3; and	Yes	A rehabilitation management plan has been provided in Appendix 12. The applies to the surface operations at Chain Valley Colliery (CVC), including pit top facilities and lands where additional infrastructure may be constructed. As no infrastructure is being constructed as part of implementation of the EP, the Dept is satisfied that the RMP revisions are appropriate.	Nil	
(n) include a program to collect sufficient baseline data for future Extraction Plans.	Yes	The subsidence monitoring program includes a comprehensive baseline data monitoring program comprised of bathymetric surveys, fixed foreshore	Nil	

Extraction Plan, Schedule 4, Condition 7	Satisfactory (Yes/No)	Comment	Action Required
		monitoring surveys, seagrass monitoring and benthic community monitoring of areas within and outside the EP area.	
The Applicant must implement the Extraction Plan as approved by the Planning Secretary.	N/a	N/a	N/a
Schedule 4, Condition 8	**Satisfactory (Yes/No)**	Comment	**Action Required**
8. The Applicant must ensure that the management plans required under conditions 7(g)-(j) above include: (a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this consent; and	Yes	The management plans required under conditions 7(g)-(j) have been developed with consideration of predicted subsidence impacts determined through the development of detailed subsidence predictions based on a detailed mine plan for MWS5 and the NPA. Impacts to built features and the natural environment are expected to be negligible.	Nil
(b) a detailed description of the measures that would be implemented to remediate predicted impacts.	Yes	Notwithstanding the comments above, the plans required under conditions 7(g)-(j) include a detailed and comprehensive description of the monitoring, mitigation and contingency measures proposed to manage or remediate potential impacts.	Nil
Evidence of consultation, Schedule 2, Condition 22	**Satisfactory (Yes/No)**	**Comment**	**Action Required**
22. Where conditions of this consent require consultation with an identified party, the Applicant must: (a) consult with the relevant party prior to submitting the subject document; (b) provide details of the consultation undertaken including: i. the outcome of that consultation, matters resolved and unresolved; and ii. details of any disagreement remaining between the party consulted and the Applicant and how the Applicant has addressed the matters not resolved.	No	Refer to the comments in the rows above regarding consultation with relevant parties. Further, consultation is documented in Section 2. 5 of the EP. Table 1 states that no comments were received from any consultees. However, in correspondence provided to the Department on 23/02/2021 (subsequent to lodgement of the EP for approval), Delta Coal indicated it had received four responses from agencies, as follows: • BCD indicated it had no comment • Transport for NSW indicated its satisfaction with the safety of the Pelican Rock Navigational Marker and provided feedback on the extra navigational markers, which were incorporated into the revised Built Features Management Plan. • LMCC provided minor comments on the MPs, which were incorporated by Delta Coal into revised versions of these MPs. • The Resource Regulator indicated it was satisfied with the resource recovery that was proposed and that a revision of the rehabilitation bond would be triggered by this Extraction Plan. Summaries of this correspondence have not been included within the EP.	Update the EP to include summaries of all correspondence on the EP, including details of the comments made and the actions taken by Delta Coal in response to those comments.

Delta Coal Response

Consultation Summary added to Table 1

Consultation evidence provided in Appendix 1

Transport for NSW – Maritime Consultation

CA Chris Armit Kumar Kuruppu; Lynda Hourigan; Melissa Anderson; Wayne Jones; Navigation Advice North; Chris Nicholas 01/02/

RE: Major Projects – Proponent Request for Advice - Chain Valley Extension Project- SSD-5465 - CVC Built Features Management Plan (SSD-5465-PA-38) (Central Coast,Lake Macquarie City)

Thanks heaps Kumar and Lynda for your input, appreciated.
Proposed responses below. I will include in the BFMP and provide the finalised MP when approved by DPIE.
regards,
Chris

From: Kumar Kuruppu <Kumar.Kuruppu2@transport.nsw.gov.au>
Sent: Monday, 1 February 2021 3:25 PM
To: Chris Armit <CArmit@deltacoal.com.au>
Cc: Melissa Anderson <Melissa.Anderson@planning.nsw.gov.au>; Wayne Jones <wayne.jones@planning.nsw.gov.au>; Navigation Advice North <navigationadvicenorth@rms.nsw.gov.au>
Subject: FW: Major Projects – Proponent Request for Advice - Chain Valley Extension Project- SSD-5465 - CVC Built Features Management Plan (SSD-5465-PA-38) (Central Coast,Lake Macquarie City)

Good afternoon Chris,
Please find Transport for NSW (TfNSW) Maritime advice below in relation to a post approval matter for the Chain Valley Extension Project- SSD-5465 referred to TfNSW by Department of Planning, Industry and Environment via Major Projects Portal.
A copy of this advice will also be uploaded to MP Portal.
Kind regards

Kumar Kuruppu
Development Services Case Officer
Development Services North
Regional and Outer Metropolitan
Transport for NSW

T 02 4908 7688
Level 8, 266 King Street Newcastle NSW 2300

NSW GOVERNMENT Transport for NSW

Use public transport... plan your trip at transportnsw.info

I acknowledge the traditional owners and custodians of the land in which I work and pay my respects to Elders past, present and future.

Text Below in Black is response from C Armit 1 February 2021 Email

From: Lynda Hourigan **On Behalf Of** Navigation Advice North
Sent: Monday, 1 February 2021 1:18 PM
To: Kumar Kuruppu <Kumar.Kuruppu2@transport.nsw.gov.au>; Navigation Advice North <navigationadvicenorth@rms.nsw.gov.au>
Cc: Mike Baldwin <Mike.Baldwin@transport.nsw.gov.au>; Brett Boehm <Brett.Boehm@transport.nsw.gov.au>; Chris Austen <Chris.Austen@transport.nsw.gov.au>; Peter Browne <Peter.Browne@transport.nsw.gov.au>; Nicole Waller <Nicole.Waller@transport.nsw.gov.au>; Lun Yeung <lun.yeung@transport.nsw.gov.au>; Sonia Mckay <Sonia.McKay@transport.nsw.gov.au>; Nathan Koch <Nathan.Koch@transport.nsw.gov.au>
Subject: RE: Major Projects – Proponent Request for Advice - Chain Valley Extension Project- SSD-5465 - CVC Built Features Management Plan (SSD-5465-PA-38) (Central Coast,Lake Macquarie City)

Hello Kumar

Thank you for your email requesting TfNSW Maritime's comment on the CVC Built Features Management Plan below.

Transport for NSW (TfNSW) Maritime is responsible for the ongoing maintenance of safe navigation throughout NSW under the Marine Safety Act 1998. As such, proposals like this are reviewed to ensure that any disruption to navigation for vessels is minimised as much as is practical.

The project documentation provided has been assessed as having minimal impact on the safety of navigation to vessels operating in this area and Maritime has no objections to the proposed works.

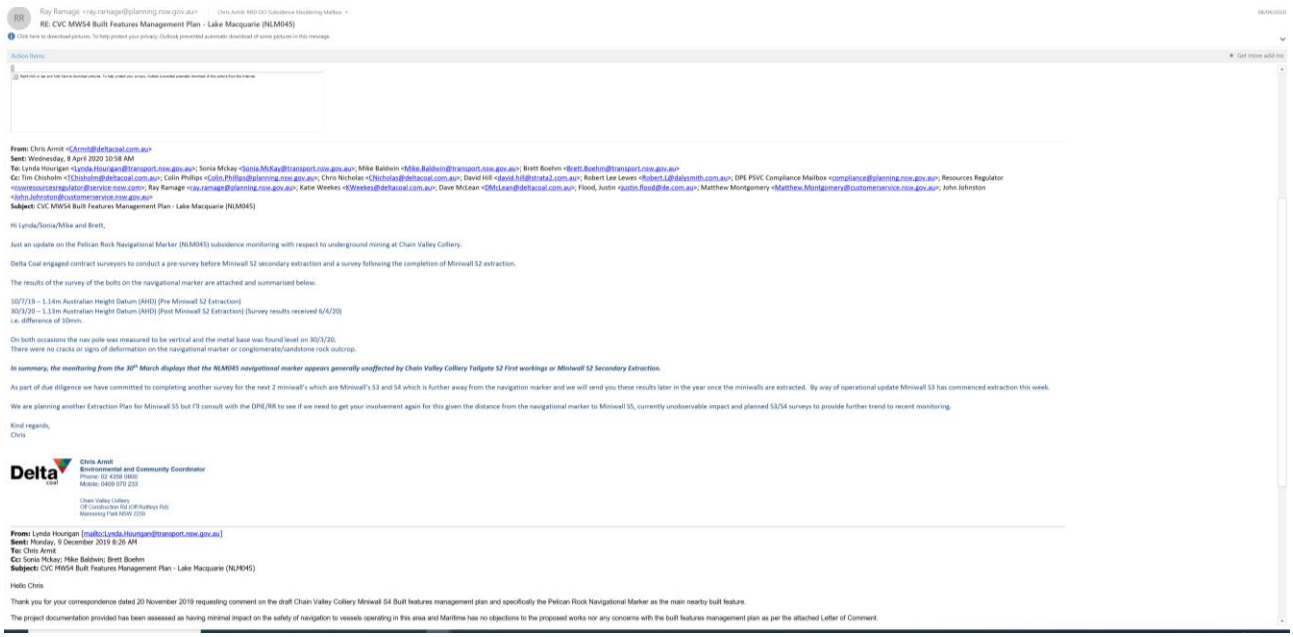
TfNSW Maritime advises the following matters need to be considered and addressed when preparing the REF and / or the Scope of Works for the Chain Valley Extension Project:

1. Any works impacting on navigation during the construction phase must seek TfNSW Maritime support 21 days prior to works commencing. A full scope of works including dates is to be provided to *navigationadvicenorth@rms.nsw.gov.au.* The extraction plan forms this scope of works.
2. All associated work boats to comply with the relevant NSW Marine Legislation for survey, registration and safety equipment, and comply with the Marine Safety (Domestic Commercial Vessels) National Law Act 2012. Noted – Mine Surveyor and survey contractors notified, will add to BFMP
3. Vessels must exhibit lights and shapes in accordance with International Regulations for Preventing Collisions at Sea. Noted – Mine Surveyor and survey contractors notified, will add to BFMP
4. ***"That If the subsidence was >500mm or the pylon ends up with more than 5° of lean on it, then there would need to be action taken."*** and NSW Maritime is to be notified immediately. Will include in BFMP and Subsidence TARP
5. For pelican rock NLM045, please confirm if this is an additional 155mm vertical subsidence to the 130mm already predicted for the mining of Miniwall S2-S4. NSW Maritime is seeking confirmation that the vertical subsidence is still within the limits allowing the project to go ahead without any action needed to be taken on NLM045. This is a total 155mm vertical subsidence, not additional. Navigational marker was already mined under in 2019, navigational marker NLM045 is located under a solid chain pillar, last subsidence measured was 30mm post Miniwall S3, no tilt change measured/vertical.
6. NSW Maritime acknowledges that the 4mm/m tilt on NLM045 is less than 0.25 degrees so this is not an issue and using this same criteria for NLM062 the 20mm movement and 0 tilt is also acceptable. Noted
7. NSW Maritime notes that NLM063 and NLM064 are both buoys so the tide has more impact on the Aid to Navigation height than the mining with the effect on the chain length and scope being almost undetectable. Therefore the subsidence values for these are also acceptable. Noted

Subsequently, NSW Maritime advises that "**There is no action required for these 4 navigation aids for the predicted subsidence and tilts and no further action required unless the subsidence and tilt exceed the values that have previously stipulated"** Will include consultation in the BFMP and provide an updated MP to reflect this.

For more information, please direct all correspondence to *navigationadvicenorth@rms.nsw.gov.au*.

Kind regards, Lynda Hourigan



Ray Ramage <ray.ramage@planning.nsw.gov.au>

RE: CVC MW54 Built Features Management Plan - Lake Macquarie (NLM045)

Click here to download pictures. To help protect your privacy, Outlook prevented automatic download of some pictures in this message.

Action Items

From: Chris Armit <CArmit@deltacoal.com.au>
Sent: Wednesday, 8 April 2020 10:58 AM
To: Lynda Hourigan <Lynda.Hourigan@transport.nsw.gov.au>; Sonia Mckay <Sonia.McKay@transport.nsw.gov.au>; Mike Baldwin <Mike.Baldwin@transport.nsw.gov.au>; Brett Boehm <Brett.Boehm@transport.nsw.gov.au>
Cc: Tim Chisholm <TChisholm@deltacoal.com.au>; Colin Phillips <Colin.Phillips@planning.nsw.gov.au>; Chris Nicholas <CNicholas@deltacoal.com.au>; David Hill <david.hill@strata2.com.au>; Robert Lee Levers <Robert.L@dalysmith.com.au>; DPE PSVC Compliance Mailbox <compliance@planning.nsw.gov.au>; Resources Regulator <nswresourcesregulator@service-now.com>; Ray Ramage <ray.ramage@planning.nsw.gov.au>; Katie Weekes <KWeekes@deltacoal.com.au>; Dave McLean <DMcLean@deltacoal.com.au>; Flood, Justin <justin.flood@de.com.au>; Matthew Montgomery <Matthew.Montgomery@customerservice.nsw.gov.au>; John Johnston <John.Johnston@customerservice.nsw.gov.au>
Subject: CVC MW54 Built Features Management Plan - Lake Macquarie (NLM045)

Hi Lynda/Sonia/Mike and Brett,

Just an update on the Pelican Rock Navigational Marker (NLM045) subsidence monitoring with respect to underground mining at Chain Valley Colliery.

Delta Coal engaged contract surveyors to conduct a pre-survey before Miniwall S2 secondary extraction and a survey following the completion of Miniwall S2 extraction.

The results of the survey of the bolts on the navigational marker are attached and summarised below.

10/7/19 – 1.14m Australian Height Datum (AHD) (Pre Miniwall S2 Extraction)
30/3/20 – 1.13m Australian Height Datum (AHD) (Post Miniwall S2 Extraction) (Survey results received 6/4/20)
i.e. difference of 10mm.

On both occasions the nav pole was measured to be vertical and the metal base was found level on 30/3/20.
There were no cracks or signs of deformation on the navigational marker or conglomerate/sandstone rock outcrop.

In summary, the monitoring from the 30th March displays that the NLM045 navigational marker appears generally unaffected by Chain Valley Colliery Tailgate S2 First workings or Miniwall S2 Secondary Extraction.

As part of due diligence we have committed to completing another survey for the next 2 miniwall's which are Miniwall's S3 and S4 which is further away from the navigation marker and we will send you these results later in the year once the miniwalls are extracted. By way of operational update Miniwall S3 has commenced extraction this week.

We are planning another Extraction Plan for Miniwall S5 but I'll consult with the DPIE/RR to see if we need to get your involvement again for this given the distance from the navigational marker to Miniwall S5, currently unobservable impact and planned S3/S4 surveys to provide further trend to recent monitoring.

Kind regards,
Chris

Delta coal
Chris Armit
Environmental and Community Coordinator
Phone: 02 4358 0800
Mobile: 0409 070 233

Chain Valley Colliery
Off Construction Rd (Off Rutleys Rd)
Mannering Park NSW 2259

From: Lynda Hourigan [mailto:Lynda.Hourigan@transport.nsw.gov.au]
Sent: Monday, 9 December 2019 8:26 AM
To: Chris Armit
Cc: Sonia Mckay; Mike Baldwin; Brett Boehm
Subject: CVC MW54 Built Features Management Plan - Lake Macquarie (NLM045)

Hello Chris

Thank you for your correspondence dated 20 November 2019 requesting comment on the draft Chain Valley Colliery Miniwall S4 Built features management plan and specifically the Pelican Rock Navigational Marker as the main nearby built feature.

The project documentation provided has been assessed as having minimal impact on the safety of navigation to vessels operating in this area and Maritime has no objections to the proposed works nor any concerns with the built features management plan as per the attached Letter of Comment.

EPA Consultation

DOC20/1053542

Major Projects
Planning and Assessment Division
Department of Planning, Industry and Environment
Locked Bag 5022
PARRAMATTA NSW 2124

No Comment to Planning Advice Requests – Draft Water Management Plan and Miniwall S5 and Northern Pillar Area Extraction Plan. Chain Valley Colliery Extension Project SSD – 5465 -Mod 4.

Dear Sir/Madam

Reference is made to your correspondence requesting input from the Environment Protection Authority (EPA) on the proposed Miniwall S5 and Northern pillar area extraction plan (Chain Valley Colliery Extention Project SSD-5465) (sent 17 December 2020) and the draft Chain Valley Colliery Water Management Plan (sent 18 December 2020).

The EPA encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, as a regulatory authority, the EPA does not approve or endorse these documents as our role is to set environmental objectives for environmental management, not to be directly involved in the development of strategies to achieve those objectives.

The EPA has not reviewed the above documents.

In view of these factors, the EPA has no comments to provide on this project and no follow-up consultation is required.

If you have any questions about this request, please contact Steve Clair on (02) 49086850 or via email at steve.clair@epa.nsw.gov.au.

Yours sincerely

PETER JAMIESON
Unit Head – Regulatory Operations - Metropolitan North
Environment Protection Authority

cc: CArmit@deltacoal.com.au

Phone 131 555 | TTY 133 677 | Locked Bag 5022 | 4 Parramatta Square | info@epa.nsw.gov.au
Phone +61 2 9995 5555 (from outside NSW) | ABN 43 692 285 758 | Parramatta NSW 2124 Australia | 12 Darcy St, Parramatta NSW 2150 Australia | www.epa.nsw.gov.au

DPI - Fisheries Consultation

SC

Scott Carter <scott.carter@dpi.nsw.gov.au> Chris Armit 15/01/2021

RE: Miniwall S5 and Northern Pillar Area Extraction Plan draft for comment and associated MP status

You replied to this message on 15/01/2021 12:11 PM.
Click here to download pictures. To help protect your privacy, Outlook prevented automatic download of some pictures in this message.

Our Ref: C20/815

Chris

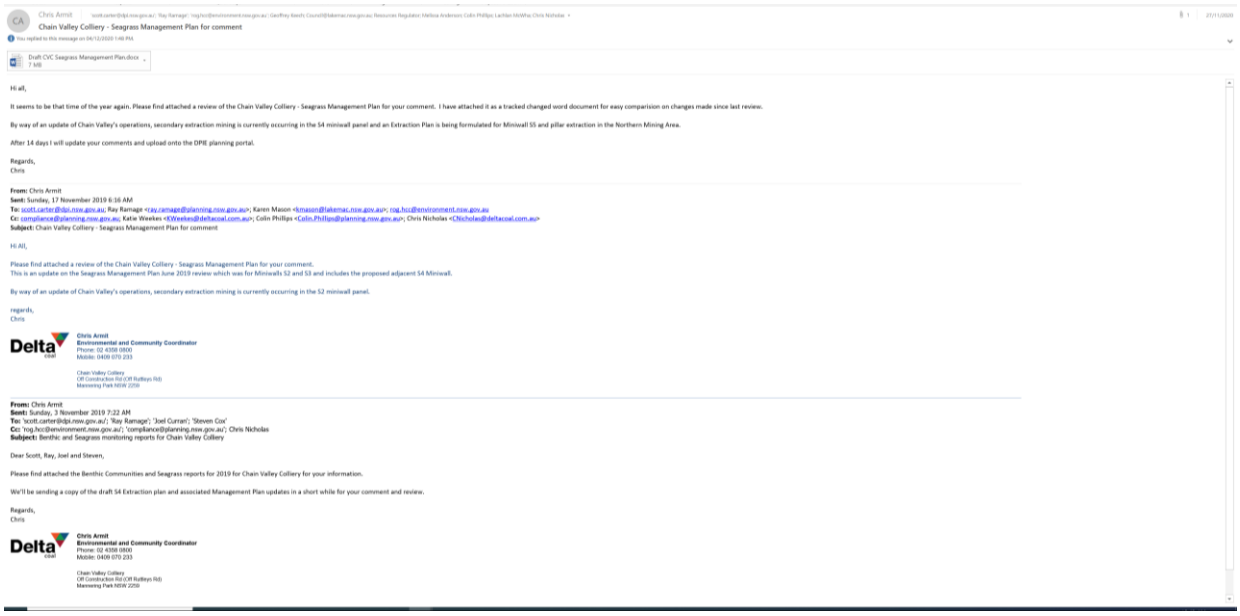
Apologies for late reply.

Based on the previous mining activities and the changes to the mining methods in the current proposal the Department has no objections to the works proceeding as described.

regards

Scott Carter
Senior Fisheries Manager Coastal Systems
NSW Department of Primary Industries | Fisheries
Port Stephens Fisheries Institute| Taylors Beach | NSW 2316
T: +61 2 4916 3931 | E: scott.carter@dpi.nsw.gov.au

ALL MAIL TO: DPI Fisheries, Attn: R. Philps,1243 Bruxner Hwy, Wollongbar NSW 2477



Chain Valley Colliery - Seagrass Management Plan for comment

Hi all,

It seems to be that time of the year again. Please find attached a review of the Chain Valley Colliery - Seagrass Management Plan for your comment. I have attached it as a tracked changed word document for easy comparison on changes made since last review.

By way of an update of Chain Valley's operations, secondary extraction mining is currently occurring in the S4 miniwall panel and an Extraction Plan is being formulated for Miniwall S5 and pillar extraction in the Northern Mining Area.

After 14 days I will update your comments and upload onto the DPIE planning portal.

Regards,
Chris

From: Chris Armit
Sent: Sunday, 17 November 2019 6:16 AM
To: scott.carter@dpi.nsw.gov.au; Ray Ramage; Karen Mason; nsg.hcc@environment.nsw.gov.au
Cc: compliance@planning.nsw.gov.au; Colin Philips; Chris Nicholas
Subject: Chain Valley Colliery - Seagrass Management Plan for comment

Hi All,

Please find attached a review of the Chain Valley Colliery - Seagrass Management Plan for your comment.
This is an update on the Seagrass Management Plan June 2019 review which was for Miniwalls S2 and S3 and includes the proposed adjacent S4 Miniwall.

By way of an update of Chain Valley's operations, secondary extraction mining is currently occurring in the S2 miniwall panel.

regards,
Chris

Chris Armit
Environmental and Community Coordinator
Phone: 02 4338 0800
Mobile: 0409 070 233

Chain Valley Colliery
Off Construction Rd (Off Rutleys Rd)
Mannering Park NSW 2259

From: Chris Armit
Sent: Sunday, 3 November 2019 7:22 AM
To: 'scott.carter@dpi.nsw.gov.au'; 'Ray Ramage'; 'Joel Curran'; 'Steven Cox'
Cc: 'nsg.hcc@environment.nsw.gov.au'; 'compliance@planning.nsw.gov.au'; Chris Nicholas
Subject: Benthic and Seagrass monitoring reports for Chain Valley Colliery

Dear Scott, Ray, Joel and Steven,

Please find attached the Benthic Communities and Seagrass reports for 2019 for Chain Valley Colliery for your information.

We'll be sending a copy of the draft S4 Extraction plan and associated Management Plan updates in a short while for your comment and review.

Regards,
Chris

Chris Armit
Environmental and Community Coordinator
Phone: 02 4338 0800
Mobile: 0409 070 233

Chain Valley Colliery
Off Construction Rd (Off Rutleys Rd)
Mannering Park NSW 2259



Chain Valley Colliery - Benthic Communities Management Plan for comment

Hi all,

Please find attached a review of the Chain Valley Colliery – Benthic Communities Management Plan for your comment. I have attached it as a tracked changed word document for easy comparison on changes made since last review and for you to add comments if required. Updated document for Miniwall S5 and NMA pillar extraction areas and SSD5465 Modification 3.

After 14 days I will update your comments and upload onto the DPIE planning portal.

Regards,
Chris

Chris Armit
Approvals Coordinator
Phone: 02 4338 0800
Mobile: 0409 070 233

Chain Valley Colliery
Off Construction Rd (Off Rutleys Rd)
Mannering Park NSW 2259

Resource Regulator Consultation

CA Chris Armit | Resources Regulator; gang.li@planning.nsw.gov.au; alexander.tutt-branco@planning.nsw.gov.au; dan.adams@planning.nsw.gov.au; Melissa Anderson; Chris Nicholas; Tim Chisholm | 01/01/2021

RE: AREQ0014285 | Chain Valley Colliery | Action required | 14 Dec 2020 12:20:01

Hi Ray,

Thanks for your email re: BFMP. To answer your question, yes, we are currently seeking approval under a modification application (CVC MOD 4) to mine under the greater Morisset Peninsula.

However, Chain Valley Colliery already has approval under SSD 5465 to mine under a smaller section of Morisset Peninsula (see below Appendix 3 from SSD5465 – I've added a red box to outline the location of consent approval area.

Mining under Fishery Point has been referenced in the last MOP approval letter and is included in the current approved MOP plans (cc'ed Dan and Melissa, if you wish to consult with them on MOP/Consent approval from an internal regulator perspective).

The BFMP scope has been outlined in the draft for comment doc (see below excerpt). I'm compelled by the consent as part of the extraction plan application process to have a BFMP for secondary extraction (i.e. MWS5 and NMA Pillar extraction) but thought it good practice to include the first workings area under the Peninsula to get some buy in from the Resource Regulator given existing built features. If you don't deem this approach necessary, happy to remove mention of it from this BFMP. Let me know if you have any comments on the draft BFMP and can make appropriate amendments if necessary.

Cheers,
Chris

APPENDIX 3
DEVELOPMENT LAYOUT



1 Introduction

1.1 Purpose and Scope

The purpose of this Built Features Management Plan (BFMP) is to outline the process for management of built features within the subsidence affected zone associated with miniwall S5, pillar extraction area in the Northern Mining Area and first workings beneath Morisset Peninsula. The primary objectives of the document are to:

CA Chris Armit | Resources Regulator; gang.li@planning.nsw.gov.au; alexander.tutt-branco@planning.nsw.gov.au; dan.adams@planning.nsw.gov.au; Melissa Anderson; Chris Nicholas; Tim Chisholm | 01/01/2021

RE: AREQ0014285 | Chain Valley Colliery | Action required | 14 Dec 2020 12:20:01

From: Resources Regulator <nswresourcesregulator@service-now.com>
Sent: Monday, 21 December 2020 1:47 PM
To: Chris Armit <CArmit@deltacoal.com.au>
Cc: gang.li@planning.nsw.gov.au; alexander.tutt-branco@planning.nsw.gov.au
Subject: AREQ0014285 | Chain Valley Colliery | Action required | 14 Dec 2020 12:20:01

Dear Chris,

Further to your submission of a Built Features Management Plan (BFMP), dated 17 December 2020, to the Resources Regulator (RR) I require some clarification.

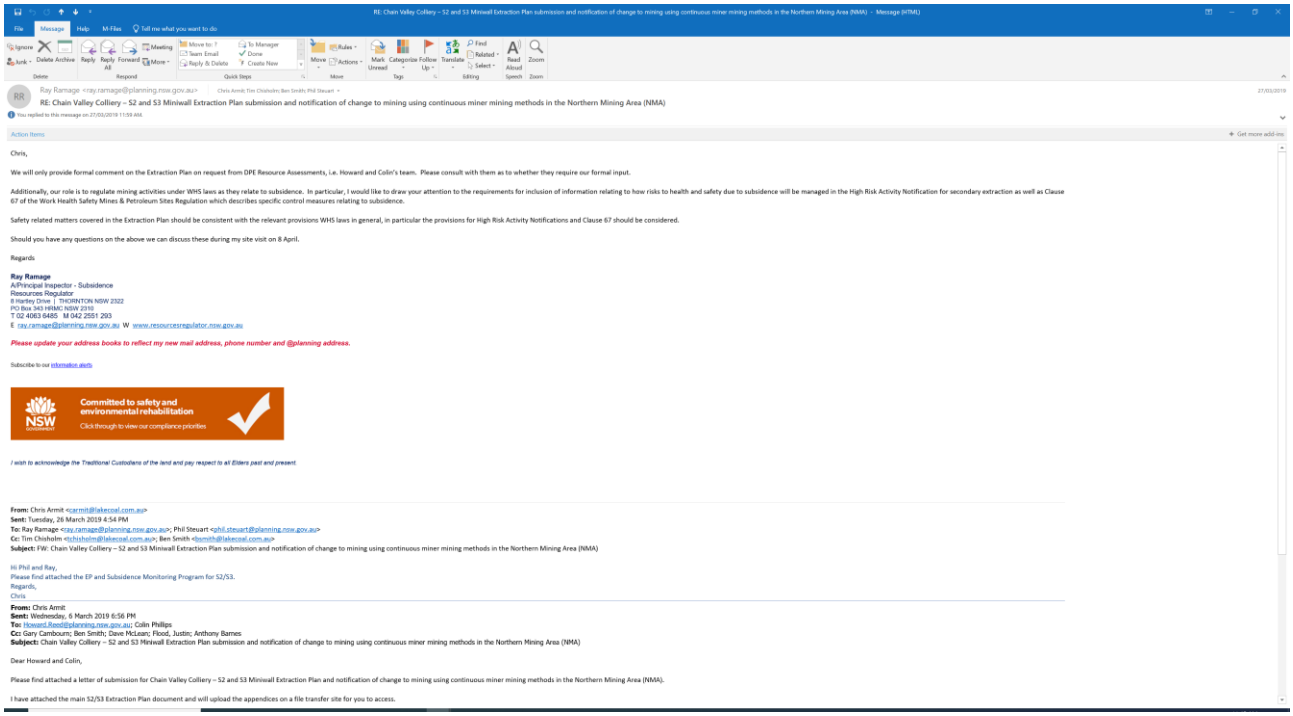
I understand that the BFMP has been submitted to RR for the purposes of consultation as required under Schedule 4, Condition 7(g) of SSD-5465.

The BFMP makes reference to Miniwall S5, first workings under Morriset Peninsula and the Northern Mining Area. It is also understood that the mine operator is currently seeking planning approval for mining in the Northern Mining Area including the suburbs of Brightwaters, Mirrabooka and Sunshine.

It is not clear to me whether Northern Mining Area subject of the BFMP has current planning approval and therefore it is not possible to provide comment in relation to that area. Can you please clarify the extents to which the BFMP applies and the status all relevant planning approvals.

Regards,

Ray Ramage
Senior Mine Safety Officer Subsidence
Subsidence Engineering | Resources Regulator
M 0422 551 293



RE: Chain Valley Colliery – S2 and S3 Miniwall Extraction Plan submission and notification of change to mining using continuous miner mining methods in the Northern Mining Area (NMA) - Message (HTML)

RE: Chain Valley Colliery – S2 and S3 Miniwall Extraction Plan submission and notification of change to mining using continuous miner mining methods in the Northern Mining Area (NMA)

Chris,

We will only provide formal comment on the Extraction Plan on request from DPE Resource Assessments, i.e. Howard and Colin's team. Please consult with them as to whether they require our formal input.

Additionally, our role is to regulate mining activities under WHS laws as they relate to subsidence. In particular, I would like to draw your attention to the requirements for inclusion of information relating to how risks to health and safety due to subsidence will be managed in the High Risk Activity Notification for secondary extraction as well as Clause 67 of the Work Health Safety Mines & Petroleum Sites Regulation which describes specific control measures relating to subsidence.

Safety related matters covered in the Extraction Plan should be consistent with the relevant provisions WHS laws in general, in particular the provisions for High Risk Activity Notifications and Clause 67 should be considered.

Should you have any questions on the above we can discuss these during my site visit on 8 April.

Regards

Ray Ramage
A/Principal Inspector - Subsidence
Resources Regulator
8 Hartley Drive | THORNTON NSW 2322
PO Box 343 HRMC NSW 2310
T 02 4063 6485 M 042 2551 293
E ray.ramage@planning.nsw.gov.au W www.resourcesregulator.nsw.gov.au

Please update your address books to reflect my new mail address, phone number and @planning address.

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NSW GOVERNMENT Committed to safety and environmental rehabilitation
Click through to view our compliance priorities

I wish to acknowledge the Traditional Custodians of the land and pay respect to all Elders past and present.

From: Chris Armit <carmit@lakecoal.com.au>
Sent: Tuesday, 26 March 2019 4:54 PM
To: Ray Ramage <ray.ramage@planning.nsw.gov.au>; Phil Steuart <phil.steuart@planning.nsw.gov.au>
Cc: Tim Chisholm <tchisholm@lakecoal.com.au>; Ben Smith <bsmith@lakecoal.com.au>
Subject: FW: Chain Valley Colliery – S2 and S3 Miniwall Extraction Plan submission and notification of change to mining using continuous miner mining methods in the Northern Mining Area (NMA)

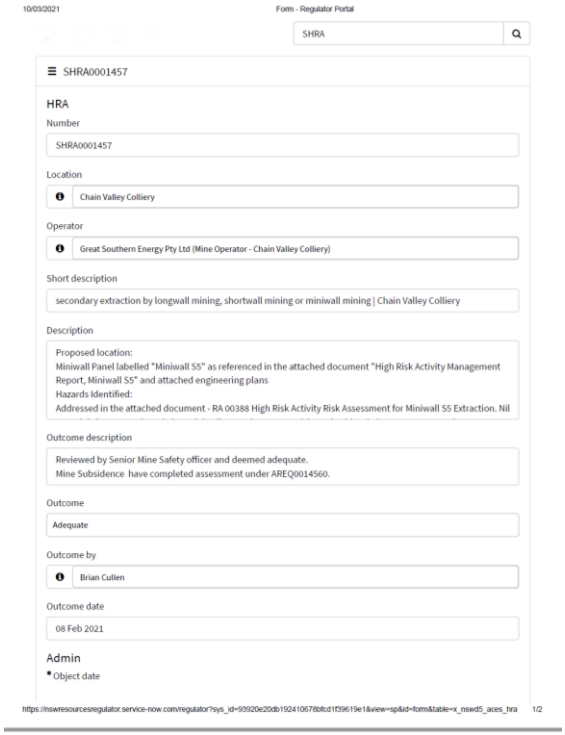
Hi Phil and Ray,
Please find attached the EP and Subsidence Monitoring Program for S2/S3.
Regards,
Chris

From: Chris Armit
Sent: Wednesday, 6 March 2019 6:56 PM
To: Howard.Reed@planning.nsw.gov.au; Colin Phillips
Cc: Gary Cambourn; Ben Smith; Dave McLean; Flood, Justin; Anthony Barnes
Subject: Chain Valley Colliery – S2 and S3 Miniwall Extraction Plan submission and notification of change to mining using continuous miner mining methods in the Northern Mining Area (NMA)

Dear Howard and Colin,

Please find attached a letter of submission for Chain Valley Colliery – S2 and S3 Miniwall Extraction Plan and notification of change to mining using continuous miner mining methods in the Northern Mining Area (NMA).

I have attached the main S2/S3 Extraction Plan document and will upload the appendices on a file transfer site for you to access.



10/03/2021 Form - Regulator Portal

SHRA

SHRA0001457

HRA

Number: SHRA0001457

Location: Chain Valley Colliery

Operator: Great Southern Energy Pty Ltd (Mine Operator - Chain Valley Colliery)

Short description: secondary extraction by longwall mining, shortwall mining or miniwall mining | Chain Valley Colliery

Description:
Proposed location:
Miniwall Panel labelled "Miniwall S5" as referenced in the attached document "High Risk Activity Management Report, Miniwall S5" and attached engineering plans
Hazards Identified:
Addressed in the attached document - RA 00388 High Risk Activity Risk Assessment for Miniwall S5 Extraction. Nil

Outcome description:
Reviewed by Senior Mine Safety officer and deemed adequate.
Mine Subsidence have completed assessment under AREQ0014560.

Outcome: Adequate

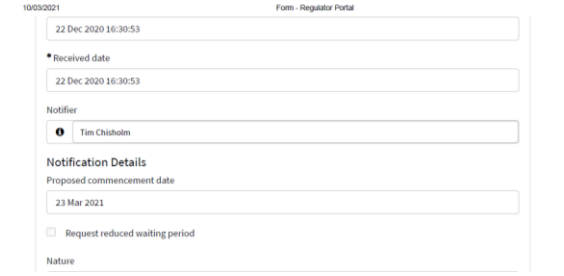
Outcome by: Brian Cullen

Outcome date: 08 Feb 2021

Admin

*Object date

https://nswresourcesregulator.service-now.com/regulator?sys_id=93920e20db192410678bfcd1f59619e1&view=sp&id=form&table=x_nswd5_aces_hra 1/2



10/03/2021 Form - Regulator Portal

22 Dec 2020 16:30:53

*Received date: 22 Dec 2020 16:30:53

Notifier: Tim Chisholm

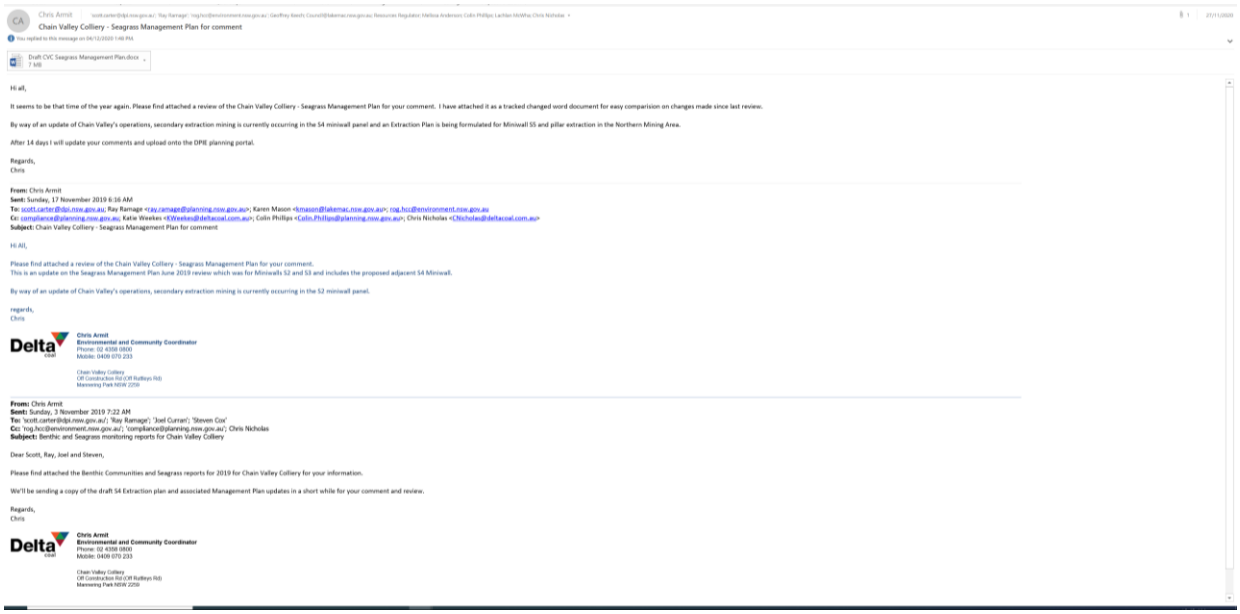
Notification Details

Proposed commencement date: 23 Mar 2021

Request reduced waiting period

Nature

Lake Macquarie City Council Consultation



Chris Armit

Chain Valley Colliery - Seagrass Management Plan for comment

Draft CVC Seagrass Management Plan.docx
7 MB

Hi all,

It seems to be that time of the year again. Please find attached a review of the Chain Valley Colliery - Seagrass Management Plan for your comment. I have attached it as a tracked changed word document for easy comparison on changes made since last review.

By way of an update of Chain Valley's operations, secondary extraction mining is currently occurring in the S4 miniwall panel and an Extraction Plan is being formulated for Miniwall S5 and pillar extraction in the Northern Mining Area.

After 14 days I will update your comments and upload onto the DPIE planning portal.

Regards,
Chris

From: Chris Armit
Sent: Sunday, 17 November 2019 6:16 AM
To: scott.carter@dpi.nsw.gov.au; Ray Ramage <ray.ramage@planning.nsw.gov.au>; Karen Mason <kmason@lakemac.nsw.gov.au>; nsg.hcc@environment.nsw.gov.au
Cc: compliance@planning.nsw.gov.au; Katie Weekes <KWeekes@deltacoal.com.au>; Colin Phillips <Colin.Phillips@planning.nsw.gov.au>; Chris Nicholas <CNicholas@deltacoal.com.au>
Subject: Chain Valley Colliery - Seagrass Management Plan for comment

Hi All,

Please find attached a review of the Chain Valley Colliery - Seagrass Management Plan for your comment.
This is an update on the Seagrass Management Plan June 2019 review which was for Miniwalls S2 and S3 and includes the proposed adjacent S4 Miniwall.

By way of an update of Chain Valley's operations, secondary extraction mining is currently occurring in the S2 miniwall panel.

regards,
Chris

Delta coal
Chris Armit
Environmental and Community Coordinator
Phone: 02 4358 0800
Mobile: 0409 070 233

Chain Valley Colliery
Off Construction Rd (Off Rutleys Rd)
Mannering Park NSW 2259

From: Chris Armit
Sent: Sunday, 3 November 2019 7:22 AM
To: 'scott.carter@dpi.nsw.gov.au'; 'Ray Ramage'; 'Joel Curran'; 'Steven Cox'
Cc: 'nsg.hcc@environment.nsw.gov.au'; 'compliance@planning.nsw.gov.au'; Chris Nicholas
Subject: Benthic and Seagrass monitoring reports for Chain Valley Colliery

Dear Scott, Ray, Joel and Steven,

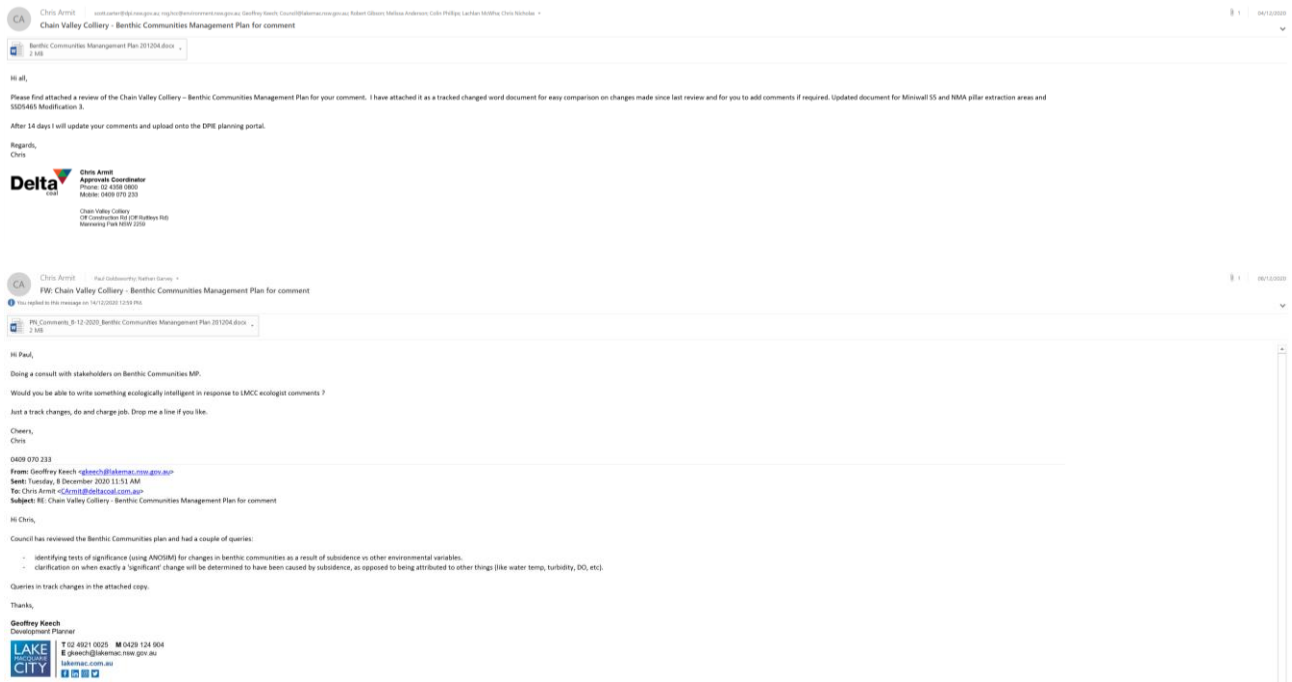
Please find attached the Benthic Communities and Seagrass reports for 2019 for Chain Valley Colliery for your information.

We'll be sending a copy of the draft S4 Extraction plan and associated Management Plan updates in a short while for your comment and review.

Regards,
Chris

Delta coal
Chris Armit
Environmental and Community Coordinator
Phone: 02 4358 0800
Mobile: 0409 070 233

Chain Valley Colliery
Off Construction Rd (Off Rutleys Rd)
Mannering Park NSW 2259



Chris Armit

Chain Valley Colliery - Benthic Communities Management Plan for comment

Benthic Communities Management Plan 201204.docx
2 MB

Hi all,

Please find attached a review of the Chain Valley Colliery – Benthic Communities Management Plan for your comment. I have attached it as a tracked changed word document for easy comparison on changes made since last review and for you to add comments if required. Updated document for Miniwall S5 and NMA pillar extraction areas and SSD5465 Modification 3.

After 14 days I will update your comments and upload onto the DPIE planning portal.

Regards,
Chris

Delta coal
Chris Armit
Approvals Coordinator
Phone: 02 4358 0800
Mobile: 0409 070 233

Chain Valley Colliery
Off Construction Rd (Off Rutleys Rd)
Mannering Park NSW 2259

Chris Armit

FW: Chain Valley Colliery - Benthic Communities Management Plan for comment

PN_Comments_8-12-2020_Benthic Communities Management Plan 201204.docx
2 MB

Hi Paul,

Doing a consult with stakeholders on Benthic Communities MP.

Would you be able to write something ecologically intelligent in response to LMCC ecologist comments ?

Just a track changes, do and charge job. Drop me a line if you like.

Cheers,
Chris

0409 070 233

From: Geoffrey Keech <gkeech@lakemac.nsw.gov.au>
Sent: Tuesday, 8 December 2020 11:51 AM
To: Chris Armit <CArmit@deltacoal.com.au>
Subject: RE: Chain Valley Colliery - Benthic Communities Management Plan for comment

Hi Chris,

Council has reviewed the Benthic Communities plan and had a couple of queries:

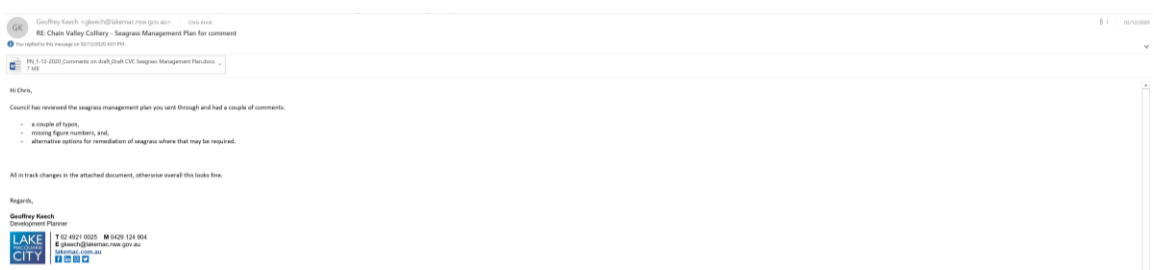
- identifying tests of significance (using ANOSIM) for changes in benthic communities as a result of subsidence vs other environmental variables.
- clarification on when exactly a 'significant' change will be determined to have been caused by subsidence, as opposed to being attributed to other things (like water temp, turbidity, DO, etc).

Queries in track changes in the attached copy.

Thanks,

Geoffrey Keech
Development Planner

LAKE MACQUARIE CITY
T 02 4921 0025 M 0429 124 904
E gkeech@lakemac.nsw.gov.au
lakemac.com.au



Geoffrey Keech <gkeech@lakemac.nsw.gov.au>

RE: Chain Valley Colliery - Seagrass Management Plan for comment

PN_1-12-2020_Comments on draft_Draft CVC Seagrass Management Plan.docx
7 MB

Hi Chris,

Council has reviewed the seagrass management plan you sent through and had a couple of comments:

- a couple of typos,
- missing figure numbers, and,
- alternative options for remediation of seagrass where that may be required.

All in track changes in the attached document, otherwise overall this looks fine.

Regards,

Geoffrey Keech
Development Planner

LAKE MACQUARIE CITY
T 02 4921 0025 M 0429 124 904
E gkeech@lakemac.nsw.gov.au
lakemac.com.au

Appendix 2 Development consent requirements

Relevant sections of SSD-5465 that detail the requirements of the EP are reproduced in **Table A2** below along with identification of where the requirements are addressed in this document.

Table A2: Requirements from SSD-5465

Condition No.	Requirement	Relevant section of this document
	Schedule	
7	*The Applicant must prepare an Extraction Plan for all second workings on site, to the satisfaction of the Planning Secretary. Each Extraction Plan must:* *Be prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary*	**This document** **Section 2.4**
	Be approved by the Secretary before the Applicant carries out any second workings covered by the plan	**Section 2.4** **Appendix 16**
	Include detailed plans of existing and proposed first and secondary workings and any associated surface development, including any applicable adaptive management measures	**Section 3.4**
	Include detailed performance indicators for each of the performance measures in Tables 6 and 7	**Sections 3.3 & 4.0**
	Provide revised predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed second workings, incorporating any relevant information obtained since this consent	**Section 2.5 and 3.2** **Appendix 12**
	Describe the measures that would be implemented to ensure compliance with the performance measures in Tables 8 and 9, and manage or remediate any impacts and/or environmental consequences	**Sections 3.4 & 4.0**
	Include a Built Features Management Plan, which has been prepared in consultation with RR and the owners of affected public infrastructure, to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings, and which *Addresses in appropriate detail all items of public infrastructure and other public infrastructure and all classes of other built features* *Has been prepared following appropriate consultation with the owner/s of potentially affected feature/s* *Recommends appropriate remedial measures and includes commitments to mitigate, repair, replace or compensate all predicted impacts on potentially affected built features in a timely manner*	**Section 4** **Appendix 10**
	Include a Benthic Communities Management Plan, which has been prepared in consultation with BCD, LMCC, and DPI Fisheries, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on benthic communities, which includes: *Surveys of the lake bed to enable contours to be produced and changes in depth following subsidence to be accurately measured*	**Section 4.3** **Appendix 7**

	Benthic species surveys within the area subject to second workings, as well as control sites outside of the area subject to second workings (at similar depths) to establish baseline data on species number and composition within the communities *A program of ongoing seasonal monitoring of benthic species in both control and impact sites* *Development of a model to predict subsidence impact of increased depth and associated subsidence impacts and effects, including but not limited to light reduction and sediment disturbance, on benthic species number and benthic communities composition, incorporating the monitoring and survey data collected; and* *Updating the model every 2 years using the most recent monitoring and survey data*	
	Include a Seagrass Management Plan, which has been prepared in consultation with BCD, LMCC, and DPI Fisheries, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on seagrass beds, and which includes: *A program of ongoing monitoring of seagrasses in both control and impact sites* *A program to predict and manage subsidence impacts and environmental consequences to seagrass beds to ensure the performance measures in Table 6 are met*	**Section 4.3** **Appendix 8**
	Include a Public Safety Management Plan, which has been prepared in consultation with RR, to ensure public safety	**Appendix 11**
	Include a Subsidence Monitoring Program which has been prepared in consultation with RR, to: *Provide data to assist with the management of the risks associated with subsidence* *Validates the subsidence predictions* *Analyses the relationship between the predicted and resulting subsidence effects and predicted and resulting impacts under the plan and any ensuing environmental consequences informs the contingency plan and adaptive management process*	**Section 5** **Appendix 13**
	Include a contingency plan that expressly provides for adaptive management where monitoring indicates that there has been an exceedance of any performance measures in Tables 6 and 7, or where any such exceedance appears likely	**Section 3.4.2** **Appendix 4**
	Include appropriate revisions to the Rehabilitation Management Plan required under Condition 27 of Schedule 3	**Appendix 12**
	Include a program to collect sufficient baseline data for future Extraction Plans	**Section 5**

Appendix 3 Extraction Plan Risk Assessment

WRAC Risk Assessment

Workplace Risk Assessment & Control

RA 00321 - Miniwall S5 Extraction, Northern Pillar Extraction Plan and Morisset Peninsula Subsidence Management Risk Assessment

Site: Chain Valley Colliery

Date: 29/04/2020 and 27/08/2020

No:	Draft - RA 00321 - Miniwall S5, Northern Pillar Extraction and Morisset Peninsula Extraction Plan Subsidence Management		
Topic	Miniwall S5 Extraction, Pillar Extraction in the Northern Pillar Area and Morisset Peninsula First workings Subsidence Management		
Venue	Chain Valley Colliery		
Requested by:	Chris Armit Environment and Community Coordinator	**Date:** 29/04/20 and 27/08/20	**Time allowed:** 4 hours
Facilitator	Chris Nicholas Technical Services Manager (29/4/2020) and Chris Armit (27/08/2020)		

Relevant Risk Assessment Documents/Procedures/Safety Alerts/Safety Bulletins

- Strata 2 (2020) S5 Subsidence Predictions report
- S4 Subsidence Predictions report
- S4 Extraction Plan Risk Assessment
- S2/S3 Subsidence Predictions report
- S2/S3 Extraction Plan Risk Assessment
- Strata 2 (2020) Northern Mining Area First workings

Persons participating in Risk Assessment

Name	Role	Years of Industry Experience	Signature
Chris Armit	Approvals Coordinator	20	
David Hill	Geotechnical Consultant	41	
Chris Nicholas	Technical Services Manager	15	
Tim Chisholm	Mine Surveyor	14	

Purpose

This risk assessment has been conducted to assess and document potential surface and sub-surface subsidence risks associated with mining of Northern Mining Domains (NMD) Miniwall S5 extraction, pillar extraction and first workings in and around the Morisset Peninsula.

Objectives and Scope

The objectives of this risk assessment are to:

- Identify hazards and assess the risk associated with environmental, public safety and surface built feature impacts from extraction.
- Ensure compliance with the WHS (Mines) Regulation 2014 Clause 67 Subsidence:

  (1) In complying with clause 9, the mine operator of an underground coal mine must manage risks to health and safety associated with subsidence at the mine.

  (2) Without limiting subclause (1), the mine operator must ensure that:

  (a) So far as is reasonably practicable, the rate, method, layout, schedule and sequence of mining operations do not put the health and safety of any person at risk from subsidence, and

  (b) Monitoring of subsidence is conducted, including monitoring of its effects on relevant surface and subsurface features, and

  (c) Any investigation of subsidence and any interpretation of subsidence information is carried out only by a competent person, and

  (d) All subsidence monitoring data is provided to the regulator in the form and at the times required by the regulator, and

  (e) So far as reasonably practicable, procedures are implemented for the effective consultation, co-operation and co-ordination of action with respect to subsidence between the mine operator and relevant persons conducting any business or undertaking that is, or is likely to be, affected by subsidence.
- Meet (where applicable) the standards for assessing and managing risks of subsidence as outlined in the “Managing Risks of Subsidence Guideline”, February 2017.
- Place a particular focus on recently updated subsidence predictions and recommendations for the area including a review of factors behind the exceedance of subsidence predictions over the MW 1 to 12 area.
- Identify the existing and potential controls to reduce the risk to a reasonable practicable level.

The scope of the risk assessment focuses on the extraction area defined by a 26.5 degree angle of draw from lakeside seagrass boundary projected to Fassifern seam or to the predicted 20mm subsidence contour of S5 (see **Figure 1 and Figure 2**). The level of monitoring required will be commensurate with the assessed level of risk (i.e. after controls are put in place) or potential consequence. The corresponding residual risk will determine if these controls are sufficiently acceptable.

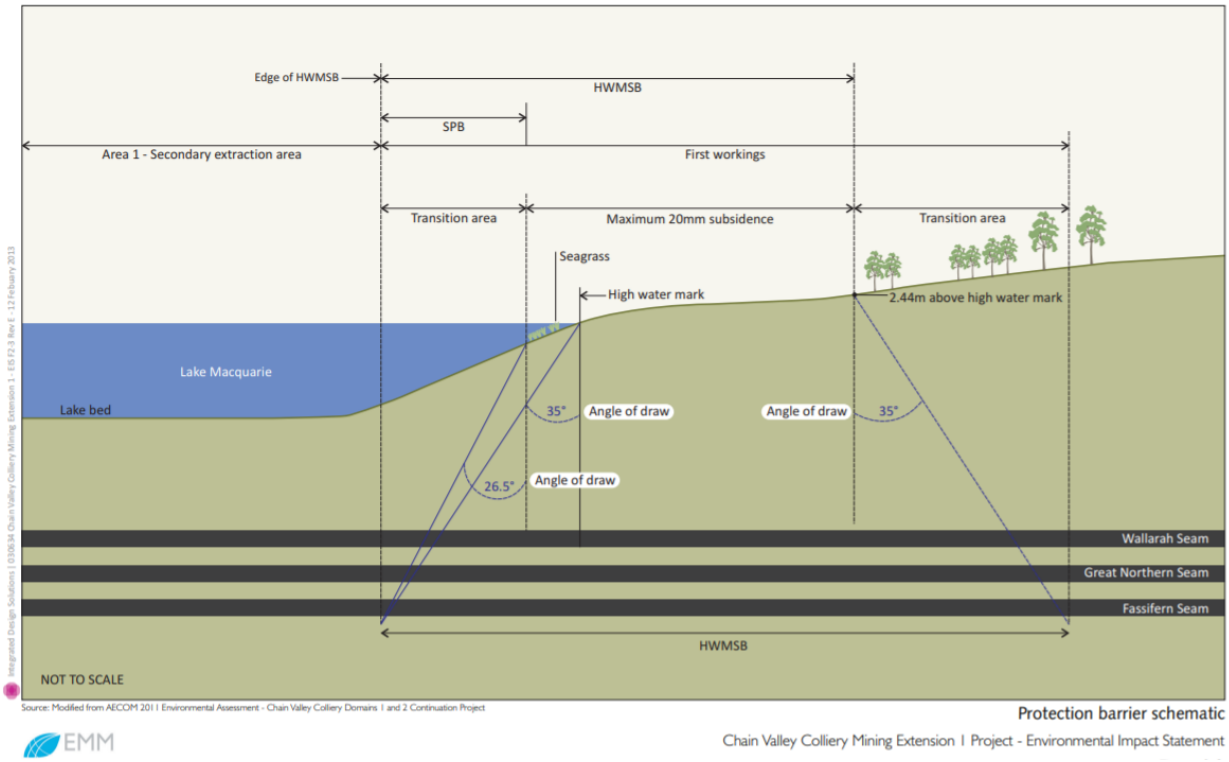


Figure 1- Protection barrier schematic from SSD 5465 Environmental Impact Statement

The list of surface and sub-surface features outlined in Appendix B of the 2003 NSW Department of Mineral Resources Guidelines for Application for Subsidence Management Approvals, along with items outlined in the 2017 Managing Risks of Subsidence Guideline, have been used as a starting reference list of features for assessment. All features on the list were assessed as to whether they exist within the defined extraction plan area. Where a feature is not noted in the WRAC assessment, it has not been identified within the area of interest.

APPENDIX 3
DEVELOPMENT LAYOUT

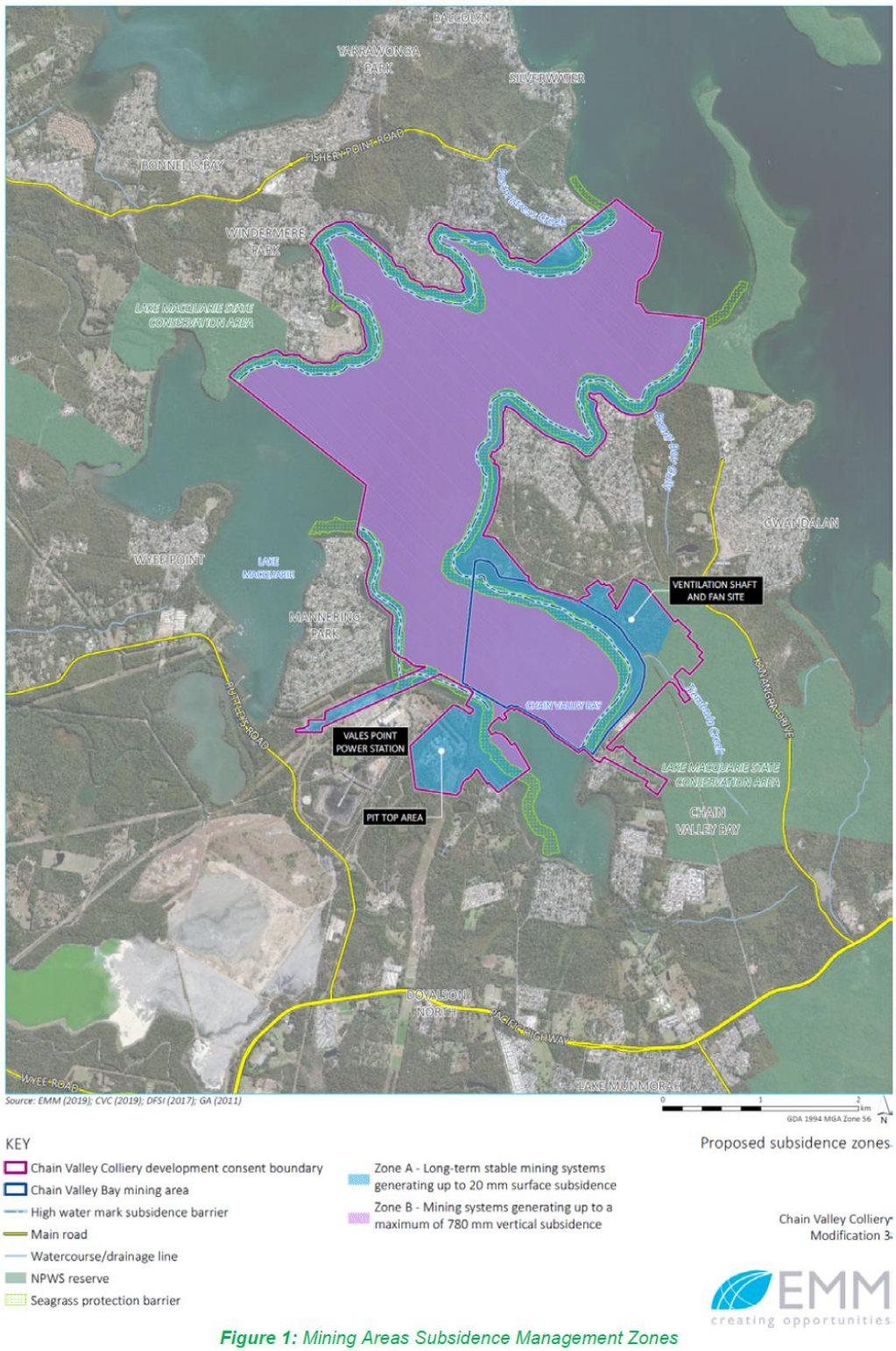


Figure 1: *Mining Areas Subsidence Management Zones*

Figure 2 – Figure 1 from CVC Consent (SSD 5465 Modification 3)

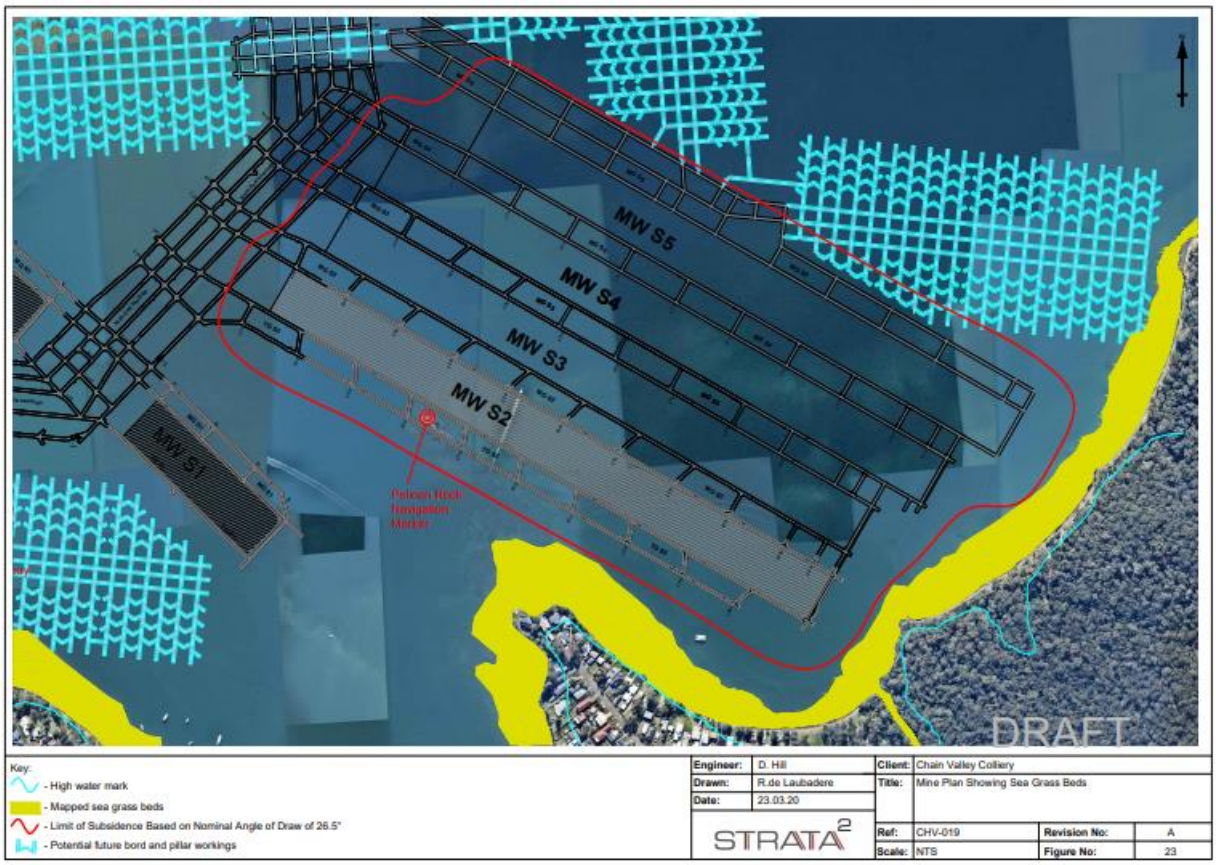


Figure 1- S2 to S5 Extraction Impact area due to Fassifern Miniwall Mining

Risk Assessment Process

1. Hazard identification
2. Identified hazards were evaluated with regard to consequence and then the Likelihood of that consequence outcome was assessed, assuming existing controls to be effectively implemented.
3. Risk rankings were derived.
4. Additional controls were proposed where possible for medium and high risks and the hazards were re-evaluated to arrive at the residual risk.
5. Likelihood and consequence were assessed in accordance AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines.
6. This risk assessment was conducted in general compliance with MDG1010 and MDG1014.
7. As low as reasonably practicable (ALARP) is determined from WHS Act 2011, Section 18.
8. Hazardous Manual Tasks should be identified and controlled to a reasonable practicable level of risk using the Risk Assessment Worksheet for Hazardous Manual Tasks Form and actions recorded in this risk assessment.
9. Actions and outcomes from the risk assessment are recorded with a due date of action completion and responsible person.
10. Risk Assessments are monitored and reviewed as detailed by the Delta Coal Site Work Health and Safety Management System.

Risk Assessment Checklist based on Hazard / Energy Types

Energy Type	POTENTIAL HAZARDS			
	To People	To Equipment	To Production	To The Environment
Electrical	• Electric Shock • Burns • Smoke Inhalation	• Unplanned movement • Fire • Circuit Damage	• Supply fails causing shutdown • Inadequate supply causing process slowdown	• Fire
Mechanical	• Crushed • Struck by Moving or Flying Objects • Caught Between Moving Objects	• Collision • Breakdown • Unplanned Movement • Breakages • Vibration	• Fails & Causes Shutdown • Slows Down Production	• Physical Damage • Fire
Chemical	• Burns • Skin Irritation • Ingestion • Inhalation (Toxic atmospheres) • Explosion (Mixing incompatible)	• Fire • Internal Damage • Corrosion	• Causes Delays or Shutdowns (Not enough, wrong type to much)	• Spillage (Water contamination, soil contamination, air pollution, vegetation destroyed)
Pressure (Fluids/Gases)	• Fluid Injection • Crush • Respiratory Problems	• Unplanned Movement • Poor Performance • Breakdown	• Equipment Failure Shutdown (No fluids or to much fluids, no gases or to much gases)	• Contamination (Dust, fuel/oil, dirty water0
Radiation	• Burns • Eye Damage (welding flash) • Internal problems		• Source fails (Causing delays or shutdown)	• Contamination
Thermal	• Burns • Heat Exhaustion • Frostbite	• Overheating • Freezing	• Shutdown (Overheating or freezing)	
Biochemical	• Sprains • Strains		• Slowdown due to loss of staff	
Noise/Vibration	• Hearing damage	• Mechanical damage	• Slowdown due to people not accessing area	• Community complaints
Biological	• Illness • Disease		• Shutdown due to lack of people	
Gravitational	• Falling from Heights • Objects falling on Personnel	• Rollover • Collapse • Failure • Damage from fall • Damage from objects falling	• Objects falling causing slowdown or shutdown	• Contamination

Risk Matrix

Hierarchy of Control		Likelihood			
Elimination	Do we still have to do this?	A	Almost certain to happen	Frequency	1 per week to 1 per month
Substitution	Is there another way or product?	B	Likely to happen at some point		1 per month to 1 per year
Redesign/Engineer	Can the equipment or process be modified?	C	Moderate, possible; heard of so it might happen		1 per year to 1 per 10 years
Isolation/Guarding	Will guarding or some type of barrier help?	D	Unlikely, not likely to happen		1 per 10 years to 1 per 100 years
Administration	Will a written procedure and/or training help?	E	Rare, practically impossible		Less than 1 per 100 years
PPE	Is personal protective equipment adequate?				

Maximum Reasonable Consequence

Consequence	Injury (I)	Environmental (E)	Loss (L)
1 - Critical	Could kill, permanently disable	Regional environmental impact/ecosystem damage. Impact causing mine or business closure. E.g. Major release off site with long term detrimental effect	Could cause very major damage > $3M
2 - High	Could cause serious injury (major LTI)	Substantial environmental damage which could result in major financial loss and/or prosecution. E.g Off-site release resulting in local ecosystem damage	Could cause major damage $500K - $3M
3 - Medium	Could cause typical MTC/LTI	Substantial temporary or minor long term damage, release immediately contained with outside assistance eg. A minor water discharge or large hydrocarbon spill. Legal non-compliance.	Could cause moderate damage $100K - $500K
4 - Low	Could cause first aid injury	Temporary or minor damage, non-compliance with internal environmental target, no legal breach, eg. Minor spill	Could cause damage $20K - $100K
5 - Insignificant	Couldn't cause injury	No detrimental effect, low financial loss, negligible environmental impact	Couldn't cause damage, or <$20K damage

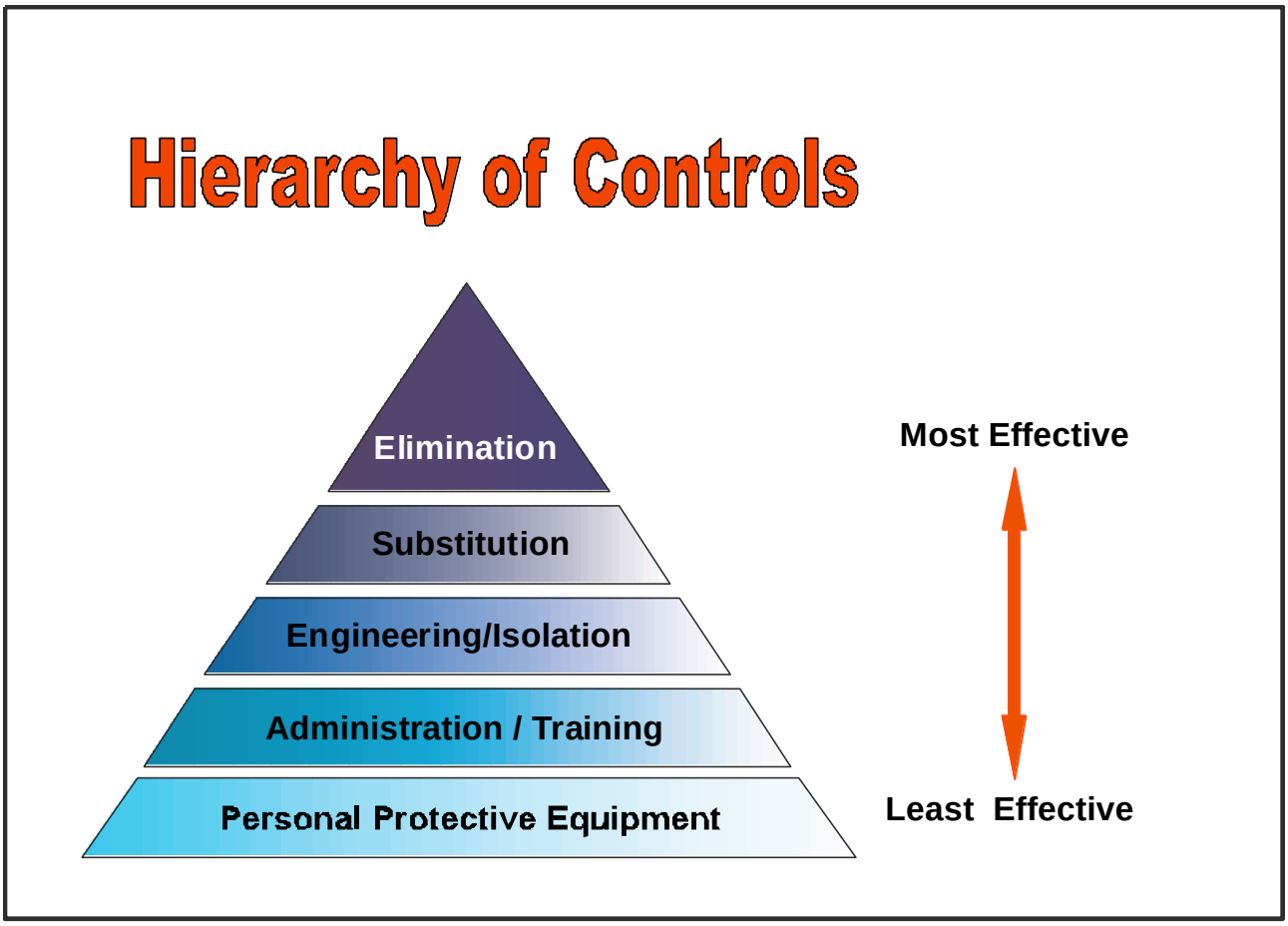
Risk Score Matrix

Risk Score	Risk	What should I do?
1 to 3	Critical	STOP WORK Immediate action required, inform senior management
4 to 10	High	Risk Assessment required. Action plan required, senior management attention needed
11 to 15	Medium	Specific monitoring of procedures required management responsibility must be specified
16 to 25	Low	Manage through routine procedures

Consequence \ Likelihood	A- Certain	B - Likely	C - Moderate	D - Unlikely	E - Rare
1 - Critical	1	2	4	7	11
2 - High	3	5	8	12	16
3 - Medium	6	9	13	17	20
4 - Low	10	14	18	21	23
5 - Insignificant	15	19	22	24	25

Least Effective ↕ Most Effective

Hierarchy of Controls (as per WHS Regulations 2011 Clause 36)



HIERARCHY OF CONTROLS 1-6 Descending Order (as per WHS Regulations 2011 Clause 36)	
Elimination	Remove the hazard from the workplace (Re-Design)
Substitution	Substituting (wholly or partly) the hazard giving rise to the risk with something that gives rise to a lesser risk. (Alternative product / plant)
Isolation	Isolating the hazard from any person exposed to it. Use barriers to shield or isolate the hazard (Guards on machines, enclosures for noises)
Engineering controls	Design & install equipment to counteract or lessen the hazard
Administrative controls	change to a system of work, a process or a procedure to lessen the hazard
Personal Protective Equipment	ensuring the provision and use of suitable personal protective equipment

Hazard Analysis and Risk Assessment

The risk management methodology as described in WHS Act 2011, WHS Regulations 2011, WHS Code of Practice WHS Act 2011, Section 274, Code of Practice –How to Manage Work, Health and Safety Risks 2011, MDG1010 and AS/NZS ISO 31000:2009 is used to identify the various processes and activities at Delta Coal sites.

Risk analyses shall be completed for each activity based on the following matrix. The subsequent risk ranking shall then determine the frequency of re-assessments.

Likelihood	Consequences
A. Almost certain to happen	1. Permanently disable.
B. Like to happen at some point	2. Could cause serious injury (Major LTI)
C. Moderate, possible, heard of so it might happen	3. Could cause Medical Treatment Case/ LTI
D. Unlikely, not likely to happen	4. Could cause First Aid Treatment
E. Rare, practically Impossible	5. Could not cause injury

Likelihood and Consequences are applicable to Table 1 below.

	LIKELIHOOD					
CONSEQUENCE		A – Certain	B – Likely	C – Moderate	D – Unlikely	E - Rare
	1 - Critical	1	2	4	7	11
	2 - High	3	5	8	12	16
	3 - Medium	6	9	13	17	20
	4 - Low	10	14	18	21	23
	5 - Insignificant	15	19	22	24	25

Facts

- Extraction is to occur in the Fassifern seam utilising miniwall extraction methods and solely beneath Lake Macquarie (ie outside the High Water Mark Subsidence Barrier and Seagrass Protection Barrier).
- S5 extraction depth of cover ranges between an effective depth of 162 to 171m. The panels are at >35^0 angle of draw to the foreshore.
- No extraction is planned within the High Water Mark Subsidence Barrier (HWMSB) and Seagrass Protection Barrier (SPB)
- The panel void width for Miniwall S5 is 97m, consistent with recent CVC practice.
- For the Miniwall S5 Twin heading gate roads with typically 110m long (centres) pillars. 5.4m wide by 3.2m high roadways.
- The S5 maingate and tailgate chain pillars are 32.6m and 40m in width respectively (solid) to limit (a) subsidence over S2 to S5 Panels and (b) abutment load transfer to future workings to the north.
- Seam thickness varies from 4.8m inbye to 5.0m outbye. The nominal extraction height will be 3.5m, leaving around 1m of top coal during extraction.
- Updated predictions for subsidence over the MW1 to 12 area of 720mm were exceeded in the MW7 to 10 area with up to 1100mm recorded (a further 150mm of creep movement could be expected). The subsidence model has since been reviewed and amended to align with this increase, and to gain an understanding of the potential mechanisms behind the increase. This model and information has been utilised to develop a mine plan and updated predictions for the NMD such that predicted subsidence is planned to remain within the approved 780mm for the domain allowing for anticipated longer term creep.
- A detailed subsidence assessment has been undertaken for miniwalls S2 and S3 by Mine Subsidence Engineering Consultants (MSEC). The assessment has indicated that the subsidence results over the miniwalls will result in approximately 290mm of vertical subsidence and 6mm/m tilt. Predicted vertical subsidence at the sea grass beds/moorings and jetties are predicted to be less than 20mm. The expected subsidence at Pelican rock is expected to be in the order of 90mm.

  Strata2 ground control consulting has undertaken a detailed subsidence assessment for miniwall S5. The assessment has indicated that the extraction of miniwall S5 will result in a maximum of approximately 0.3-0.4m of long-term vertical subsidence, strains of <2mm and tilts of <5 mm/m . Predicted vertical subsidence at the sea grass beds/moorings and jetties is less than 20mm. The expected long-term subsidence at Pelican Rock is expected to be in the order of 0.1-0.2m
- Strata2 ground control consulting has undertaken a detailed geotechnical design report for the miniwall layout which has formed the basis for the mine design used in the subsidence assessment.

- Delta Coal has successfully mined Miniwall S1, N1, S2 and S3 in the NMD with subsidence monitoring results at the foreshore well within predictions.
- Delta Coal has completed a rock head survey of the NMD which has formed the basis for the key assumptions used in the technical reports.
- S5 extraction depth of cover ranges between 162 and 171m. Caving is expected to extend up to 35m above the Fassifern Seam extraction horizon and the theoretical height of the total Fractured Zone is 93m. However, in practice, the Fractured zone is expected to terminate at the base of the Teralba Conglomerate, some 45m to 50m above the mining horizon.
- The location of the maximum predicted subsidence is beneath Lake Macquarie within the FAS working footprint (ie outside the foreshore and mapped seagrass areas) **Figure 2**.
- First workings under the Morisset peninsula to be designed in accordance with the geotechnical design to remain long term stable and negligible surface subsidence.

Assumptions

- Employees are trained and assessed in relevant contents of the Delta Coal site WHSMS as a minimum.
- Compliance with the Environmental Protection Act 1994, Environmental Planning and Assessment Act 1979, Work Health and Safety Act 2011 and Work Health and Safety Regulations 2011, Code of Practice –How to Manage Work, Health and Safety Risks 2011, AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines.
- Compliance with the Delta Coal Environmental Management System
- Compliance with the Work Health and Safety Act 2011 and Work Health and Safety Regulations 2011, Code of Practice –How to Manage Work, Health and Safety Risks 2011, AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines.
- Work Health and Safety Act (2013) and Regulations (2014) Mines and Petroleum sites.

Monitoring and Review

Delta Coal site monitoring and review processes should encompass all aspects of the risk management process for the purposes of:

- ensuring that controls are effective and efficient in both design and operation;
- obtaining further information to improve risk assessment;
- analyzing and learning lessons from events (including near-misses), changes, trends, successes and failures;

- Identifying emerging risks.

References

- AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines
- MDG1010 – Risk Management Handbook for the Mining Industry
- MDG1014 - Guideline to reviewing a risk assessment of mine equipment and operations
- Work Health and Safety Act 2011
- Work Health and Safety Regulations 2011
- Codes of Practice –WHS Act 2011, Section 274.
- Work Health and Safety Mines Act 2013
- Work Health and Safety Mines Regulations 2014
- AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines
- MDG1010 – Risk Management Handbook for the Mining Industry
- MDG1014 - Guideline to reviewing a risk assessment of mine equipment and operations
- Environmental Protection Act 1994
- Environmental Planning and Assessment Act 1979
- DGS, 2017. Multi-Seam Mining Feasibility Study for the Proposed Miniwalls CVB to CVB4 at Chain Valley Colliery
- EMM, 2015. Chain Valley Colliery- Modification 2- SoEE
- EMM, 2013. Chain Valley Colliery Mining Extension project 1- EIS
- Lake Coal, 2013. Chain Valley Colliery Extraction Plan MW7 to MW12
- NSW DMR, 2003. Guideline for Applications for Subsidence Management Approvals
- NSW DRE Mine Safety, 2017. Guideline Managing Risk of Subsidence
- PHMP 00021- Mannering and Chain Valley Collieries Principal Hazard Management Plans
- Delta Coal Subsidence PHMP
- Miniwall S1/N1 Extraction Plan and associated Risk Assessment

- Miniwall S2/S3 Extraction Plan and associated Risk Assessment
- Miniwall S4 Extraction Plan and associated Risk Assessment
- DGS (2018). Updated Investigation Report into the Maximum Subsidence Prediction Exceedance over Miniwalls 1 to 12 at Chain Valley Colliery, Vales Point. Report No. CHV-002/10b to LakeCoal Pty. Ltd.
- MSEC (2018). Subsidence Predictions and Impact Assessments for Natural and Built Features due to the Extraction of the Proposed Miniwalls S2 and S3 in Support of the Extraction Plan. Report No. MSEC 979 Rev 2.
- Strata2 (2019b). S4 Panel : Geotechnical Environment, Subsidence Estimates and Impacts. Report No. CHV-010-Rev0 to Chain Valley Colliery.
- Strata 2 (2019) Secondary Extraction of Herringbone Report No. CHV-015-Rev0Strata 2 (2020) Herringbone Pillar Layout – Design criteria for Negligible Surface Effects Report No. CHV-008-Rev 0
- Strata 2 (2020) Geotechnical Aspects of S5 Panel Design and Subsidence Report No. CHV-019-Rev0

Definitions

Hazard

Means a situation or thing that has the potential to harm a person. Hazards at work may include: noisy machinery, a moving forklift, chemicals, electricity, working at heights, a repetitive job, bullying and violence at the workplace. (reference Code of Practice –How to Manage Work, Health and Safety Risks 2011)

Hazardous Manual Task

Defined in the WHS Regulations 2011, means a task that requires a person to lift, lower, push, pull, carry or otherwise move, hold or restrain any person, animal or thing involving one or more of the following:

- repetitive or sustained force
- high or sudden force
- repetitive movement
- sustained or awkward posture
- exposure to vibration.

Musculoskeletal disorder

Defined in the WHS Regulations 2011, means an injury to, or a disease of, the musculoskeletal system, whether occurring suddenly or over time. It does not include an injury caused by crushing, entrapment (such as fractures and dislocations) or cutting resulting from the mechanical operation of plant.

Risk Assessment

Risk management process applied to a scope of work, overall activities, equipment and machinery to determine how often specified events may occur and the magnitude of their consequence. When applied to a specific and sequential set of job steps/activities this may be referred to as a Job Safety Analysis.

Risk

Is the possibility that harm (death, injury or illness) might occur when exposed to a hazard. (Reference Code of Practice –How to Manage Work, Health and Safety Risks 2011)

Risk control

Means taking action to eliminate health and safety risks so far as is reasonably practicable, and if that is not possible, minimising the risks so far as is reasonably practicable. Eliminating a hazard will also eliminate any risks associated with that hazard. .(reference Code of Practice –How to Manage Work, Health and Safety Risks 2011)

WRAC

Workplace Risk Assessment & Control

Subsidence

Movement of the ground surface as a result of readjustments of the overburden due to collapse or failure of underground mine workings and/or compression of remnant pillars

Subsidence Effects
The term used to define the subsidence and differential subsidence parameters (i.e. subsidence, tilt, strain and horizontal displacement) that may or may not have an impact on natural or man-made surface and sub-surface features above a mining area

Subsidence Impacts
The impact that a subsidence effect has on natural or man-made surface and sub-surface features above a mining area

Tilt
The rate of change of subsidence between two points (A and B), measured at set distances apart (usually 10 m).

Strain
The change in horizontal distance between two points at the surface after mining, divided by the pre-mining distance between the points, may be tensile, compressive or shear.

Rock Head
The geological boundary in the overburden between competent rock and unconsolidated sediments and weathered rock

Abbreviations

ALARP	As low as reasonably practicable (ALARP) - determined from WHS Act 2011, Section 18.
CVC	Chain Valley Colliery
DISRD	Department of Industry, Skills and Regional Development
EMP	Environmental Management Plan
FOS	Factor of Safety
JSA	Job Safety Analysis
LTA	less than adequate
LAK	Delta Coal
MC	Mannering Colliery
MSD	Musculoskeletal Disorder
MSMFI	Multi-seam Mining Feasibility Investigation
PCP	Principle Control Plans

PMHMP	Principle Mining Hazard Management Plans
PPE	Personal protective Equipment
STD	Standard
STF	Slip/Trips/Falls
SMP	Safety Management Plan
SWP	Standard Work Procedure

Monitoring and Review

Delta Coal site monitoring and review processes should encompass all aspects of the risk management process for the purposes of:

- ensuring that controls are effective and efficient in both design and operation;
- obtaining further information to improve risk assessment;
- analyzing and learning lessons from events (including near-misses), changes, trends, successes and failures;
- Identifying emerging risks.

Risk Table

The hazards were analysed and risks derived. The existing control mechanisms were identified prior to establishment of risk. Proposed risk reductions were discussed and agreed and a residual risk determined based on implementation of existing and proposed risk reductions. Consequences assessed through this risk assessment were taken as the reasonable practicable level of risk considering Injury to Personnel as a primary consideration and Environmental Impact and Financial Loss as a secondary consideration as defined in the Risk Assessment Matrix.

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
1.	**Natural Features**													
1.1a	Groundwater	Loss of groundwater from aquifers due to subsidence induced fracturing impacts users or dependant ecosystems	• Sub-critical Mine design (panel width, chain pillar width and extraction height to limit height of hydraulic fracturing) • Strata2 Mine Design Report • Existing extraction has already influenced groundwater levels (minimal further impact predicted) • Ground water assessment (SEE) • GWMP • Operational water management TARP and underground water make monitoring.	E	D	3	17	Update the GWMP for S5 and Pillar Extraction Plan application				ALARP	Approvals Coordinator	30/11/20

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
1.1b		Abnormal groundwater inflow due to extraction of Miniwall panel	• Strata2 Mine Design Report • Documented experience indicates that dykes and normal faults with throws of up to 3m have no appreciable impact on subsidence development or overburden hydraulic conductivity • Sub-critical Mine design (panel width, chain pillar width and extraction height to limit height of hydraulic fracturing) • Existing extraction has already influenced groundwater levels (minimal further impact predicted) • Subsidence and Water Management TARP • Ground water assessment (SEE) • GWMP • Strata2 report on S2 water make • Water monitoring systems (WO and trending database)	L	D	3	17					ALARP		

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
1.1c		Impact on registered groundwater bores in proximity to extraction effects their ongoing use (GW24575)	• Mining underneath saline Lake Macquarie. Previously no groundwater users identified • Minimal impact based on assessment and existing mining (SEE) • Sub-critical Mine design (panel width, chain pillar width and extraction height to limit height of hydraulic fracturing)	E	D	4	18	As part of GWMP identify potential bores to be affected by MWS5. Check groundwater bores register and monitor SWL where access is granted Provide alternative water supply until impacted bore recovers where proven to be related to mining impact or as required by the secretary	D	5	22	LOW	Approvals Coordinator	If triggered

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
1.2a	Sea/Lake	Increased lakebed cracking resulting in impacts outside predictions	• Sub-critical Mine design (panel width, chain pillar width and extraction height to limit height of hydraulic fracturing) • Geological mapping of known structures incorporated into the mine design and assessed. • Detailed subsidence assessment by Strata 2. Predictions are significantly less than the EA approved limits. • Thickening of Teralba Conglomerate reduces fracture heights • Extensive subsidence model including bathymetric survey • Subsidence monitoring program • No previous evidence of significant irregularities around geological structures in previous MW areas • Subsidence PHMP and associated TARP	E	D	3	17	Undertake remediation of any mining affected sections in consultation with relevant authorities/landowners.				ALARP	Approvals Coordinator	If triggered

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
1.3a	Shoreline	Increased flooding risk due to subsidence	• HWMSB/Mine Design Report • Subsidence assessment (<20mm predicted) • Subsidence monitoring program	E	E	2	16					ALARP		
1.3b		Foreshore ecology impacted by increased flooding or erosion	• HWMSB/Seagrass Protection Barrier Mine Design • Subsidence assessment (<20mm predicted) • Subsidence monitoring program including 6 monthly bathymetric surveys • Biodiversity management plan	E	E	3	20	Undertake remediation of any mining affected sections of foreshore in consultation with relevant authorities/landowners.				ALARP	Approvals Coordinator	If triggered
1.3c		Changes in lakebed depth and wave climate result in increased erosion	• HWMSB/Mine Design • Low wave height environment (SEE) • Subsidence assessment (<0.4m vertical subsidence predicted) • Subsidence monitoring program	E	E	4	23					ALARP		

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
1.4	Ecosystems (Seagrass)	Increased depth from subsidence reduces presence/health of seagrass beds	• Seagrass mapping (no threatened species identified in extraction plan area) • Seagrass Management Plan and monitoring program • SPB/Mine design report • Subsidence assessment (<20mm predicted) • Subsidence monitoring program	E	D	4	21	Undertake remediation of any mining affected sections of seagrass in consultation with relevant authorities/landowners. Rehabilitation Management Plan				ALARP	E&C Compliance Coordinator	If triggered
1.5	Ecosystems (Benthic Communities)	Increased depth from subsidence reduces colony numbers/health	• Benthic communities monitoring surveys • Benthic Communities Management Plan • Subsidence assessment (<0.4m predicted for S5) • Subsidence monitoring program • Predictive modelling and assessment	E	D	4	21	Undertake remediation of any mining affected sections of seagrass in consultation with relevant authorities/landowners.				ALARP	E&C Coordinator	If triggered

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
1.6	Threatened and Protected Species (Loggerhead and Green Turtles)	Increased depth from subsidence results in reduction in food source (seagrass)	• Annual Seagrass mapping • SPB/Mine Design Report • Subsidence Assessment (<20mm Predicted) for first workings • Mobile and no impact predicted to food source	E	E	5	25	Review Subsidence trigger levels in the Seagrass Management plan and the Subsidence Monitoring TARP with regards to survey tolerance (meaningful survey limits) and corresponding seagrass health				ALARP	EC Coordinator	30/06/2020
1.7	Cliff/Steep Slope	Horizontal movements of cliff face results in rock failure	• Sub critical Mine design (panel width, chain pillar width and extraction height to limit height of hydraulic fracturing) • Subsidence assessment (Strata2) • Subsidence monitoring program • HWMSB/Mine Design • Miniwall S5 footprint contained to areas under Lake Macquarie • Pillar extraction to remain under Lake Macquarie Seagrass and Highwater Subsidence Mining barriers	E	E	5	25					ALARP		

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
1.8	Rock outcrops within lake (Pelican Rock)	Change in depth results in public safety risk	• Subsidence assessment (<0.2m long term predicted) • No direct secondary extraction undermining of the outcrop or marker • Subsidence monitoring program updated to include Pelican Rock Navigational Marker • Built Features Management and RMS Consultation	I	E	2	16	Update Built features management plan and consult with stakeholders				ALARP	EC Coordinator	30/6/20
2. Public Utilities														

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
2.2	Services	Services not identified within impact area during original SEE impacted by subsidence	• Dial before you dig has confirmed no services located within subsidence affectation area (>20mm). All services located landward from high water mark. • Seagrass and Highwater Subsidence Mining barriers • Miniwall S5 footprint contained to areas under Lake Macquarie Pillar extraction to remain under Lake Macquarie	L	E	3	20					ALARP		
3. Public Amenities														
	Nil		• Miniwall S5 footprint contained to areas under Lake Macquarie • Pillar extraction to remain under Lake Macquarie • Seagrass and Highwater Subsidence Mining barriers											
4. Farm Land and Facilities														

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
	Nil		• Miniwall S5 and Pillar Extractionfootprint contained to areas under Lake Macquarie • Seagrass and Highwater Subsidence Mining barriers • Long term stable pillar design for First Workings under land											
5. Industrial, Commercial and Business Establishments														
	Nil		• Miniwall S5 and Pillar Extractionfootprint contained to areas under Lake Macquarie • Long term stable pillar design for First Workings under land Seagrass and Highwater Subsidence Mining barriers											
6. Areas of Archaeological and/or Heritage Significance														

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
6.1	AHIMS sites (adjacent extraction plan area)	Arch sites near foreshore impacted by flooding or erosion increases due to subsidence	• Locations identified (approx.) via AHIMS register • Conservation Risk Assessment covers for Miniwall S5 subsidence monitoring • Heritage Management Plan • HWMSB (no impact predicted) • Subsidence assessment (<20mm) • Subsidence monitoring program Consultation with the RAPs	E	E	4	23					ALARP	EC Coordinator	1/9/2020
7. Items of Architectural Significance														
	Nil		• Miniwall S5 and Pillar Extraction footprint contained to areas under Lake Macquarie Long term stable pillar design for First Workings under land											
8. Permanent Survey Control Marks														

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
8.1	State Survey Marks/Permanent Survey Marks	Survey marks near foreshore effected by horizontal/vertical movement	• HWMSB/Mine Design • Subsidence assessment Miniwall S5 and Pillar Extraction footprint contained to areas under Lake Macquarie • Long term stable pillar design for First Workings under land	E	D	4	21	Review Built Features Management Plan to include Trig station adjacent MW S5 Subsidence monitoring program to include Trig station adjacent MW S5				ALARP	EC Coordinator Mine Surveyor	30/6/20 30/6/20
9. Residential Establishments														

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
	Nil		• Miniwall S5 and Northern Pillar Extraction footprint contained to areas under Lake Macquarie • Long term stable pillar design for First Workings under land • Authority to Mine system and survey control					Subsidence Monitoring Program						
10. Other identified items requiring particular assessment														

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
10.1a	Public Safety	Shallow water buoy (or other markers including sailing markers) within extraction plan area impacted due to subsidence resulting public safety risk	• Strata2 Subsidence assessment • Marker locations visually assessed and mapped and within seagrass area. • RMS consulted as part of previous S4 Extraction Plan. • Keep CCC informed of actions taken in relation to public safety risks • PMHMP Subsidence	I	D	3	17	Review the presence and potential impacts to shallow water buoys in Extraction area				ALARP	Mine Surveyor	01/06/20
10.1b		Jetties within extraction plan area impacted due to subsidence	• Subsidence assessment (<20mm predicted) due to mine design principles • Consultation program / community notifications • Visual assessment undertaken Subsidence monitoring program	E	D	4	21	Consultation with affected landholders - send out notification letters				ALARP	Mine Surveyor	30/09/20

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
10.1c		Moorings within extraction plan area impacted due to subsidence	• Limited moorings adjacent the EP area • Strata2 S5 Subsidence assessment • Majority of moorings within seagrass boundary (<20mm subsidence). Negligible change • Subsidence monitoring program	E	D	4	21	Check if there are any moorings in Extraction area				ALARP	Mine Surveyor	30/6/20
10.2	Consultation	LTA community, stakeholder or agency consultation results in concerns over impact	• CCC meetings • Delta Coal Website • Regular meetings with relevant authorities. Consultation with DPIE has occurred. • Extraction Plan Guidelines •	E	C	4	18	Review notification requirements for secondary extraction for affected stakeholders Landowner notifications to be sent out.				ALARP	Mine Surveyor	

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
10.3a	Subsidence Impact (general)	Subsidence predictions exceeded results in increased impact/community concern/ breach of conditions	• Sub-critical Mine design (panel width, chain pillar width and extraction height to limit height of hydraulic fracturing) including proximity of mine workings to surface constraints • Strata 2 Subsidence Assessment • Subsidence monitoring program	E	D	3	17	Update subsidence monitoring program to include MWS5	E	3	20	Low	Mine Surveyor	30/06/20

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
10.3b	Subsidence Impact (general)	Known or unknown geological structures in the workings increases subsidence impact	• Geological database and mapping from old and existing workings • Strata2 Mine Design Report • Known major structures incorporated into the updated geological and subsidence model • Strata Failure Management Plan • All pillars squat pillars thus confinement not reduced by structures • Subsidence monitoring to date has not indicated significant variation in areas of geological structure • Subsidence monitoring program	E	D	3	17					ALARP		

10.3c	Subsidence Impacts (Height of Fracturing)	Height of fracturing exceeds predictions leading to impacts on groundwater/ingress into mine workings due to direct hydraulic connectivity with the Lake.	• Sub-critical mine design (panel width, chain pillar width and extraction height to limit height of hydraulic fracturing) • PMHMP Subsidence • Lake Bed rock head survey undertaken and used to inform Mine Design and Subsidence Assessment report. • Bathymetric survey undertaken at the end of S2 March 2020. • Constrained zone thickness is greater than or equal to 12T • Strata2 Mine Design Report • Experience from inbye end of Miniwall 12 at Chain Valley at similar rock head thickness did not result in increased water make or signs of direct connectivity at higher levels of subsidence • Strata2 Subsidence Assessment Report • No overlying workings in the NMD • Geological mapping and site model • Subsidence monitoring program	E	D	3	17					ALARP		

No	Activity	Potential Hazard	Existing Controls	Cons I,E,L	Likelihood	Consequence	Risk Rank	Proposed Controls	Likelihood	Consequence	Risk Rank	Risk Level	Responsible Person	Due Date
			• Ground water assessment (SEE) • GWMP • Operational water management TARP											

Actions

No	Clause(s) No from RA Tables	Action	Person responsible for Action	Action timeframe	Comments	Database Action No	Responsible Person signature
1.	1.1.a	Update the GWMP for S5 Extraction Plan application Check groundwater bores register Provide alternative water supply until impacted bore recovers where proven to be related to mining impact or as required by the secretary	C Armit	30/6/2020			
2	1.1.c	Undertake remediation of Miniwall S5 mining affected areas as required in consultation with relevant authorities/landowners.	C Armit	If triggered			
3	1.3b, 1.4, 1.5, 1.8	Undertake remediation of any mining affected sections of foreshore in consultation with relevant authorities/landowners.	C Armit	If triggered			
4	1.6	Review Subsidence trigger levels in the Seagrass Management plan and the Subsidence Monitoring TARP with regards to survey tolerance (meaningful survey limits) and corresponding seagrass health.	C Armit	30.06.2020			
5	1.8	Update Built features management plan and consult with stakeholders (add trig station and pelican rock nav marker update in subsidence predictions)	C Armit	30.06.2020			

6	6.1	Review previous Archaeological surveys and requirement for further surveys for subsidence monitoring	C Armit	1.09.2020			
7	10.1a, 10.1c	Check if there are any moorings, shallow water buoys infrastructure in Extraction area	T Chisholm	30.06.2020			
8	10.2	Review notification requirements for secondary extraction for affected stakeholders	T Chisholm	30.09.2020			
9	10.3.a	Update Subsidence monitoring program and to include Trig station adjacent MW S5 Extend foreshore monitoring where access is granted Organise appropriate land access to conduct monitoring	T Chisholm	30.06.2020			



_____

[Chris Armit] **[Signature]** **[29/08/20]**

_____ _____

(Dave McLean) **[Signature]** **[Date]**

MDG 1014 Review Checklist

RISK ASSESSMENT REVIEW CHECKLIST

Risk Assessment Title: MINIWALL S5 and NORTHERN PILLAR EXTRACTION PLAN ***Date:*** 27/08/20

Site: CHAIN VALLEY COLLIERY

1. Report

[Circle or Highlight Yes or No for the following]

1.1	Is there a description of the operation or equipment being assessed?	Yes / No
1.2	Is there a summary of the strategic, corporate and risk management context?	Yes / No
1.3	Is there a list of the people involved in the risk identification step, together with their organizational roles and experience relevant to the risk assessment topic?	Yes / No
1.4	Is there an adequately detailed outline of the approach used to identify the risks?	Yes / No
1.5	Is there an outline of the method used for assessing the likelihood and consequences of the risks?	Yes / No
1.6	Is there, discussion of the basis for defining either the safety standard to be achieved, or the level of risk management expenditure?	Yes / No
1.7	Is there a list of the main actions to be taken to reduce risks and to manage risks?	Yes / No
1.8	Is there a timetable for implementing the main actions?	Yes / No
1.9	Does the report specify a requirement for a working audit requirement after completion of all stages?	Yes / No

2. Process

	How do you rate the following? [Circle or Highlight Poor to Very Good]	Poor/Very Good
2.1	The range of expertise of team which did the study.	**1 2 3 4 5**
2.2	The appropriateness of the degree of detail of the study.	**1 2 3 4 5**
2.3	The comprehensiveness of the systematic approach.	**1 2 3 4 5**
2.4	The identification of the key risk scenarios to be addressed.	**1 2 3 4 5**
2.5	The basis for deciding the required safety level or effort.	**1 2 3 4 5**
2.6	The method for assessing likelihood and consequences.	**1 2 3 4 5**
2.7	The thoroughness of consideration of planned risk reduction actions.	**1 2 3 4 5**
2.8	The thoroughness of consideration of existing or planned risk controls.	**1 2 3 4 5**
2.9	The objectivity and balance of the study (ie not unduly optimistic or pessimistic)	**1 2 3 4 5**

Signed: 

Position: Approvals Coordinator Date: 27/08/20

Appendix 4 Subsidence Management Trigger Action Response Plan

Revision 3 - 8/3/2021

CHAIN VALLEY COLLIERY- SUBSIDENCE MANAGEMENT TRIGGER ACTION RESPONSE PLAN (TARP)

SUBSIDENCE MANAGEMENT NORTHERN MINING AREA DOMAIN (S5 and Northern Pillar Area)

	DETAILED PERFORMANCE INDICATORS	MONITORING REQUIREMENTS	CONTAINMENT / REMEDIATION MEASURES	ADAPTIVE MANAGEMENT MEASURES	CONTINGENCY PLANS
SUBSIDENCE PARAMETERS (Bathymetric Survey)	**Normal** Subsidence ≤ 500mm	As per Subsidence Monitoring (SM) Program			
	Trigger Level 1 Subsidence > 500mm to ≤ 780mm	6 monthly surveys until subsidence stabilises, then as per SM Program		Update subsidence predictions based on monitoring data Identify controlling mechanisms Review potential change in impact on natural and built features & update management plans if required	Review ability to limit further increases based on understood mechanisms including; Extraction heights, panel widths, panel recovery
	Trigger Level 2 Subsidence >780mm	6 monthly until subsidence stabilises then as per SM Program	Review if increase likely to create impact at foreshore/seagrass or exceed final subsidence prediction Notify immediately DPIE if incident and within 7 days for non-compliance Notify RR, BCD, affected landholders or infrastructure owner	Implement further controls as applicable from review Update subsidence predictions based on monitoring data Update impact assessment on natural and built features	Immediately review mine plan including panel width, pillar widths, extraction height and panel length Consult with DPIE and RR Review and update Extraction Plan
SUBSIDENCE PARAMETERS (Foreshore Survey over minimum of 2 adjacent pegs)	**Normal** <20mm recorded movement	Monitoring as per SM Program			
	Trigger Level 1 <20mm recorded movement with slow (3-5mm/month) creep	Validate increase with additional monthy survey/s then as per SM program		Update subsidence predictions based on monitoring data Identify controlling mechanisms Review potential change in impact on natural and built features & update management plans if reqd	
	Trigger Level 2 >20mm recorded movement (assoicated with mining)	Implement Ecological Monitoring program for HWMSB exceedance Increase frequency of subsidence parameter monitoring to until rates stabilises. Then as per SM program	**Cease extraction in panel in question until review conducted in consultation with DPIE and DRE** Notify immediately DPIE if incident and within 7 days for non-compliance Notify RR, OEH, affected landholders or infrastructure owner	Investigate cause of exceedance (ie validate impact due to FAS extraction or not). Update subsidence predictions based on monitoring data Update impact assessment on natural and built features	Provide offsets for any ecological communities or threatened species in the HWMSB if impacts detected Immediately review mine plan including panel width, pillar widths, extraction height in consultation. Consult with DPIE and RR Review and update Extraction Plan
BUILT FEATURES	**Normal** No damage requiring remediation	Monitoring as per Subsidence Monitoring Program RMS routine monitoring navigation markers			
	Trigger Level 1 Subsidence parameters exceeded such that Fassifern workings indicated to have potential impact on foreshore Private bore capacity reduced	Monitoring as per BFMP (Built Feature Management Plan)	Review navigational marker freeboard and notify Transport for NSW if impacted Notify immediately DPIE if incident and within 7 days for non-compliance Notify RR and potentially affected landholders or infrastructure owner. Provide temporary water if required.		Develop BFMP in conjunction with owner for built features surrounding potential impact area
	Trigger Level 2 Impact to built feature	Monitoring as per BFMP	**Cease extraction in panel in question until review conducted in consultation with DPIE and RR** Assist owner with information to aid in Subsidence Advisory NSW claim in accordance with BFMP	Update impact assessment based on observed damage	Immediately review mine plan including panel width, pillar widths Consult with DPIE and RR Review and update Extraction Plan

Revision 3 - 8/03/2021

CHAIN VALLEY COLLIERY- SUBSIDENCE MANAGEMENT TRIGGER ACTION RESPONSE PLAN (TARP)

SUBSIDENCE MANAGEMENT NORTHERN MINING AREA DOMAIN (S5 and Northern Pillar Area)

		DETAILED PERFORMANCE INDICATORS	MONITORING REQUIREMENTS	CONTAINMENT / REMEDIATION MEASURES	ADAPTIVE MANAGEMENT MEASURES	CONTINGENCY PLANS
Triggers	PUBLIC SAFETY (Foreshore area and steep slopes)	**Normal** No impact	Monitoring as per SM Program and Public Safety MP			
		Trigger Level 1 Subsidence parameters exceeded such that Fassifern workings indicated to have potential impact on foreshore	Increase visual inspection of foreshore to daily until public safety risk quantified as low Inspect foreshore in vicinity of steep slopes and retaining walls for signs of movement ASAP. Implement TARP as required.		Review potential of flooding and drainage impacts about foreshore or stability concerns at steep slopes/ retaining walls. Undertake appropriate risk assessments	
		Trigger Level 2 Area around foreshore becomes unstable / shows signs of mining induced impact Flooding or drainage impacts considered likely as result of Fassifern extraction	Visual inspections frequency to be commensurate with level of risk (ie increase until controls put in place) Inspect foreshore in vicinity of other steep slopes and retaining walls for signs of movement ASAP. Implement TARP as required.	**Cease extraction in panel in question until review conducted in consultation with DPIE and RR** Immediately implement temporary safety controls (barricades and signage available from mine site). Arrange for assistance and stay at site if immediate risk to public exists Inform ECC as to result of inspection Geotechnical Engineer to inspect area immediately. Notify LMCC and Transport for NSW Notify BCD, DPIE and RR	Implement longer term safety controls	Foreshore stabilisation of unsafe areas in consultation with LMCC/CC Council and RR as soon as possible Flooding and drainage rectification works in consultation with infrastructure owner as soon as possible
	BENTHIC COMMUNITIES	**Normal** ANOVA/ANOSIM >5%	Monitoring as per Benthic MP			
		Trigger Level 1 ANOVA/ANOSIM level is approaching 5%	Liaise with monitoring consultant & undertake internal review to determine if impacts are related to mining Arrange a peer review of the monitoring results and statistical analysis			
		Trigger Level 2 ANOVA/ANOSIM <5%	Undertake follow up monitoring at affected sites to obtain confirmation of impacts. Incident Report to be completed and distributed to relevant agencies	Notify DPIE-Fisheries, LMCC and DPIE Notify immediately DPIE if incident and within 7 days for non-compliance	Consult with relevant authorities about monitoring and management controls	Consult with relevant authorities to identify if offsets are required and how these are to be implemented.
	SEAGRASS	**Normal** Negligible impact	Monitoring as per Seagrass MP			
		Trigger Level 1 Approaching 20% decline in condition Approaching 20mm of additional mine induced subsidence within mapped seagrass	Liaise with monitoring consultant & undertake internal review to determine if impacts are related to mining		Review if variation is within broader background variation range for the site.	
		Trigger Level 2 >20% decline in conditions from year baseline survey ≥150mm of additional mine induced subsidence at survey location	Incident Report to be completed and distributed to relevant agencies	Notify immediately DPIE if incident and within 7 days for non-compliance Notify DPIE-Fisheries and LMCC	Consult with relevant authorities about monitoring and management controls	Consult with relevant authorities to identify if offsets are required and how these are to be implemented.
	THREATENED SPECIES AND ENDANGERED POPULATIONS	**Normal** Negligible environmental consequences	Monitoring as per Subsidence Monitoring Program, Benthic Communities Management Plan and Seagrass Management Plan			
		Trigger Level 1 As per Seagrass and Benthic Community Management Plans Monitoring Level 1 triggers	Liaise with monitoring consultant & undertake internal review to determine if impacts are related to mining and greater than neglible environmental consequences.		Review if variation is within broader background variation range for the site.	
		Trigger Level 2 As per Seagrass and Benthic Community Management Plans Monitoring Level 2 triggers >780mm subsidence	Incident Report to be completed and distributed to relevant agencies	Notify immediately DPIE if incident and within 7 days for non-compliance Notify DPIE-Fisheries and LMCC	Initiate ecological monitoring program to assess the impacts to ecological communities and threatened species. Consult with relevant authorities about monitoring and management controls	Consult with relevant authorities to identify if offsets or rehabilitation is required and how this is to be implemented.
	WATER INFLOW	Ongoing monitoring of water inflows and site water management through operational Water Management and Monitoring TARP process				

Revision 3 - 8/03/2021

CHAIN VALLEY COLLIERY- SUBSIDENCE MANAGEMENT TRIGGER ACTION RESPONSE PLAN (TARP)

SUBSIDENCE MANAGEMENT NORTHERN MINING AREA DOMAIN (S5 and Northern Pillar Area)

Responsibilities	**Environment Compliance Coordinator**	Coordinate and undertake all environmental monitoring as outlined in TARP Implement TARP actions in consultation with regulatory agencies as/if required Notify the relevant Government agencies and other affected parties of exceedance of performance measures Coordinate Subsidence Review as a part of Annual Environmental Reporting Arrange for subsidence prediction and impact updates as required Update Extraction Plan as required Audit public safety controls regularly
	Mine Surveyor	Coordinate subsidence monitoring as outlined in TARP Review subsidence monitoring results against TARP triggers Inform relevant stakeholders as to subsidence monitoring trends and exceedances
	Mine Manager	Ensure adequate financial and personnel resources are made available for implementation of this plan Review and approve required mine plan changes

Appendix 5 Water Management Plan

Delta coal	Doc Owner: **Environmental Compliance Coordinator** Doc No:

CHAIN VALLEY COLLIERY

Water Management Plan

ENVIRONMENTAL MANAGEMENT PLAN

Reviewed	
	Chris Armit - Delta Coal
Authorised by:	Chris Armit
	Approvals Coordinator
Date:	6 April 2021

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1 Introduction

1.1 Purpose

The Water Management Plan (WMP) addresses the requirements for Development Consent SSD-5465 as modified (MOD 3) and EPL 1770.

The purpose of the WMP is to:

- guide the management of surface and groundwater resources throughout the operational life of the mine;
- address the relevant conditions of the development consent;
- meet the requirements of EPL 1770, including Pollution Reduction Programs (PRP's) that have been implemented on site;
- address the relevant commitments made within the Surface Water Assessment (SWA) (GSSE, 2013) and Environmental Impact Statement (EIS) (EMM, 2013); and
- address legislative requirements and guidelines relevant to the WMP.

The WMP incorporates the following components as required by SSD-5465:

- a Water Balance;
- a description of Surface Water Management;
- a Surface Water Monitoring Plan;
- a Ground Water Monitoring Plan; and
- a Water Management Review.

1.2 Background

Chain Valley Colliery (CVC) is an underground coal mine located on the southern side of Lake Macquarie approximately 60 km south of Newcastle and 80 km north of Sydney (see **Figure 1**). The pit-top is located approximately 1 km south-east of the township of Mannering Park at the southern extent of Lake Macquarie.

In August 1960, J&A Brown and Abermain Seaham Collieries Ltd commenced clearing the present site with drift and shaft sinking starting a few months later. Production of coal from the Wallarah Seam, commenced with the first delivery to the adjacent Delta Electricity's Vales Point Power Station (VPPS) in April 1963.

In 2013 the owners of Mannering Colliery (MC) and CVC entered into an agreement which enabled LakeCoal to operate the MC until 2022. LakeCoal became the operator of MC effective 17 October 2013, with the underground link between CVC and MC completed in October 2017.

As of 1 April 2019, Great Southern Energy Pty Ltd (trading as Delta Coal, DC) own and operate the two underground coal mines, CVC and MC. Mining is currently undertaken at CVC, with the coal being transported underground to MC where the coal is crushed and screened and sent directly to VPPS.

1.3 Operations

CVC is an underground coal mine which extracts coal through both first and secondary workings. ROM coal from both the first and second workings is transported out of the mine via a conveyor system to Mannering Colliery for processing.

The surface infrastructure comprises limited facilities at the 14 hectare pit top area adjacent to the Vales Point Power Station, off Construction Road at Mannering Park, and another 0.3 hectare area at the ventilation facility situated at Summerland Point. Both the pit top and ventilation facilities have remained largely unchanged since their establishment.

The above operations have potential impacts which were addressed in the SWA (GSSE, 2013). To address these, the SWA (GSSE, 2013) identified the following key objectives for surface water management at CVC:

- the prevention of the flow of pollutants into watercourses and the sedimentation on receiving waters, being Swindles Creek to the east of the pit top and Lake Macquarie;
- the control of discharges from the site to ensure that all discharges are within the water volume and quality criteria set out in EPL 1770;
- to minimise site potable water usage requirements and maximise runoff water reuse; and
- to ensure there is sufficient water available to meet Chain Valley Colliery's water requirements.

1.4 Consultation

The original WMP (GSSE, 2012) was prepared in consultation with the former NSW Office of Water (NOW), DTIRIS (Division of Resources & Energy (DRE)) and Wyong Shire Council. The previous WMP (GSSE, 2012) was submitted on the 23 August 2012 and approved by the Director-General on the 6 November 2012.

The 2015 revision of the WMP was prepared in consultation with the (former) NOW and the Environment Protection Authority (EPA) and incorporates outcomes of correspondence with EPA in relation to the variation of the EPL. Comments on the WMP were received from NOW on the 5 December 2014 and requested a change to the groundwater drawdown trigger to 2m over a 2 month period, which is consistent with the minimal impact considerations of the NSW Aquifer Interference Policy, this change has been made within the Groundwater Management Plan (**Appendix B**).

Comments were also sought from the EPA and subsequently requested via email in December 2014. On the 12 June 2015 the EPA responded stating that "The Environment Protection Authority ("EPA") encourages the development of such plans to ensure that proponents have met their statutory obligations and designated environmental objectives. However, EPA does not review these documents as our role is to set environmental objectives for environmental / conservation management, not to be directly involved in the development of strategies to achieve those objectives. The EPA has not reviewed this report and accordingly offers no comments in relation to it".

In accordance with Schedule 3, Condition 18 of development consent SSD-5465 the December 2019 WMP review was prepared by suitably qualified and experienced persons, Sally Callander (EMM Consulting), Andrew Dawkins (Geoterra) and Chris Armit (EMM Consulting), whose appointment has been endorsed by the Director-General.

A draft revision of the WMP was provided to DPIE - Water, EPA and DPIE on 26 November 2019 and a further review was provided in May 2020 associated with the Miniwall S4 Extraction Plan.

A review has been undertaken after the approval of SSD5465 Mod 3 (approved in June 2020) and for the submission of the Miniwall S5 and Northern Pillar area extraction plan (December 2020) with an updated Groundwater Management Plan. A summary of the comments received and amendments subsequently made to the document prior to finalisation are detailed in **Table 1**. Evidence of consultation is provided in **Appendix 1**. The groundwater management plan section of this plan was approved by DPIE on the 6 April 2021 as part of the Miniwall S5 and Northern Pillar Area extraction plan **(Appendix 1)**.

Table 1: Consultation Summary

Stakeholder	Comments	Response/Action
NSW DPIE	Request for information (RFI) provided on 5 March 2020. See attached DPIE RFI letter and attachment (Appendix 1). Extraction Plan approval which includes approval of the Groundwater Management Plan (Appendix 1).	Tracked changed document provided on planning portal for updated consent references and mining panel numbering
NSW EPA	No comments	Nil required
DPIE - Water	No comments	Nil required
Natural Resource Access Regulator (NRAR)	No comments	Nil required
DPI-Fisheries	No objection or comments	Nil Required

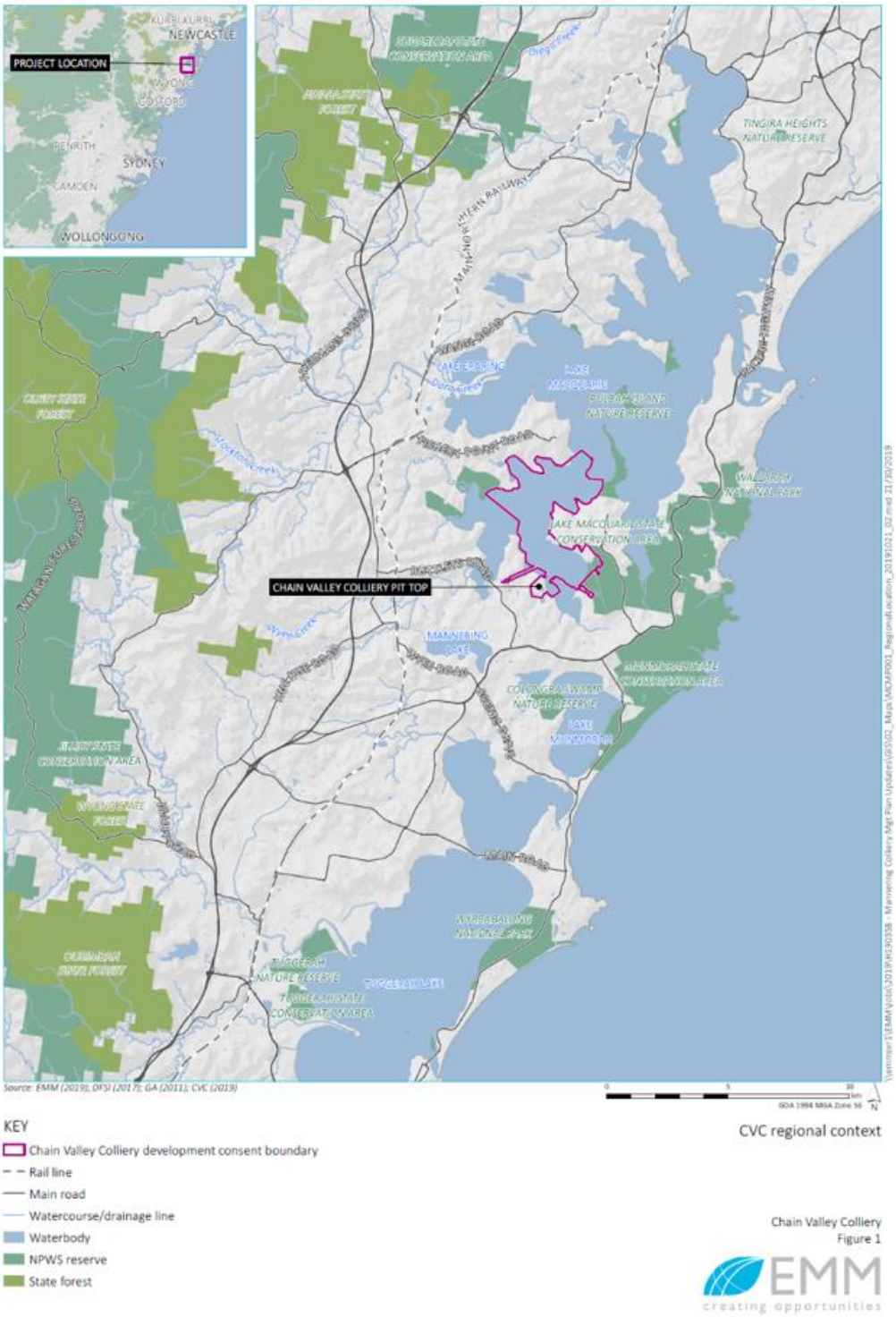


Figure 1: Regional Context

2 Summary of the Statutory Approval Requirements

2.1 Key Legislation, Policy and Guidelines

A number of legislative requirements, government policies and guidelines relating to water management are applicable and have been addressed in detail within the SWA (GSSE, 2013). The key items of legislation and the relevant approval documents to this WMP are:

- *Water Act 1912 and Water Management Act 2000* - LakeCoal applied for a 4,443 ML/year groundwater license on the 5th October 2011 under the *Water Act, 1912* to pump water from the underground workings to the sedimentation and pollution control ponds at the pit top. The license (WAL41508) was subsequently granted on the 12 March 2013;
- *Protection of the Environment Operations Act 1997* (POEO Act) - Chain Valley Colliery has an existing EPL 1770 under the POEO Act for the discharge of water from site;
- *Environmental Planning and Assessment Act 1979* (EP&A Act) - On 23rd December 2013 development consent SSD-5465 was issued for the *Chain Valley Extension Project*, which has been modified twice by approval on the 27 November 2014 and 16 December 2015; and
- *Mining Act 1992* – Delta Coal holds numerous mining authorities under the Mining Act 1992, a list of all leases held is contained within the Environmental Management Strategy (OMP-D-16374), the most relevant for the WMP is Mining Purposes Lease 1349 as it pertains to the surface facilities area.

The relevant aspects of these approval documents are addressed further below.

Key policies and guidelines which are relevant to the preparation and implementation of this WMP include:

- Australian and New Zealand Environment Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC Guidelines), October 2000;
- Department of Environment and Conservation (DEC), Approved Methods for the Sampling and Analysis of Water Pollutants in NSW, March 2004;
- Managing Urban Stormwater: Soils and Construction (the Blue Book), Volume 1 and Volume 2E – Mines and Quarries (Landcom, 2004 and Department of Environment and Climate Change (DECC), 2008;
- NSW Water Quality and River Flow Objectives, September 1999;
- NSW State Rivers and Estuaries Policy, 1993;
- NSW Groundwater Quality Protection Policy, adopted in 1998;
- The NSW State Groundwater Dependent Ecosystems Policy, adopted in 2002;
- NSW Groundwater Quantity Management Policy;
- Australian Government, Charter: National Water Quality Management Strategy, 2018;

- Australian and New Zealand Environment Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), National Guidelines for Sewerage Systems - Effluent Management, 1997; and
- NSW Department of Environment and Conservation (DEC), Environmental Guidelines: Use of Effluent by Irrigation, 2004.

2.2 Development Consent (SSD-5465)

This plan has been prepared in accordance with Schedule 3, Condition 21 of SSD-5465, which states the requirements of the WMP and what it must address. Surface and groundwater related requirements of SSD-5465, including specific requirements that are to be addressed in this plan, and where they are addressed, are detailed in **Appendix 2**.

In accordance with Schedule 2, Conditions 2 and 2A, in addition to carrying out the works in accordance with the conditions of SSD-5465, DC will also carry out works generally in accordance with the Environmental Impact Statement (EIS), Statement of Environmental Effects (SEE) (Mod 1), SEE (Mod 2), SEE (Mod 3), Project Layout Plans, and Statement of Commitments.

2.3 Mining Leases

MPL 1349, is the most relevant lease to this WMP as MPL 1349 relates to the surface facilities. MPL 1349 contains the following provision with respect to surface water management.

> *2. The proponent shall implement all practical measures to prevent and/or minimise any harm to the environment that may result from the construction, operation or rehabilitation of the development.*
>
> *18. Operations must be carried out in a manner that does not cause or aggravate air pollution, water pollution (including sedimentation) or soil contamination or erosion, unless otherwise authorised by a relevant approval, and in accordance with an accepted Mining Operations Plan. For the purpose of this condition, water shall be taken to include any watercourse, waterbody or groundwater and perform any instructions given by the Director-General in this regard.*

2.4 Environmental Protection License (EPL 1770)

CVC operates under EPL 1770 issued by the Environment Protection Authority (EPA) under the POEO Act. The EPL has been modified a number of times, most recently on the 1 April 2019 for the transfer from Lake Coal Pty Ltd to Great Southern Energy Pty Ltd (trading as Delta Coal). Water related requirements of the EPL, including specific requirements that are to be addressed in this management plan and section references within the WMP are detailed in **Appendix 2**. A 5 year anniversary review of EPL 1770 was undertaken in 2019.

2.5 Maximum Harvestable Right Dam Capacity

Under the NSW *Water Management Act 2000*, landholders are permitted to capture, store and use a portion of the rainfall runoff on their property. The right to harvest rainfall is determined by geographic location and is typically 10% of the total rainfall runoff for the property and storage is calculated under the Maximum Harvestable Right Dam Capacity (MHRDC) provision. Dams that exceed this capacity or are greater than a certain size must be licenced.

Where dams are used to control pollution or effluent, there are exemptions to the licencing requirements. This is the case for the pollution control dams at CVC where the dams are exempt from the MHRDC calculation.

3 Water Balance

A comprehensive site water balance has been prepared for the site and is described in detail within the SWA (GSSE, 2013). This section of the WMP provides a summary of the water balance to enable the key inputs and outputs to be understood along with the water balance results. It also describes the implications of the proposed changes to site water management described in **Section 4.4**.

For more detailed information on the site water balance refer to the SWA (GSSE, 2013).

3.1 Water Balance Model

A detailed 'daily time-step' water balance model was used to represent the Chain Valley Colliery water balance using GoldSim Version 10.50 (GoldSim Technology Group LLC). This software is a graphical, object-oriented system simulation software for completing either static or dynamic systems. GoldSim is commonly used to undertake 'daily time step' water balance simulations for coal mines within NSW due its enhanced modelling capability and flexibility compared to spreadsheet models that have predominately been used in the past. The Chain Valley Colliery water cycle, as simplified and modeled in GoldSim is shown in the schematic water flow diagram as shown on **Figure 2**.

3.2 Data (Model Inputs and Outputs)

3.2.1 Rainfall Runoff

The dataset developed for the water balance used information from the Wyee and Norah Head weather stations. There are other stations in the general vicinity, however these stations were selected due to their proximity to the CVC and length and completeness of the data, which together, provide over 100 years of rainfall data.

The pit top area was segregated into four distinct catchments which were further broken up into eight sub-catchments for the purpose of the CVC water balance.

The daily step GoldSim model was used to estimate the surface water runoff from different sub catchments at the pit top area. The runoff coefficients adopted are considered conservative but reflect the large impermeable area in the catchment which includes laydown areas, compacted roads and coal stockpile areas. The free

water surfaces of the pollution control dams and the roofed areas were modelled as completely impervious areas, capturing all precipitation.

Catchment areas as modeled within the GoldSim model are provided in **Table 2**.

Table 2: Pit Top Catchment Areas

Major Catchment Name	Sub-Catchment Name	Catchment Area (ha)
Carpark (Catchment 1)	Carpark (not modelled)	NA
Storage Yard (Catchment 2)	Oil Water Separator	0.15
	Workshop (Roof)	0.24
	Old Bath House (Roof)	0.11
	Pit Top Storage Yard	3.03
Stockpile (Catchment 3)	CHP Stockpile	5.34
Pollution Control Dams (Catchment 4)	Dams D1 to D6	0.41
	Dams D7 to D13	1.97
Total catchment reporting to pollution control dams (excluding carpark)		**11.25**

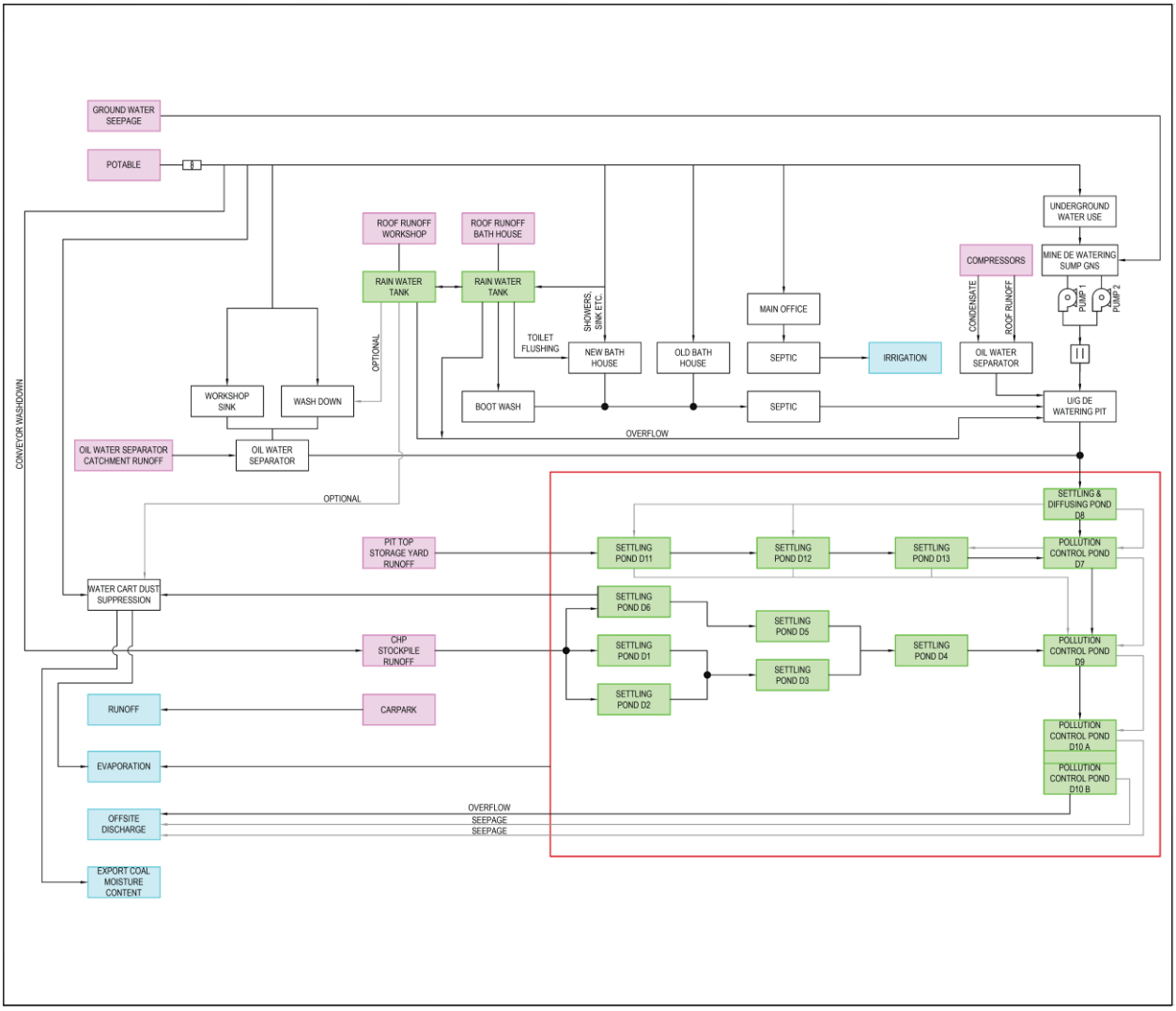


Figure 1: GoldSim schematic water flow diagram

3.2.2 Evaporation

Evaporation data was obtained from the Peats Ridge weather station on Waratah Road (station number 61351), approximately 33km south-west of the site. This was the closest meteorological weather station to the CVC with over 25 years of evaporation information. Evaporation data from this weather station was adjusted for the change in site conditions from the measuring site to the sedimentation dams by multiplying the average monthly rates by a pan coefficient of 0.7.

Evaporation from the pollution control dams was calculated using a daily step within the GoldSim model similar to the runoff model calculations. This model used the evaporation rate, modified by the pan coefficient, and the surface area of the dams, which was calculated using survey data.

3.2.3 Underground Water Extraction

The Groundwater Assessment (Geoterra, 2013) predicted that the average daily water volumes pumped from the coal face would increase from approximately 7.3 ML/day to 10.5 ML/day. This estimated pumping rate is an average value and therefore pumped flow rates may exceed this value on occasions. It should be noted however, that this average daily volume was calculated as an 'end of mining' estimate and can be considered a 'worst case' prediction of groundwater inflow rates. It is not expected to occur for the majority of the project life.

The annual groundwater make from the mine is estimated at approximately at 1,817 ML/yr, or 4.98 ML/day (Geoterra, 2019).

Pump rate information provided by LakeCoal indicates that the two existing underground dewatering pumps from the Great Northern Seam sump have a maximum pumping rate of 75 L/sec and 75 L/sec respectively. This equates to a total maximum pumping rate from underground of approximately 12.96 ML/day.

However, within the EIS (EMM, 2013) LakeCoal committed to limiting the main underground pumps to a maximum pump out rate of 10.5 ML/day (equivalent to the predicted average daily volume that will need to be pumped from the coal face during the later stages of the project). This limit was put in place during September 2014, using the site Citect system to automatically stop the one of the underground pumps when 9.5 ML has been pumped and stopping the second pump if a total of 10.5 ML in any day has been pumped. The pumps are only able to be restarted the following day. This limit can however be temporarily disabled by authorised persons in the event of unacceptable risk (e.g. flooding and risk to employee health and safety), which was a requirement of the site risk assessment completed.

When not pumping, water accumulates underground in a number of storages that exist within both the Great Northern and Wallarah Seams, these are discussed in **Section 4.3**.

3.2.4 Pollution Control Dam Characteristics

Information pertaining to the GoldSim modelling of the sedimentation dams was obtained from survey data. This information is shown in **Table 3**. It should be noted that the volume of dam D6 was not available and was estimated based on a 1 m depth, the measured surface area and standard stage/storage relationships. Dams D1 to D6 and D7 to D13 were each modelled as single storages to simplify the water balance processes at the site.

Table 3: Pollution Control Dam Capacities (as modelled in GoldSim)

Dam	Volume (m^3)
D1	80
D2	51
D3	284
D4	547
D5	770
D6	568
Total dams D1 to D6	**2300**
D7	3856
D8	2933
D9	3796
D10	4802
D11	297
D12	229
D13	168
Total dams D7 to D13	**16081**

3.2.5 Loss of Water through Coal Export

During mining and conveying, the moisture content in the coal increases due to the use of water sprays at the coal face and at transfer points along the conveyor system. A review of the CVC coal analysis data indicates that the inherent (air dried) moisture content of the coal from underground is approximately 2.7%.

This same data indicates that the total moisture of the CVC coal that is exported is approximately 7.3%, which means that around 4.6% of this total moisture content is added to the coal prior to export. This equates to 69,000 tonnes of additional water at the proposed maximum rate of production of 1.5 Mtpa. Therefore, approximately 69.0 ML of water is exported from the CVC every year, or 188.9 kL/day.

3.2.6 Additional Data

A limited amount of water usage and flow monitoring data at CVC was available for the water balance investigation. However, where historic information was lacking, data and operational information was made available to best derive estimates of the respective water balance parameters (flow rates, water usage, etc.). Additional data, as used in the water balance model, is shown in **Table 4**, as well as comments/assumptions on how this data was derived.

Table 4: CVC Supplied and Derived Data

Parameter	Value	Comments/Assumptions
Potable Water: Underground (includes increase of 25% to account for any additional underground potable water demand)	140 ML/yr	Average of underground potable water from monitored water use with an additional 25% to account for increased potable water used underground.
Potable Water: Main Office	211 L/day	Includes shower, sink and toilet facilities. Shower (26 L/day): Assumes 9 L/min, 10 min/person, 2 showers per week. Toilet (154 L/day): Assumes 15 employees, employees at work 5 days/week, 6 L/toilet flush, average employee flushes 3 times/day (at work). Sink (31 L/day): Assumes 15 employees, 1.2 L/wash, employees at work 5 days/week, employees use sink 3 times/day.
Potable Water: Workshop	3724 L/day	Includes equipment washdown and sink use. Equipment Washdown (3712 L/day): Assumes 1-hour wash/day, 1.031 L/sec flow rate. Sink (12 L/day): Assumes 1.2 L/wash, 1 sink used 10 times per day.
Potable Water: Bath House 1	24 L/day	Includes sinks facilities. Sinks (24 L/day): Assumes 1.2 L/wash, 2 sinks each used 10 times per day.
Potable Water: Bath House 2 (Showers, Sink)	8519 L/day	Includes shower and sink facilities Shower (8190 L/day): Assumes 9L/min, 10 min/person, average of 91 shift ends / day (calculated from shift information provided by DC). Sink (329 L/day): Assumes 220 employees, 1.2 L/wash, employees at work 4 days/week, employees use sink 3 times/day.
Bath House 2 Toilet Flushing Demand	1097 L/day	Assumes 220 employees, employees at work 4 days/week, 4 L/toilet flush (reduced for urinals),

		average employee flushes 3 times/day (at work).
Potable Water: Bath House 3 (Showers, Sink)	8519 L/day	Includes shower and sink facilities Shower (8190 L/day): Assumes 9L/min, 10 min/person, average of 91 shift ends / day (calculated from shift information provided by DC). Sink (329 L/day): Assumes 220 employees, 1.2 L/wash, employees at work 4 days/week, employees use sink 3 times/day.
Bath House 3 Toilet Flushing Demand	1097 L/day	Assumes 220 employees, employees at work 4 days/week, 4 L/toilet flush (reduced for urinals), average employee flushes 3 times/day (at work).
Bootwash Water Demand	480 L/day	Assumes it is used 3 L/person/shift, average of 91 shift ends / day (calculated from shift information provided by DC).
Dust Suppression Demand	11ML/yr	Calculated from available water cart records
Combined Rainwater Tank Capacity	30 kL	Estimated rainwater tank capacity.

3.3 Water Balance Results

3.3.1 Expected Discharge from Chain Valley Colliery

As noted in **Section 3.2.3**, DC limits the main underground pumps to a maximum pump out rate of 10.5 ML/day. As such, the GoldSim model was run (using a deterministic simulation) assuming that the pumps from the Great Northern Seam sump were constantly pumping at this 10.5 ML/day rate. This scenario assumes that adequate capacity is available in the underground workings to effectively store water during periods when the groundwater inflow rate exceeds the underground dewatering rate. This is further discussed in **Section 4.3**. It should be noted that assuming a constant underground pump rate of 10.5 ML/day is a 'worst case' scenario and is only predicted to occur, on occasions, near the end of the project life.

Key statistics from the GoldSim modelling, assuming a constant discharge from underground of 10.5 ML/day, include:

- daily average discharge through the LDP1 of 10.716 ML/day;
- maximum discharge through LDP1 of 35.124 ML/day; and
- likelihood of LDP1 volumetric limit exceedance on any given day of 4% (or approximately 15 times per year).

The prediction that rainfall events will regularly result in discharges above the EPL LDP limit of 12.161 ML/day is further discussed in **Section** Error! Reference source not found.. During the period 2017 to 2020, there have b

een 3 discharges above the LDP volumetric limit of 12.161 ML/day. Two occurred during 2016 and one in August 2019. All were reported to the EPA and DPIE.

3.3.2 Potable Water Use

The total amount of potable water used at the CVC was investigated in the GoldSim model, with and without the committed water savings measures (as described in **Sections 4.7**) in order to quantify how much potable water these measures are likely to save at the site. GoldSim modelling estimates that the potable water used in the pit top area will be reduced from 55.9 kL/day to 23.7 kL/day with an overall saving of 32.3 kL/day (11.8 ML/year) as a result of water saving measures being implemented.

This equates to an approximate reduction in total potable water of 8.9% (for current levels of potable water use) and 7.4% (allowing for a 25% increase in the underground potable water use as a result of the proposed future mining works).

3.4 Water Supply and Security

All water required for operational activity has historically been sourced from the single potable water supply connection from the Central Coast Council town-water system. This connection is considered a secure source of water as it is only a small portion of the total water consumed annually by the Central Coast and no viable alternative sources have been identified. Further discussion on water savings and alternative water supply is contained in **Section 4.7**.

No water is obtained from unregulated water sources listed in the *Water Sharing Plan for the Central Coast Unregulated Water Sources 2009*.

4 Surface Water Management

4.1 Overview of Water Management System

The water management at the CVC pit top is primarily focused on erosion and sediment control, however there are a number of water management components including the underground de-watering, oil water separator system, the effluent management train and the operation of the pollution control dams.

All water required for operational activity is sourced from the single potable water supply connection from the Central Coast Council town-water system. All excess water from the underground workings is pumped to the Great Northern Seam sump. This water is then pumped to the surface and discharged into the site's pollution control dams.

A combination of surface slope and earth diversion drains on the eastern and northern boundaries results in the majority of the site draining east towards the pollution control dams. A small catchment (i.e. carpark and access road) discharges off-site to the west and north. Other than the carpark catchment, the site's pollution control dams receive all rainfall runoff from the pit top, amenities water and underground mine water, as well as workshop and wash down water after treatment by an oil separator. A system of 13 pollution control dams have been constructed from a mixture of earth, crushed rock, recycled brick and stone. The dams are interconnected through a series of overflow pipes and spillways which allows water to circulate through each dam before reaching the site discharge point. The dams provide improvement to the site wastewater and runoff quality prior to discharge to Lake Macquarie (via Swindles Creek).

4.2 Potable water

All water used for underground mining purposes by CVC is potable water and used in equipment, for cleaning, and dust control. To quantify the estimated volume of water consumed underground a flow/volume meter is installed on the underground water line.

Water is made available throughout the underground workings to satisfy statutory obligations for the production of underground coal. Water is consumed mainly by the following processes.

- when cutting coal at the coal face - to reduce respirable dust and propensity for frictional ignition of coal dust and methane gas;
- when transferring coal along the underground conveyor system and at transfer points - to reduce dust make;
- for use in cleaning;
- for use in equipment; and
- for emergency firefighting purposes.

Water used in the pit top operations is consumed by amenities, dust suppression and wash down.

4.3 Underground Water

In addition to the potable water, naturally saline groundwater migrates into the underground workings of the mine. This water is pumped to or collects in a sump within the Great Northern Seam, from there it is pumped to the pollution control dams on the surface. This water is not used for operational purposes due to its high salinity and subsequent potential effects on mine machinery and equipment.

As mentioned in **Section 3.2.3**, DC has limited the main underground pumps to a maximum pump out rate of 10.5 ML/day. To facilitate restrictions to pumping rates, underground water can be stored within both the Great Northern and Wallarah Seams. The underground storage volumes have been assessed and estimated at the following capacities:

- Great Northern Seam – North East Sump, ~ 100 ML;
- Great Northern Seam - Shaft Headings Sump, ~ 200 ML;
- Great Northern Seam - Sump Headings, ~ 5 ML; and
- Wallarah Seam – Wallarah Sump/Storage Location, 150 to 200 ML.

Details on groundwater management are contained in the Groundwater Management Plan (GwMP) (GeoTerra, 2019) which is in **Appendix 3**.

4.4 Surface Water Catchments and Controls

For the purpose of the WMP runoff from the pit top area is managed as 4 catchment areas including:

- Catchment 1 (Carpark) – carpark, office building and partial runoff from the workshop roof;
- Catchment 2 (Storage Yard) – rear storage yard and oil water separator;
- Catchment 3 (Stockpile) – stockpile, entry road and bathhouse form the third catchment; and
- Catchment 4 (Sedimentation Dams) – pollution control dams.

The above catchments and the major drainage structures are shown on **Figure 2.**

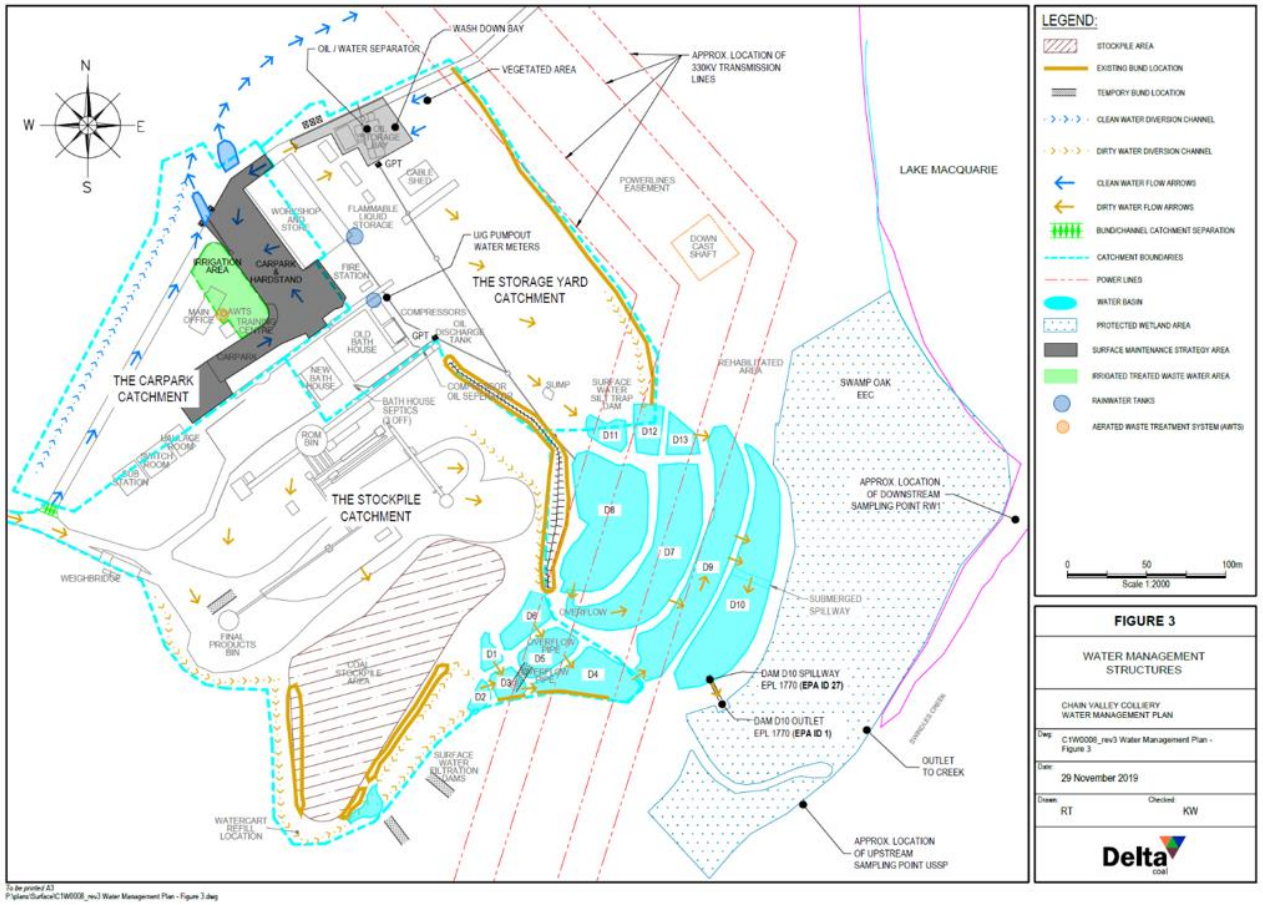


Figure 2: Water Management Structures

4.4.1 Catchment 1

Catchment 1 (carpark catchment) is a relatively clean catchment as a large portion of this area is vegetated, and there are areas of offices and sealed roads. However, the carpark is unsealed (gravel hardstand) and some sediments accumulate on the surface.

The key control methods implemented in Catchment 1 include:

- clean water diversion channel runs down the north-western perimeter of the pit top to divert any off-site run-on into the natural drainage channel. This is the only major clean water diversion channel required on-site with the remaining topography such that small bunds are sufficient to prevent overland flows entering the site;
- a concrete spoon drain at the intersection with the main site entry road directs dirty runoff from the entry road toward the weighbridge within the storage yard catchment and prevents it from entering this catchment;
- regular sweeping of the carpark surface to remove accumulated sediment;
- kerb and guttering on the access road provides the perimeter drainage directing runoff to the sediment treatment basins within this catchment; and
- utilisation of two small basins, the first is in line with main drainage outlet of the carpark and the second is beside the workshop adjacent to the carpark. Both basins allow coarse sediment to be removed prior to discharge into the natural drainage channel and are shown on **Figure 2**.

4.4.2 Catchment 2

Catchment 2 (storage yard catchment) includes the main storage yard, the majority of which is gravelled hardstand for equipment storage. This area also includes the vehicle wash down bay and bunded areas which drain to the oil water separator within this catchment.

The key control methods implemented in Catchment 2 include:

- there is no off-site water flowing into this catchment and subsequently clean water diversion is not required;
- an earth bund is installed along the eastern perimeter of the catchment which contains all dirty water runoff; and
- a large portion of this storage yard area drains south-east via overland flow into the pollution control dams D11, D12 and D13 which function as primary settling dams before discharging into the main mine water treatment system (i.e. dams D7 to D10);

- the remainder of the catchment (e.g. bathhouse, workshop and treated water) enters various inlet pits and drains south-east via the pit and pipe network into the main mine water treatment system via dams D8; and
- an oil water separator to treat runoff from the bunded hydrocarbon storage areas and vehicle wash down bay (see **Section 4.10**).

4.4.3 Catchment 3

Catchment 3 (stockpile catchment) includes the main entry/haul road, weighbridge (no longer in use), coal handling (including ROM bin) and coal stockpiles (also no longer in use).

The key control methods implemented in Catchment 3 include:

- perimeter bunding along south-west perimeter to prevent clean water entering this area and dirty water leaving the site;
- bunding and surface grading around the water cart fill location to directed runoff to a stockpile catch drain;
- bunding and drainage around the weigh bridge to directed runoff to a stockpile catch drain;
- runoff is contained by two main stockpile catch drains that surround the stockpile. Runoff from this area contains a significant amount of coal fines and there are in-line sumps within the catch drains to trap coarse material before it enters the series of pollution control dams below the stockpile; and
- runoff from this catchment area reports to the pollution control dams D1 to D6 which function as primary settling dams before discharging into the main mine water treatment system (i.e. dams D7 to D10).

4.4.4 Catchment 4

This catchment contains all the pollution control dams (i.e. D1 to D13) which receive runoff from the storage yard area, the stockpile area, pumping of water from underground, and rainfall directly into the dams. The management of this catchment is described in **Section 4.5**.

4.5 Management of Pollution Control Dams

Effective management of surface water runoff relies heavily on the use of pollution control dams for the detention of dirty water as well as mine water. All surface water runoff potentially containing sediment, septic treated bathhouse wastewater, treated water from the oil water separator and underground mine water is captured by the site's pollution control dams prior to discharge under EPL 1770. These dams have been constructed with a mixture of earth, crushed rock, crushed recycled brick and stone and are interconnected through a series of overflow pipes and spillways. The dams discharge through the LDP into native vegetation and flow to Swindles Creek prior to draining into Lake Macquarie on the western shoreline of Chain Valley Bay.

Water is directed through the treatment dams from a number of main inlet locations. Runoff from the stockpile area and the storage yard enters the pollution control dams as described above for those catchments. The underground mine water is pumped to a pit adjacent the compressor house and is combined with the septic treated wastewater from the bathhouse, the treated compressor condensate water and some surface runoff.

From this pit the water is piped to D8 for settling and diffusion. Water within D8 enters D7 via a spillway at the southern end of D8. However, due to the imperfect nature of the dam's construction an unknown amount of water diffuses through the dam wall. The water in D7 flows into D9 in a similar manner, in D9 the underground water is combined with the runoff from other areas on site. The primary spill from D9 to D10 is at the northern end of D9. Once in D10 the water flows over a shallow buffer spillway to the main discharge spillway and offsite at the LDP. A real time monitoring system on the final spillway was installed in February 2015, with monitoring data sent every 30 minutes via 3G to an online database where data can then be viewed or downloaded.

The dams provide improvement to the site wastewater and runoff quality through the settlement of fines and suspended solids and prevention of off-site discharge of hydrocarbon spills prior to discharge to Lake Macquarie. Based on the volume of the dams and the average daily discharge, the estimated residence time of the water in the pollution control dams is 1 – 2 days. The storage capacity of these dams is provided in **Section 3.2.4**.

4.6 Erosion and Sediment Control / Ground Disturbance

Erosion and sediment control are predominately managed through the implementation of the primary controls described above within the surface water management systems. In addition to these controls, temporary erosion and sediment controls are implemented for any construction disturbance that is not contained with the surface water management system. The primary objective is to ensure that appropriate procedures and programs of work are in place to meet the requirements of Managing Urban Stormwater: Soils and Construction (the Blue Book), Volume 1 and Volume 2E – Mines and Quarries (Landcom, 2004 and Department of Environment and Climate Change (DECC), 2008).

4.6.1 Soils

CVC surface facilities are situated at the southern end of Lake Macquarie. This area is principally comprised of the Doyalson soil landscape with small parts on the Wyong soil landscape. The Doyalson soil landscape is characterised by gently undulating rises on Munmorah Conglomerate with broad crests, ridges and long gently inclined slopes.

Local relief is up to 30 metres and slope gradient is less than 10%. Doyalson soils are strongly acidic soils of low fertility with slight to high erodibility. The Wyong soil landscape is characterised by broad, poorly drained deltaic floodplains and alluvial flats of Quaternary sediments. Local relief is less than 10 metres and slope gradient is less than 3%. Wyong soils are strongly acidic, poorly drained, impermeable soils of very low fertility with saline subsoils.

There is also the potential for acid sulfate soils (ASS) to be present, with probability of occurrence increasing with proximity to the shoreline of Lake Macquarie (see **Section 4.8**).

4.6.2 Potential Impacts

As there is expected to be very little disturbance to ground surfaces and generally restricted to limited construction activities associated with the mines pit top, erosion impacts will be minimal. Construction activities would typically be in areas of relatively flat land at the pit top, with mitigation measures to be put in place to control mobilisation of disturbed soils at the time of, and immediately following, the construction activity.

The greatest potential for soil exposure and movement of soil would occur during any construction activities within areas outside of the pit top water management system (such as at the ventilation shaft site). Exposed soil may be mobilised, leading to erosion, fugitive dust emissions and potential sedimentation of Lake Macquarie. The following sections provide control measures to prevent adverse impacts on surrounding catchment areas and receiving waters.

4.6.3 Standard Erosion and Sediment Controls

Erosion and sediment controls are to be implemented across the CVC for all phases of the operation including construction, operation and maintenance activities to mitigate impacts on watercourses and the surrounding environment. Where activities are contained with the pit top surface water management system, erosion and sediment control will be achieved through the controls described in the previous section.

Where soil disturbance activities are outside of these controls, standard erosion and sediment control techniques and management principles are used in accordance with the requirements of Managing Urban Stormwater: Soils and Construction Vol. 1 and Vol. 2E - Mines and Quarries (referred to as the Blue Book in this Plan) (Landcom, 2004 and DECC, 2008).

For activities at CVC, a 'Permit to Clear or Disturb Land' is required prior to disturbance. This permit includes requirements to have water management and erosion controls in place prior to disturbance.

4.6.4 Construction Erosion Management Plan

Where soil disturbance activities are outside of the surface water management system, erosion and sedimentation shall be effectively controlled through the development of a Construction Erosion Management Plan (CEMP) prior to undertaking large scale disturbances (i.e. greater than 2,500 m^2). The CEMP shall be consistent with the Blue Book (Landcom, 2004 and DECC, 2008) and would include the following key principles:

- conducting best practice land clearing procedures for all proposed disturbance areas including:
    - coordinating construction activities to minimise exposure of disturbed soils to the elements; and
    - topsoil stripping procedures to reduce deterioration in topsoil quality and dust generation.
- appropriate storage of topsoil stockpiles in areas away from roadways and other drainage lines;
- appropriate design of access tracks;
- use of diversion structures to separate 'clean' water runoff from disturbed areas runoff, to minimise volumes of sediment-laden and mine water for management;
- ensuring sediment-laden runoff is treated via designated sediment control devices;
- topsoiling, reshaping and revegetation of disturbed areas as soon as possible following the completion of construction activities;
- temporary erosion and sediment controls to be in place prior to any construction activity outside of an existing dirty water management system; and
- implementing an effective maintenance program for the site.

The above principles are addressed in further detail in **Appendix 4**.

4.7 Water Savings

CVC seeks continual improvement in relation to water consumption, potential improvements in water efficiency, alternative water sources and options for recycling and reuse. The following measures are implemented on site:

- use of a road sweeper to clean roads (as opposed to more frequent washing of roads with a water cart);
- rainwater tank installed on the workshop;
- repair works to aging pipelines to reduce losses from leakage; and
- trial use of chemical dust suppressant to reduce water cart usage.

The primary use of potable water is to supply underground activities. The water storage within the dirty water dams is not suitable for supply to underground machinery.

4.8 Acid Sulfate Soils

The ASS risk map for coastal NSW shows a high probability of occurrence of ASS below the pollution control dams, and down to the shoreline of Lake Macquarie.

Disturbance of ASS would be avoided wherever practicable. Where ASS has the potential to be disturbed, an ASS management plan would be prepared. Any ASS disturbed would be tested and handled in accordance with the ASS management plan and would be treated or disposed of to an appropriately licensed facility. For activities at CVC, a 'Permit to Clear or Disturb Land' is required prior to disturbance which includes requirements to manage the disturbance of ASS.

Geotechnical drilling in March 2020 for the buried sewer pipeline and pump station was tested by Douglas Partners for acid sulfate soils but none was detected.

4.9 Sewerage Disposal and Management

There are two sources of domestic wastewater located at the pit top facilities. The first source is generated in the administration office building and the second is generated in the operations bathhouses and operations area. Both wastewater streams are treated by separate treatment systems. The administration office treatment system is an aerated wastewater treatment system (AWTS) while the bathhouse system is a traditional 3 part septic.

Following treatment, the office wastewater is sprayed onto the grass surrounding the office building via a spray irrigation system. The bathhouse wastewater is discharged to the pollution control dams. Both systems have a quarterly monitoring and maintenance schedule in place that is undertaken by an external wastewater treatment system service contractor.

EPL 1770 also has a limit for faecal coliforms of 200 CFU/100 mL at the LDP. This is monitored for and reported on monthly. In addition, effluent stream monitoring is undertaken quarterly (monitoring parameters are detailed in **Section 5.3**) and annual soil sampling of the effluent irrigation area is undertaken, as per **Section 5.6**.

4.10 The Oil Water Separator

Water that is likely to be contaminated with oil and grease, such as runoff from the oil storage facilities, diesel tank storage, workshop / maintenance areas and wash bay is directed to and treated by an oil water separator.

The system includes a packed bed oil separation system where solids are removed in the grit trap and oily water is drawn from the sump through a floating skimmer, into the packed bed oil separator by a non-emulsifying pump. The system has a capacity of 2000 L/hr of through flow. The waste oil is collected in a container and the treated water flows by gravity to the pollution control dams.

A separate oil water separation system is installed on the condensate drain from the compressors on site. This system consists of an in-ground tank where water is passed through and under over a weir arrangement and then discharged to the pollution control dams.

Inspections and maintenance of the separation systems occurs regularly, in addition to water quality monitoring and analysis for total oil and grease at all monitoring points as per **Section 5.3**.

5 Monitoring

To ensure the continued functionality of the surface water management system and to assist CVC identify any potential issues with the system, an on-going water monitoring program is implemented, inclusive of water quality and stream health monitoring.

5.1 Baseline Water Quality Monitoring Data

CVC collates and maintains an up to date database of surface water quality monitoring data for all sampling at the mine. A summary of the baseline water quality data available for the site is presented in Section 3.5.2 of the SWA (GSSE, 2013).

5.2 Impact Assessment Criteria and Trigger Levels

5.2.1 Surface Waters

Table 5 provides water quality parameters and relevant limits to be measured at the LDP as per EPL 1770.

Table 5: Water Quality Monitoring Limits for Chain Valley Colliery

Parameter	Trigger Value	Source
Faecal coliform	200 colony forming units per 100 millilitres	EPL 1770
pH	6.5-8.5	EPL 1770
TSS	50 mg/L	EPL 1770

5.2.2 Underground Water

Groundwater monitoring is described within the GwMP provided in **Appendix 3.**

5.3 Surface Water Monitoring and Frequency

DC will continue to monitor as required by the EPL and also undertake monitoring beyond the requirements of the EPL. The monitoring locations, parameters to be monitored and the required frequency are detailed in **Table 6** with the position of these monitoring locations shown on **Figure 3**. Surface water quality monitoring summary plots for LDP1 for the period from January 2012 to December 2018 are presented in **Appendix 5**.

Table 6: Surface Water Quality Monitoring Locations and Frequency

Identification	Type of Monitoring Point	Parameter	Frequency	Sampling Method
Outlet to Creek (OTC)	Operational (where discharged water enters Swindles creek)	pH Total suspended solids Biochemical Oxygen Demand Faecal Coliforms Enterococci Total oil and grease Electrical Conductivity Total Nitrogen Total Phosphorus Anionic Surfactants	Monthly (min 4 weeks)	Grab sample
Dam 10 Outlet LDP1 and LDP27	EPL 1770 Licensed Discharge Points 1 (Dam piped discharge) and 27 (Dam spillway)			
USSP	Baseline Data (Swindles Creek Upstream of Site)			
RW1	Baseline Data (Swindles Creek Downstream of Site)			

All monitoring of waters should be undertaken in accordance with Approved Methods for Sampling and Analysis of Water Pollutants in NSW (DECCW, March 2004). Additionally, pollutant concentration measurements shall be determined in micrograms per litre and within ANZECC concentration limits unless noted otherwise.

5.4 Stream Health Channel Flow and Riparian Vegetation Monitoring

A program to monitor creek line channel stability and health of riparian vegetation within Swindles Creek is undertaken along a short length of the downstream watercourse. Observations of stream health and stability are undertaken quarterly and recorded on the CVC *'Creek Stability Inspection'* form.

Monitoring of Swindles Creek, as per the creek stability form, includes multiple photographic points at representative locations. Photos are taken over multiple inspections in a repeatable manner, with the inspection specifically including:

- general observations of water quantity and quality;
- documenting locations and dimensions of significant erosive or depositional features;
- documenting evidence of erosion and exposed soils;
- noting general indicators of stream health, including abundance of flora and fauna; and
- a review and comparison of results to previous inspections.

Where degradation or adverse erosion is occurring, additional investigations will be undertaken to assess whether the impacts may be associated with the operation of the mine and ameliorative actions undertaken as required. In addition, further riparian vegetation monitoring will be undertaken in accordance with the Biodiversity Management Plan.

5.5 Groundwater Monitoring Program

Details of the groundwater monitoring program is contained in the GwMP in **Appendix 3**, which includes monitoring of mine inflows and private bore water levels.

5.6 Effluent Monitoring

In accordance with *Environmental Guidelines: Use of Effluent by Irrigation* (DEC, 2004), quarterly monitoring of the irrigated effluent from the AWTS at the administration building is undertaken. The parameters that are monitored are identified in **Table 7**.

Soil monitoring (of the surface soil and soil profile adjacent to the administration building) is also undertaken in accordance with *Environmental Guidelines: Use of Effluent by Irrigation* (DEC, 2004). Soil monitoring is undertaken annually using hand auger to assess soils within the irrigation area. The parameters monitored and frequency of monitoring is identified in **Table 8**, which is more frequent than the recommended sampling frequency.

Table 7: Monitoring of CVC AWTS Effluent Stream

Identification	Type of Monitoring Point	Parameter	Frequency	Sampling Method
AWTS	Effluent from AWTS	pH Electrical Conductivity Sodium Adsorption Ratio Total Dissolved Solids Total Suspended Solids Total Phosphorus Total Nitrogen Faecal Coliforms Enterococci Total Oil and Grease Biochemical Oxygen Demand	Annual	Grab sample

Table 8: Soil Monitoring at CVC

Monitoring Location	Parameter	Frequency of Sampling	
		Surface Soil	Soil Profile
Effluent Irrigation Area	pH	Annually	Annually
	Electrical Conductivity (EC) (dS/m)	Annually	Annually
	Nitrate-N	Annually	Annually
	Total N	Annually	Annually
	Available P	Annually	N/A
	Total P	Annually	Annually
	Exchangeable Sodium Percentage	Annually	Annually
	Heavy Metals & Pesticides	Annually	N/A
	P sorption	Annually	Annually

5.7 Additional Operational Monitoring

In addition to the other monitoring described above, DC also undertakes periodic surface water quality monitoring for dams within the site. This additional monitoring allows the performance of the surface water management system to be assessed for various areas around the site. CVC is also committed to monitoring water usage onsite. Water usage is currently monitored through the following:

- metering of the potable supply to site;
- monitoring of the volume of water pumped from the Great Northern Seam sump to the surface and maintaining records of the water cart operation, including fill times.

5.8 Inspections and Maintenance

All water management structures will be inspected regularly. **Table 9** contains the inspection schedule used to ensure the water management structures are functioning effectively throughout CVC. The inspections will also determine the scheduling of maintenance required for the structures.

Table 9: Inspection Schedule for Water Management Structures

To Be Inspected	Frequency
All water management structures	Monthly
Works In Progress (including temporary erosion and sediment control structures)	Weekly

In addition to these inspections, regular water quality monitoring is undertaken as described above. The results of this monitoring with regards to total suspended solids will assist in assessing the effectiveness of the water management system, along with highlighting any possible areas that need to have additional controls added or improve the function of existing controls.

All water management structures will be maintained in a functioning condition. Where controls are observed to be not functioning correctly, the controls will be restored to meet the required standard. The maintenance and monitoring of specific features of the site are described in the sections below.

5.8.1 Sediment Dams

Visual inspections of the sediment dams are undertaken to determine the clarity of the water and if any maintenance is required. The inspections also enable correct scheduling of de-silting works and prompt repairs and/or replacement of damaged works. When required, the silt from dams is removed and stored so that it is not able to be washed back into the dam. Documented inspections of the above are part of the Monthly Environmental Inspection which is scheduled via a work order (part of the CVC maintenance management system).

De-silting of dams is scheduled to occur annually. However, the schedule may be amended based on the above inspections and identified requirements.

5.8.2 Drainage Channels

For clean water diversions, any signs of erosion along the length of the drains should be noted and remedial works undertaken as required. Where significant erosion is observed, additional erosion controls are constructed e.g. establishment of vegetation cover, use of temporary sediment devices until the vegetation is established, scour protection (rock-armouring or erosion blanket) of the channel surface.

Where dirty water drainage channels contain in-line sumps, these will be cleaned on a regular basis depending on the accumulation of material within the sumps.

5.8.3 Temporary ESC Structures

Regular visual checks will be made of any temporary erosion and sediment controls (ESC) such as sediment filter fences, sandbag weirs etc. to ensure that they are functioning adequately. Structures will be repaired where required.

5.8.4 Roads and Hard Stand Areas

A water cart will be used around the site to ensure dust is kept to a minimum. This will be undertaken on an as needs basis, with more regular use during the warner months. The use of chemical dust suppressant is also being trialed to reduce water usage.

5.8.5 Washbay Oil Water Separator

The packed bed oil separator system is designed to minimise maintenance and servicing. As oil separator systems are critical for the reliable prevention of oil contamination, regular inspections/servicing are important. It is critical that the mechanisms be regularly checked for operation to prevent environmental contamination. Preventative maintenance may also prevent failures before they occur by detecting trends in functionality.

This system has specific weekly and monthly work orders that ensure the system is serviced and maintained.

All accumulated waste oils and solid material shall be disposed of periodically by a licensed operator. The weekly waste management inspection will determine waste oil levels and disposal requirements.

5.8.6 Compressor Condensate Oil Water Separator

Excess oil from the compressors and surrounds is contained, piped to a collection tank which is inspected weekly to ensure the system is serviced and maintained.

Any accumulated waste oil is then removed for recycling by licensed and approved waste management contractors.

5.8.7 Carpark

The carpark hardstand area shall be regularly maintained to minimise the generation of sediment. The maintenance strategy shall include the immediate removal or shaping of material that might result in concentrated flow paths by maintaining a smoothly graded surface. A water cart will be used around the site (as required) to ensure dust is kept to a minimum. A street sweeper is used a monthly basis to sweep the sealed entrance roads.

5.8.8 Underground Flow Monitoring Devices

Water flow monitoring appliances have been installed in the mine to measure pumped water volumes to and from the mine workings. These appliances shall be maintained in good working order, and if required, the mine will supply a test certificate to certify the current accuracy of the appliances furnished by the manufacturer or by some duly qualified person or organisation.

5.9 Data Recording and Publication

Recording of monitoring data will be undertaken in accordance with the requirements outlined in EPL 1770. DC will collate and maintain an up-to-date database of surface water quality monitoring data for all sampling at the mine. Monitoring results will be interpreted as they are received in order to ensure water quality is maintained within the desired parameters.

A summary of results, including daily volumetric discharge and water quality results, will be prepared monthly and made publicly available on the DC website (www.deltacoal.com.au) in accordance with the requirements of *Protection of the Environment Operations Act, 1997*.

The results will also be compared to relevant site operations and meteorological conditions to further interpret the results. This comparison between samples, sampling periods and against other factors will assist in identifying whether the activities on the site are in fact affecting the water quality of the local catchment.

Results of surface water quality monitoring will be reported in the Annual Review. The results will also be made available to the Community Consultative Committee members on a regular basis as part of the Environmental Monitoring and Reporting process, as well as to the Central Coast Council and Lake Macquarie City Council (LMCC).

6 Reporting

6.1 Regular Reporting

The water monitoring results will be reviewed on a monthly basis to confirm compliance with the conditions specified in **Section 5** or ensure corrective action is taken where results or trends indicate non-compliance or risk of future non-compliance.

A summary of monthly environmental monitoring results will be published on the DC website.

6.2 Annual Review

The water monitoring results will be reviewed on a monthly basis to confirm compliance with the conditions specified in **Section 5** or ensure corrective action is taken where results or trends indicate non-compliance or risk of future non-compliance.

The results will also be included in the Annual Review. The Annual Review will include:

- a summary of monitoring results,
- comparison against the water quality criteria;
- summary of previous years monitoring results;
- comparison against predictions in the Environmental Impact Statement (EIS);
- identify any trends in water quality/quantity;
- identify any non-conformances over the year; and
- describe any actions currently implemented or planned to ensure compliance with the water quality impact criteria.

The Annual Review will be forwarded to the relevant authorities including the DPIE, EPA and WaterNSW. The Annual Review will also be forwarded to members of the Community Consultative Committee and local Councils (Central Coast and Lake Macquarie) and will also be placed on the CVC website.

The EPA will be provided with an annual return, including monitoring details, as required by EPL 1770.

6.3 Incident or Non-Compliance Response and Reporting

Following detection or notification of an incident, site personnel at CVC will immediately focus on the mitigation of any potential environmental harm. Should potential or actual harm to the environment be identified, the appropriate regulatory authority shall be immediately notified, and remediation measures applied. Where ameliorative actions may reduce the threat or harm to the environment, action will be undertaken immediately to mitigate or rectify the issue. These actions will be followed by an investigation into the cause of the incident.

If monitoring reveals that, as a direct result of CVC operations, levels have exceeded the relevant criteria outlined in **Section 5,** DC will conduct an investigation into the source of the non-compliance. As detailed in Condition 7, Schedule 6 of SSD-5465, relevant agencies will be notified by phone or email at the earliest

opportunity of an incident that causes or threatens to cause material harm to the environment. For all other incidents, relevant agencies will be notified by phone or email as soon as practicable.

An investigation will consider any activities and plant operation or other factors that may have caused or contributed to the incident or non-compliance. This will include a review of rainfall data, an investigation regarding the water source, and an inspection of all relevant pollution control structures to ensure they are functioning correctly. Aspects to be inspected include:

- integrity of all structures to capture/convey flows as designed;
- level of sediment in pollution control dams and drains;
- amount of vegetation (reeds) in pollution control dams, which may affect the pH of the water;
- the location of the water source; and
- the presence of any hydrocarbon spills underground or on the surface in the vicinity of pollution control structures.

The written report will be provided to any affected landowner and/or existing tenants, including tenants of mine owned properties, to the DPIE, EPA and any other relevant stakeholders within 7 days of the date of the incident or being made aware of the incident (such as receiving monitoring data). The report will:

- describe the date, time and nature of the observation;
- identify the cause (or likely cause) of the damage;
- describe what action has been taken to date; and
- describe the proposed measures to address the impacts and prevent further such occurrences.

DC will implement the recommendations of the investigation in order to address any future non-compliance issues. Additional details of the incident reporting process are provided in the Environmental Management Strategy.

The GwMP in **Appendix 3** contains the assessment triggers and ameliorative measures relevant to the groundwater monitoring.

Any incidents or complaints will be recorded and fully investigated to find root causes and corrective actions implemented where necessary. Additionally, the following measures will be undertaken:

- a review of management practices to systematically identify and implement options to modify site practices so as to ensure effective water management and erosion and sediment control activities in order to achieve the goals stated in this plan; and
- additional water quality monitoring may be conducted at a complainant's request at an appropriate frequency.

7 Stakeholder Management, Response and Training

7.1 Complaint Protocol

DC has a 24-hour telephone hotline (1800 115 277) for members of the public to lodge complaints, concerns, or to raise issues associated with the operation. This service aims to promptly and effectively address community concerns and environmental matters. All complaints are recorded and responded to.

The information recorded in the complaint register includes:

- date and time the complaint was lodged;
- personal details provided by the complainant;
- nature of the complaint;
- action taken or if no action was taken, the reason why; and
- follow up contact with the complainant.

7.2 Independent Review

As detailed in Condition 2, Schedule 5 of SSD-5465, an Independent Review can be requested by a landowner who "*considers the development to be exceeding the relevant criteria in Schedule 3".*

If the Secretary is satisfied that an independent review is warranted, then within 2 months of the Secretary's decision the Applicant shall:

(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to:
- *consult with the landowner to determine his/her concerns;*
- *conduct monitoring to determine whether the development is complying with the relevant criteria in Schedule 3; and*
- *if the development is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and*

(b) give the Secretary and landowner a copy of the independent review

7.3 Dispute Resolution

If any disputes are not adequately addressed by the complaints handling process then they will be handled by the Environmental Compliance Coordinator. If the response of CVC is not considered to satisfactorily address the concern of the complainant, a meeting may be convened with the complainant, Mine Manager together with the Environmental Compliance Coordinator to determine any further options to reduce potential impacts.

Any actions agreed from the meeting will be implemented by CVC. After implementation of the proposed actions the complainant will be contacted and advice sought as to the satisfaction or otherwise with the measures taken.

If no agreed outcome is determined or the complainant is still not satisfied by the action taken, then an Independent Review may be requested by the complainant. If determined to be warranted by the Secretary,

an independent review will be undertaken in accordance with the process identified in Schedule 5 of SSD-5465.

7.4 Training, Awareness and Competence

Training is an essential component of the implementation phase of this WMP. The Environmental Compliance Coordinator will ensure that training and awareness processes are implemented to manage, identify and minimise potential impacts of CVC and to ensure personnel are aware of their roles and responsibilities in terms of water quality management and erosion and sediment control.

Generally training at CVC consists of induction training for new starters and contractors along with environmental awareness training at two-year intervals and ongoing “toolbox” training for all permanent employees as required. Site inductions also specifically identify that no unauthorised clearing is to occur.

As the document owner, the Environmental Compliance Coordinator is the contact point for any person that does not understand this document or their specific requirements and will provide guidance and training to any person that requires additional training regarding this management plan.

8 Audit and Review

8.1 Overview

This document shall be reviewed, and if necessary revised, annually or within 3 months of the following;

- the submission of an Annual Review;
- the submission of an incident report;
- the submission of an independent environmental audit; and
- following any modification to the development consent or EPL.

8.2 Audits

Internal and external audits of this document and all other Environmental Management System documents are to be undertaken every three years. Improvements from the audit are to be incorporated in the site action database to ensure the actions are assigned to the relevant people and completed.

Audits shall be carried out by personnel who have the necessary qualifications and experience to make an objective assessment of the issues. The extent of the audit, although pre-determined, may be extended if a potentially serious deviation from this document is detected.

Any audit non-conformances and/or improvement opportunities will have corrective and preventative actions implemented to avoid recurrence, these actions will be loaded into the site Incident Database to ensure the actions are assigned to the relevant people and completed.

External audits will be conducted utilising external specialists and will consider this document and related documents. External auditors shall be determined based on skills and experience and upon what is to be accomplished.

An Independent Environmental Audit (IEA) was undertaken during June 2019. In accordance with SSD-5465 Schedule 6, Condition 9, IEA's will be scheduled for every three years thereafter (unless the Secretary directs otherwise) by an audit team whose appointment has been endorsed by the Secretary.

9 Records and Document Control

9.1 Records

Generally, the Environmental Compliance Coordinator will maintain all Environmental Management System records which are not of a confidential nature. Records that will be maintained include:

- monitoring data and equipment calibration;
- environmental inspections and auditing results;
- environmental incident reports;
- the complaints register; and
- licences and permits.

All records will be stored so that they are legible, readily retrievable and protected against damage, deterioration and loss. Records will be maintained for a minimum of 4 years or as otherwise required under any legislation, licence, lease, permit or approval.

9.2 Document Control

This document and all others associated with the Environmental Management System shall be maintained in a document control system which is in compliance with the site Document Control Standard which is available to all site personnel. Any proposed change to this document will be via the Environmental Compliance Coordinator. Details on document revisions are provided in **Table 10**.

Table 10: Document Revision Details

Version	Date	Details of Revision	Company	Reviewed by/ Authorised by
1	23/08/2012	Revision 1	LakeCoal	GSS Environmental Chris Ellis
2	21/07/2015	Revision 2	LakeCoal	Niche Environment and Heritage Chris Ellis
3	30/11/2019	Updated to Delta Coal format and site update and results	Delta Coal EMM Consulting	Sally Callander Chris Armit Katie Weekes
4	18/12/2020 17/12/2020 5/3/2021 6/4/2021	Updated for Modification 3 and updated Groundwater Management Plan for Extraction Plan DPIE RFI DPIE Approval	Delta Coal	Chris Armit

10 Roles and Responsibilities

10.1 Responsibilities

All employees and contractors of Chain Valley Colliery are responsible for environmental management. However, various positions in the organisation have roles, responsibilities and authorities for managing environmental aspects, action plans, programs and controls.

Roles and responsibilities specific to completing the requirements of this WMP are identified in **Table 11**.

Table 11: Water Management Roles and Responsibilities

Role	Responsibilities
General Manager	• Ensure that adequate financial and personnel resources are made available for the implementation of the WMP.
Manager of Mining Engineering	• Overall responsibility for environmental compliance with Mining Lease, EPL, Development Consent and other mining approvals as they pertain to water management.
Environmental Compliance Coordinator	• Implementing the forward works program; • Planning for adequate resources to implement this site WMP. • Approving revised versions of this site WMP; • Co-ordination of external audits, corporate reporting and management; • Co-ordinate environmental monitoring, reporting, inspections, environmental training, authority liaison, maintaining complaints register and community liaison; • Allocation of resources within area of responsibility and budget; • The implementation and adherence to this site WMP; • Providing adequate training to employees and contractors regarding their requirements under this site WMP; • Contractor management; and • Delegating tasks associated with this site WMP when responsible personnel are absent.
Employees and contractors	• Comply with the requirements of this WMP.

11 References & Associated Documents

Documents used in the preparation of this management plan are detailed in **Table 12**.

Table 12: References and Associated Documents

Reference Type	Document
Australian standards	AS/NZS ISO 14001:2004 *Environmental management systems – Requirements with guidance for use* AS/NZS ISO 14004:2004 *Environmental management systems – General guidelines on principles, systems and support techniques*
Legislation and regulations	NSW EPA, EPL 1770 *Environment Protection License 1770* Development Consent SSD-5465 (Modification 2) dated 16 December 2015 for the Mining Extension 1 Project *Environmental Planning and Assessment Act 1979* *Mining Act 1992* *Protection of the Environment Operations Act, 1997* *Water Act 1912* *Water Management Act 2000*
Delta Coal documents	Delta Coal - Environmental Management Strategy. LakeCoal, 2019. Chain Valley Colliery Annual Review 2018. Doc No. REP 00058, 16 May 2019. Delta Coal, 2020. Chain Valley Colliery Annual Review 2019.
External documents	Australian and New Zealand Environment Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), National Guidelines for Sewerage Systems - Effluent Management, 1997. Australian and New Zealand Environment Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC Guidelines), October 2000. Australian Government, Charter: National Water Quality Management Strategy, 2018. DECCW, March 2004. Approved Methods for Sampling and Analysis of Water Pollutants in NSW.

	Douglas Partners, 2020, Geotechnical assessment for Sewer Pipeline, Chain Valley Colliery. GEOTERRA, 2020, Groundwater Management Plan, Chain Valley Colliery. GEOTERRA, 2019, Groundwater Management Plan, Chain Valley Colliery. GEOTERRA, 2014, Groundwater Management Plan, Chain Valley Colliery. GEOTERRA, March 2013, Chain Valley Colliery Mining Extension 1 Groundwater Assessment. GSS Environmental, March 2013, Chain Valley Mining Extension 1 Project Surface Water Assessment. Landcom, 2004 and Department of Environment and Climate Change (DECC), 2008. Managing Urban Stormwater: Soils and Construction (the Blue Book), Volume 1 and Volume 2E – Mines and Quarries. NSW Water Quality and River Flow Objectives, September 1999. NSW State Rivers and Estuaries Policy, 1993. NSW Groundwater Quality Protection Policy, adopted in 1998. NSW Groundwater Quantity Management Policy. NSW Department of Environment and Conservation (DEC), Environmental Guidelines: Use of Effluent by Irrigation, 2004. The NSW State Groundwater Dependent Ecosystems Policy, adopted in 2002.

12 Definitions

ANZECC Australia New Zealand Environment Conservation Council

AWTS Aerated Waste Water Treatment System

CC Council – Central Coast Council

DECCW Former NSW Department of Environment, Climate Change and Water

DP&E NSW Department of Planning and Environment (former)

DPIE NSW Department of Planning, Industry and Environment

DoI - Water NSW Department of Industry (Water)

DRE Division of Resources and Energy (within the Department of Trade and Investment, Regional Infrastructure and Services)

EPA Environment Protection Authority

EP&A Act Environmental Planning and Assessment Act 1979

EPL Environment Protection License

GwMP Groundwater Management Plan

LDP Licensed Discharge Point

LMCC Lake Macquarie City Council

MPL Mining Purposes Lease

Mt Million Tonnes

NOW NSW Office of Water (former)

OEH Office of Environment and Heritage

POEO Act *Protection of the Environment Operations Act 1997*

ROM Run of Mine

Planning Secretary Planning Secretary of the Department of Planning, Industry and Environment, or nominee

SSD-5465 Development Consent SSD-5465 (for the Chain Valley Colliery Mining Extension 1 Project)

TARP Trigger Action Response Plan

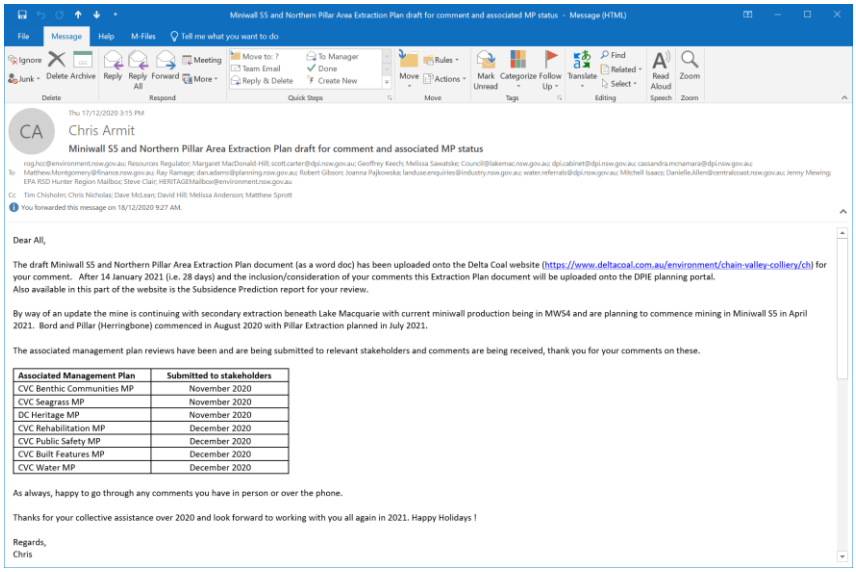
TSS Total Suspended Solids

WMP Water Management Plan

WSC Wyong Shire Council (now part of Central Coast Council)

Appendix 1: Consultation

Consultation – Draft Extraction plan including the Water Management Plan



Miniwall S5 and Northern Pillar Area Extraction Plan draft for comment and associated MP status - Message (HTML)

CA Chris Armit

Miniwall S5 and Northern Pillar Area Extraction Plan draft for comment and associated MP status

Dear All,

The draft Miniwall S5 and Northern Pillar Area Extraction Plan document (as a word doc) has been uploaded onto the Delta Coal website (https://www.deltacoal.com.au/environment/chain-valley-colliery/ch) for your comment. After 14 January 2021 (i.e. 28 days) and the inclusion/consideration of your comments this Extraction Plan document will be uploaded onto the DPIE planning portal.
Also available in this part of the website is the Subsidence Prediction report for your review.

By way of an update the mine is continuing with secondary extraction beneath Lake Macquarie with current miniwall production being in MWS4 and are planning to commence mining in Miniwall S5 in April 2021. Bord and Pillar (Herringbone) commenced in August 2020 with Pillar Extraction planned in July 2021.

The associated management plan reviews have been and are being submitted to relevant stakeholders and comments are being received, thank you for your comments on these.

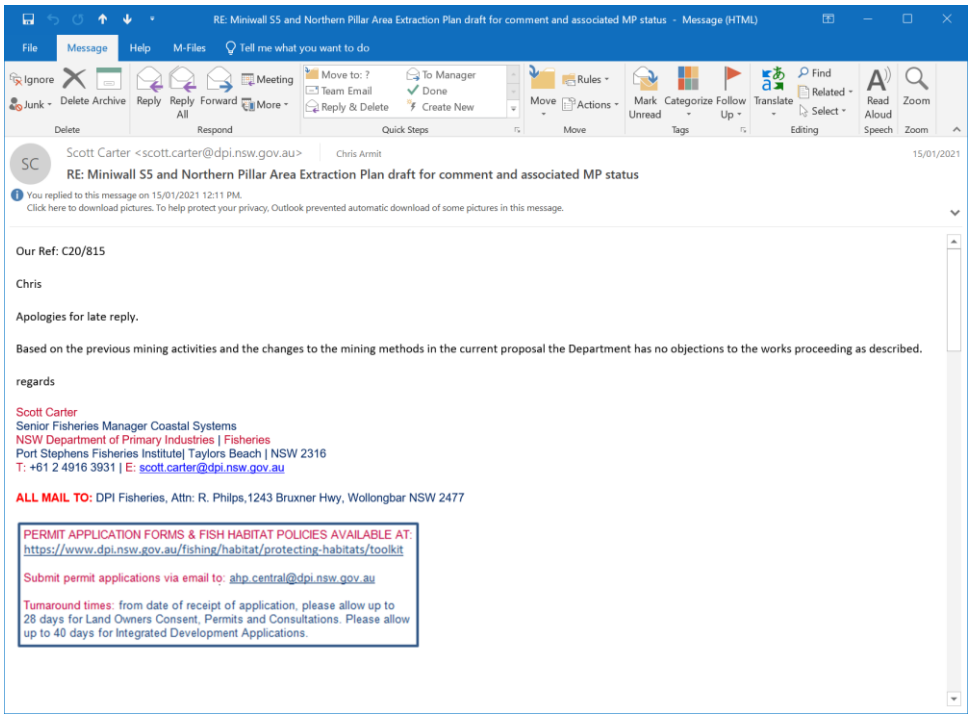
Associated Management Plan	Submitted to stakeholders
CVC Benthic Communities MP	November 2020
CVC Seagrass MP	November 2020
DC Heritage MP	November 2020
CVC Rehabilitation MP	December 2020
CVC Public Safety MP	December 2020
CVC Built Features MP	December 2020
CVC Water MP	December 2020

As always, happy to go through any comments you have in person or over the phone.

Thanks for your collective assistance over 2020 and look forward to working with you all again in 2021. Happy Holidays !

Regards,
Chris

DPI Fisheries Consultation



RE: Miniwall S5 and Northern Pillar Area Extraction Plan draft for comment and associated MP status - Message (HTML)

SC Scott Carter <scott.carter@dpi.nsw.gov.au> Chris Armit 15/01/2021

RE: Miniwall S5 and Northern Pillar Area Extraction Plan draft for comment and associated MP status

You replied to this message on 15/01/2021 12:11 PM.
Click here to download pictures. To help protect your privacy, Outlook prevented automatic download of some pictures in this message.

Our Ref: C20/815

Chris

Apologies for late reply.

Based on the previous mining activities and the changes to the mining methods in the current proposal the Department has no objections to the works proceeding as described.

regards

Scott Carter
Senior Fisheries Manager Coastal Systems
NSW Department of Primary Industries | Fisheries
Port Stephens Fisheries Institute| Taylors Beach | NSW 2316
T: +61 2 4916 3931 | E: scott.carter@dpi.nsw.gov.au

ALL MAIL TO: DPI Fisheries, Attn: R. Philps,1243 Bruxner Hwy, Wollongbar NSW 2477

PERMIT APPLICATION FORMS & FISH HABITAT POLICIES AVAILABLE AT:
https://www.dpi.nsw.gov.au/fishing/habitat/protecting-habitats/toolkit

Submit permit applications via email to: ahp.central@dpi.nsw.gov.au

Tumaround times: from date of receipt of application, please allow up to 28 days for Land Owners Consent, Permits and Consultations. Please allow up to 40 days for Integrated Development Applications.

DPIE Consultation - Request for Information Letter



Chris Armit
Approvals Coordinator
Chain Valley Colliery

Off Construction Rd (Off Ruttleys Rd)
MANNERING PARK, NSW, 2259

05/03/2021

Dear Mr Armit

Chain Valley Colliery
Extraction Plan – Miniwall S5 and Northern Pillar Area

I refer to the Extraction Plan dated January 2021 for Miniwall S5 and the Northern Pillar Area (NPA) at the Chain Valley Colliery, submitted in accordance with condition 7 of Schedule 4 of the Chain Valley Extension Project development consent (SSD 5465).

The Department has reviewed the Extraction Plan and identified several clarifications and minor matters that must be addressed by way of improvements to various parts of the Extraction Plan and its sub-plans (see Attachment A). The Department is satisfied that these matters can be addressed in a timely manner and would not materially change the ability of Delta Coal to effectively manage subsidence impacts.

In summary, the revised Extraction Plan should:

- include the detailed plans of existing and proposed first and second workings that clearly indicate the High Water Mark Subsidence Barrier (Plan 2) and show that all areas of proposed extraction are outside of the Seagrass Protection Barrier;
- where necessary refer to the proposed extraction of Miniwall S5 and the NPA, not previously extracted miniwalls;
- include detailed performance indicators and contingencies for Threatened Species or Endangered Populations, as required by Table 6 of the conditions of consent;
- include timeframes for the implementation of contingency measures set out in the Subsidence Management TARP;
- include evidence of further consultation, including specific details of the comments received from agencies and the actions taken in response to those comments; and
- align with the current consolidated conditions of consents, including alignment with the timing of document reviews and revisions.

The attached comments on the Extraction Plan and its sub-plans must be addressed to the satisfaction of the Secretary prior to the Department granting its final approval of the Extraction Plan. As noted above, the Department believes that they can be readily addressed in a timely manner. It would be appreciated if Delta Coal provides an electronic copy of the revised document, with tracked changes, allowing for a more expedient review.

If you require any more information, please contact James McDonough on 9585 6313.

Yours sincerely

DPIE Request for Information Letter - Response Summary Table

DPIE Review	Response
include the detailed plans of existing and proposed first and second workings that clearly indicate the High Water Mark Subsidence Barrier (Plan 2) and show that all areas of proposed extraction are outside of the Seagrass Protection Barrier	Plan 2 updated to include clear indication of the High Water Subsidence Barrier. All secondary workings extraction areas are located outside of Seagrass Protection Barrier.
where necessary refer to the proposed extraction of Miniwall S5 and the NPA, not previously extracted miniwalls	Document updated for legacy miniwall naming (see tracked changes)
include evidence of further consultation, including specific details of the comments received from agencies and the actions taken in response to those comments	See updates in section 2.5 Table 1 and Appendix 1 which includes specific stakeholder comment details and communications.

align with the current consolidated conditions of consents, including alignment with the timing of document reviews and revisions	Consent references updated to changes in SSD5465 Modification 3 numbering and conditions.
It would be appreciated if Delta Coal provides an electronic copy of the revised document, with tracked changes, allowing for a more expedient review	A Microsoft Word document has been provided with tracked changes included at the start of the document change process. Plan 2 amendment and Subsidence Management TARP were not able to be tracked changed as they were drafted in software without the tracked changes option.

DPIE Consultation – Extraction Plan approval Letter

Planning, Industry & Environment

Chris Armit
Approvals Coordinator
Chain Valley Colliery
Delta Coal Pty Ltd
Off Construction Road (Off Rutleys Road)
Mannering Park NSW 2259

06/04/2021

Dear Mr Armit

Chain Valley Colliery (SSD 5465)
Miniwall S5 and NPA Extraction Plan

I refer to the Miniwall S5 and NPA Extraction Plan which was submitted on 18 January 2021 in accordance with Condition 7 of Schedule 4 of the consent for Chain Valley Colliery (SSD 5465).

The Department has carefully reviewed the document and is satisfied that it addresses the requirements of the conditions of consent for Extraction Plans (see Attachment A).

Accordingly, the Planning Secretary has approved the Miniwall S5 and NPA Extraction Plan (Revision 1.2, dated 10 March 2021). Please ensure that the approved plan is placed on the project website at your earliest convenience.

If you wish to discuss the matter further, please contact James McDonough on 9585 6313.

Yours sincerely

Lauren Evans
A/Director
Resource Assessments (Coal & Quarries)
As nominee of the Planning Secretary

Planning, Industry & Environment

ATTACHMENT A

Consideration of Approval of Miniwall S5 and NPA Extraction Plan

1. As required by condition 7 of Schedule 4 of the consent for Chain Valley Colliery (SSD 5465), the Extraction Plan (EP) for proposed Miniwall S5 and the Northern Pillar Area (NPA) consists of an overarching document that describes the proposed mining operations, supported by a specialist subsidence assessment, and a series of specialist management plans (MPs) including a:
   - Public Safety MP;
   - Built Features MP;
   - Groundwater MP;
   - Rehabilitation MP;
   - Benthic Communities MP;
   - Seagrass MP;
   - Subsidence Monitoring MP; and
   - Subsidence Management Trigger Action Response Plan (TARP).

   The EP was submitted by Delta Coal. The EP was prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Secretary. Many of these MPs are little changed from when they were reviewed in March 2020 as part of the EP for Miniwall S4, which was approved in June 2020.

Appendix 2: Development Consent Summary

Chain Valley Colliery Development Consent SSD-5465 Summary

This WMP has been prepared in accordance to Schedule 3, Condition 21 of SSD-5465, which states the requirements of the WMP and what it must address. **Table A1** outlines the requirements of the WMP and where this document addresses these requirements.

Table A1: Requirements from Chain Valley Colliery Development consent SSD-5465

Condition No.	Requirement	Relevant section of this document
	Schedule 2 Administrative Conditions	
22	**EVIDENCE OF CONSULTATION** 22. Where conditions of this consent require consultation with an identified party, the Applicant must: (a) consult with the relevant party prior to submitting the subject document; (b) provide details of the consultation undertaken including: i. the outcome of that consultation, matters resolved and unresolved; and ii. details of any disagreement remaining between the party consulted and the Applicant and how the Applicant has addressed the matters not resolved.	**Section 1.4** **Appendix 1**
23	**STAGING, COMBINING AND UPDATING STRATEGIES, PLANS OR PROGRAMS** 23. With the approval of the Planning Secretary, the Applicant may: (a) prepare and submit any strategy, plan or program required by this consent on a staged basis (if a clear description is provided as to the specific stage and scope of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program); (b) combine any strategy, plan or program required by this consent (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined); (c) update any strategy, plan or program required by this consent (to ensure the strategies, plans and programs required under this consent are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the development); and (d) combine any strategy, plan or program required by this consent with any similar strategy, plan or program required by an adjoining mining consent or approval, in common ownership or management.	**Section 8**
	Schedule 3 Specific Environmental Conditions	
18	*The Applicant must prepare and implement a Water Management Plan for the surface facilities sites to the satisfaction of the Planning Secretary.* *This plan must be prepared in consultation with DPIE Water and EPA, by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary and submitted to the Planning Secretary for approval within 6 months of the date of this consent.* *This plan must include:*	**Section 1.4**
	(a) a comprehensive water balance for the development that includes details of: • *sources and security of water supply;* • *water make in the underground workings;* • *water transfers from the underground operations to the surface;* • *water use; and* • *any water discharges;*	**Section 3**

	(b) management plans for the surface facilities sites, that include: • *a detailed description of water management systems for each site, including:* – *clean water diversion systems;* – *erosion and sediment controls; and* – *any water storages;* • *measures to minimise potable water use and to reuse and recycle water;* • *measures to manage acid sulfate soils, if encountered;* • *activities that would involve ground disturbance at the site; and* • *monitoring and reporting procedures.*	**Section 4**
	(c) a Surface Water Management Plan which: • *includes baseline data on surface water flows and quality of Swindles Creek;* • *details surface water impact assessment criteria, including trigger levels for investigating any potentially adverse impacts on surface water resources or surface water quality;* • *provides a program to monitor:* – *surface water discharges;* – *surface water flows and quality; and* – *channel stability;*	**Section 5**
	(d) a Ground Water Monitoring Program which includes a program to: • *monitor and report groundwater inflows to underground workings;* • *predict, manage and monitor impacts to nearby groundwater bores on privately-owned land that may be impacted by the development; and*	**Appendix A**
	(e) a detailed review of surface water management at the site, with particular reference to the water storages within the dirty water management system, to: • *determine whether the capacity, integrity, retention time and management of the dirty water storages (particularly the final Pollution Control Dam) are sufficient to ensure that water discharged from the site meets the EPL limits and surface water impact assessment criteria within the Surface Water Management Plan; and* • *propose any appropriate changes to the surface water management system.*	**Appendix C**
	The Applicant shall implement the approved management plan as approved from time to time by the Secretary. *NOTE: The Secretary may require the Applicant to implement upgrades and other changes identified under paragraph (e), in accordance with condition 4 of schedule 2.*	**This document**
	Statement of Commitments	
	Groundwater *In addition to the management and mitigation measures undertaken at the Colliery for groundwater as described in the WMP, the following*	**GwMP in Appendix A**

	commitments specific to the Proposal will be undertaken. Some commitments are already undertaken under the WMP. Delta Coal will: • *assess whether abnormal or significant groundwater inflow changes occur in the active panels;* • *maintain the water flow monitoring appliances used to measure pumped water volumes to and from the Colliery in good working order;* • *maintain and plot records of daily total Colliery water pumping and annually communicate an interpretation of the findings within the Annual Review. A copy of the Annual Review will be supplied to DPI Water;* • *measure water levels and quality within private bores, where access is possible, in relevant areas to assess if any adverse effects occur due to subsidence from the Proposal; and* • *develop groundwater assessment criteria and triggers, response protocols and contingency measures.*	
	Although it is not anticipated that private bore yields would be impacted due to subsidence, should such a situation arise, Delta Coal would provide an alternative water supply until the impacted bore recovers.	**GwMP in Appendix A**
	Any monitored or reported adverse impacts on the yield, saturated thickness or quality of a private registered bore will be investigated by Delta Coal. In the event of a groundwater level drop of over 2 m for a period of two months or more, a notable increase in iron hydroxide, or an adverse change in salinity as a consequence of subsidence, Delta Coal will enter into negotiations with the affected landowners and the Mine Subsidence Board with the intent of formulating an agreement which provides for one, or a combination of: • *re-establishment of saturated thickness in the affected bore(s) through bore deepening;* • *establishment of additional bores to provide a yield at least equivalent to the affected bore prior to mining;* • *provision of access to alternative sources of water; and/or* • *compensation to reflect increased water extraction costs (e.g., due to lowering pumps or installation of additional or alternative pumping equipment).*	**GwMP in Appendix A**
	Surface Water *Management and monitoring of surface water will continue to be undertaken in accordance with the Colliery's WMP, which will be reviewed and updated as required to include the commitments made below. Delta Coal will:*	**This document**
	update the WMP to include any changes as a result of the proposed modification;	**This document**
	limit the main underground pumps to a maximum pump out rate of 10.5 ML/day within 12 months of approval;	**Section 3.2.3**
	request an amendment of EPL 1770 to include a condition on the daily discharge volume limit stating that "Exceedence of the volume limit for	**Section 1.1**

	Point 1 is permitted only if the discharge from Point 1 occurs solely as a result of rainfall at the premises exceeding 10 mm during the 24 hours immediately prior to commencement of the discharge";	
	undertake daily measurements of discharge volumes and report publically on a monthly basis via Delta Coal's website;	**Section 5.9**
	continue collection of baseline water quality data to aid in the development of appropriate discharge water quality trigger values;	**Section 5.3**
	engage a suitably qualified expert to conduct an assessment of the metals contained within discharge water in accordance with the ANZECC water quality guidelines and provide this assessment to the EPA by 31 December 2013;	**Section 2.4**
	investigate water saving measures to minimise the amount of potable water required from WSC for Colliery operations;	**Section 4.7**
	quantify the groundwater storage capacity in the Great Northern and Wallarah Seams;	**Section 4.3**
	continue effluent monitoring regime of receiving soils from the AWTS in accordance with the parameters and testing frequencies identified in the Colliery's WMP. The results of this monitoring program will be reviewed by a suitably qualified expert and used to determine the appropriateness of the existing irrigation area to receive this effluent;	**Section 5.6**
	develop a program to monitor creek line channel stability and the health of riparian vegetation within Swindles Creek. Monitoring will be undertaken in accordance with Section 8.5.2 of the Surface Water Impact Assessment (EIS Appendix E) and incorporated into the Colliery's WMP or Biodiversity Management Plan; and	**Section 5.4**
	record monitoring data in accordance with the Colliery's WMP and EPL 1770. Monitoring data will be interpreted as it is received to ensure appropriate operational guidance on monitoring water quality within desired parameters. Results of water quality monitoring will be reported in the Annual Review and made available to the CCC, as well as Wyong and Lake Macquarie Councils.	**Section 5.9**

CVC operates under EPL 1770 issued by the NSW EPA under the POEO Act. The EPL has been modified a number of times, most recently on the 2 April 2019. CVC has two Licensed Discharge Points (LDP) under EPL 1770. The main discharge point is defined in the EPL as Point 1 and referred to herein as Licensed Discharge Point 1 (LDP1). Licenced Discharge Point 27 is the spillway which rarely discharges.

Relevant sections of EPL 1770 detail water related requirements and are reproduced in **Table A2** below along with identification of where the requirements are addressed in this document.

Table A2: Environment Protection Licence 1770 Water Quality Requirements

Condition No.	Requirements	Relevant section of this document
2	**Discharges to Air and Water and Applications to Land**	

<table>
<tr><td>P1</td><td>Location of monitoring/discharge points and areas</td><td></td></tr>
<tr><td>P1.2</td><td>The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.</td><td>Noted</td></tr>
<tr><td>P1.3</td><td>The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.
Water and land
<table>
<tr><th>EPA Identification no.</th><th>Type of Monitoring Point</th><th>Type of Discharge Point</th><th>Location Description</th></tr>
<tr><td>1</td><td>Discharge to waters
Discharge quality and volume monitoring</td><td>Discharge to waters
Discharge quality and volume monitoring</td><td>Discharge to waters and monitoring from final settlement pond via low level discharge identifed as EPA 1 on plan of the premises titled "EPL premises Plan Fig 1 Project Extents, Monitoring and Compliance Locations dated 12 March 2015 DOC15/83810.</td></tr>
<tr><td>27</td><td>Discharge to waters
Discharge quality and volume monitoring</td><td>Discharge to waters
Discharge quality and volume monitoring</td><td>Discharge to waters via concrete high level spillway from final settlement pond adjacent to EPA 1 on plan of the premises titled "EPL premises Plan Fig 1 Project extents, Monitoring and Compliance Locations" dated 12 March 2015 DOC15/83810.</td></tr>
</table></td><td>Section 5</td></tr>
<tr><td>3</td><td>Limit Conditions</td><td></td></tr>
<tr><td>L1</td><td>Pollution of Waters</td><td></td></tr>
<tr><td>L1.1</td><td>Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.</td><td>Section 2</td></tr>
<tr><td>L2</td><td>Concentration Limits</td><td></td></tr>
<tr><td>L2.1</td><td>For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.</td><td>Section 5</td></tr>
<tr><td>L2.2</td><td>Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.</td><td>Section 5</td></tr>
<tr><td>L2.3</td><td>To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.</td><td>Noted</td></tr>
<tr><td>L2.4</td><td>Water and/or Land Concentration Limits
Point 1, 27
<table>
<tr><th>Pollutant</th><th>Units of Measure</th><th>50 percentile concentration limit</th><th>90 percentile concentration limit</th><th>3DGM concentration limit</th><th>100 percentile concentration limit</th></tr>
<tr><td>Faecal Coliforms</td><td>colony forming units per 100 millilitres</td><td></td><td></td><td></td><td>200</td></tr>
<tr><td>pH</td><td>pH</td><td></td><td></td><td></td><td>6.5-8.5</td></tr>
</table></td><td>Section 5</td></tr>
</table>

	Total suspended solids — milligrams per litre — 50	
L3	**Volume and mass limits**	
L3.1	For each discharge point or utilisation area specified below (by a point number), the volume/mass of: a) liquids discharged to water; or; b) solids or liquids applied to the area; must not exceed the volume/mass limit specified for that discharge point or area. **Point** / **Unit of Measure** / **Volume/Mass Limit** 1 — kilolitres per day — 12161 27 — kilolitres per day — 12161	**Section 5**
L3.2	The volumetric daily discharge limit for the premises is the combined discharge measured at EPA discharge points 1 and 27 and must not exceed 12161 kilolitres per day.	**Section 5**
M2	**Requirement to monitor concentration of pollutants discharged**	
M2.3	Water and/ or Land Monitoring Requirements	**Section 5**

Point 1

Pollutant	Units of measure	Frequency	Sampling Method
Biochemical oxygen demand	milligrams per litre	Once a month (min. of 4 weeks)	Grab sample
Enterococci	colony forming units per 100 millilitres	Once a month (min. of 4 weeks)	Grab sample
Faecal Coliforms	colony forming units per 100 millilitres	Once a month (min. of 4 weeks)	Grab sample
pH	pH	Once a month (min. of 4 weeks)	Grab sample
Total suspended solids	milligrams per litre	Once a month (min. of 4 weeks)	Grab sample

Point 27

Pollutant	Units of measure	Frequency	Sampling Method
Enterococci	colony forming units per 100 millilitres	Daily during any discharge	Grab sample
Faecal Coliforms	colony forming units per 100 millilitres	Daily during any discharge	Grab sample
pH	pH	Daily during any discharge	Grab sample
Total suspended solids	milligrams per litre	Daily during any discharge	Grab sample

M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted. **Section 5**

M8 Requirement to monitor volume or mass

M8.1 For each discharge point or utilisation area specified below, the licensee must monitor:
a) the volume of liquids discharged to water or applied to the area;
b) the mass of solids applied to the area;
c) the mass of pollutants emitted to the air;
at the frequency and using the method and units of measure, specified below. **Section 5**

Point 1

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	kilolitres per day	In line instrumentation

Point 27

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	kilolitres per day	In line instrumentation

G2	Other general conditions	
G2.1	Completed programs **Program** / **Description** / **Completed Date** Coal Mine Particulate Matter Control Best Practice — Requires licensee to conduct a site specific Best Management Practice (BMP) determination to identify ways to reduce particle emissions — 28-September-2012 Assessment of Potential Impacts of Metals in wastewater — The licensee must conduct an assessment of metals detected in wastewater discharges from the mine in accordance with the ANZECC water quality guidelines.. To obtain a greater understanding of the type and concentration of metals discharged in mine water and entering the receiving waters. To limit the concentration of metals discharged in mine water within ANZECC guidelines. — 23-October-2013 Air Quality Monitoring — The licensee must evaluate best locations and install monitoring devices as defined in Project Approval MP10_0161 under the Environent Planning & Assessment Act 1979. — 31-December-2013 PRP4 - Upgrade to Clean and Dirty Water Management System — The licensee must review and upgrade separation of the Clean and Dirty Water Management System and review and upgrade bunding. — 14-August-2015 PRP5 - Remediation of Dam Wall and Spillway formalisation — The licensee must design and remediate the dam wall on the final control pond and formalise a spillway to prevent dam seepage and to ensure that volumetric discharge can be monitored — 27-February-2015 PRP 6 Upgrade to Sewage Treatment Systems — Assessment of options for improved disinfection of effluent from STP on licenced premises. — 06-January-2015 PRP7 Sewage Treatment System Concept Design — Provide the EPA with a Concept Design and Timetable for Implementation of Upgrade to the Sewage Treatment System — 19-February-2016	**Noted**

Appendix 3: Groundwater Management Plan (GwMP)

Appendix 5: Standard Erosion and Sediment Controls

Land Clearing Procedures (Clearing and Topsoil Stripping)

Minimise land disturbance to avoid exposing unnecessary land to the processes related to erosion and sedimentation. This is achieved by:

- All operations are planned to ensure that only the areas which are under active excavation are cleared and that there is no damage to any trees and pasture areas outside the limits to be cleared.
- Limiting the cleared width to that required to accommodate excavation plus areas required for topsoil stockpiling.
- General vegetation clearing will not be undertaken until earthwork operations are ready to commence.
- All proposed erosion and sediment control measures are implemented in advance of, or in conjunction with, vegetation clearing and soil stripping operations.
- Prior to vegetation clearing or soil stripping operations, the stripping panel is delineated on a plan and in the field will be marked by survey pegs placed at intervals on each side of the disturbed area. Topsoil limits and the topsoil stripping depths are shown on the pegs.
- Where possible, topsoil is stripped in moist but not wet condition to reduce deterioration in topsoil quality and dust generation and only be stockpiled when no areas of reshaped overburden are available for direct placement and spreading.

Topsoil Stockpiles

Where suitable areas are unavailable for the immediate respreading, topsoil is stockpiled to a maximum depth of three metres and subsequently applied when the areas become available. The period of the stockpiling is minimised in order to reduce the detrimental effects of the storage of any native seed in the soil and damage to the soil structure.

All stockpiles are shaped, trimmed (max batter slope 3H:1V) then ripped and immediately sown with a sterile cover crop and permanent pasture species to provide stockpile stabilisation. Sediment fence is constructed around the downslope perimeter of the stockpiles where required to provide temporary sediment control until vegetation becomes established. Surface drainage in the vicinity of the stockpiles is configured as to direct any runoff around the area so not to cause any potential erosion of the loose material.

Where topsoil is used as the growing medium, it is re-spread in the reverse sequence to its removal, so that the organic layer, containing any seed or vegetation, is returned to the surface. Re-spreading on the contour aids runoff control and increased moisture retention for subsequent plant growth. Re-spread topsoil should be levelled to achieve an even surface, avoiding a compacted or an over-smooth finish.

Access Tracks

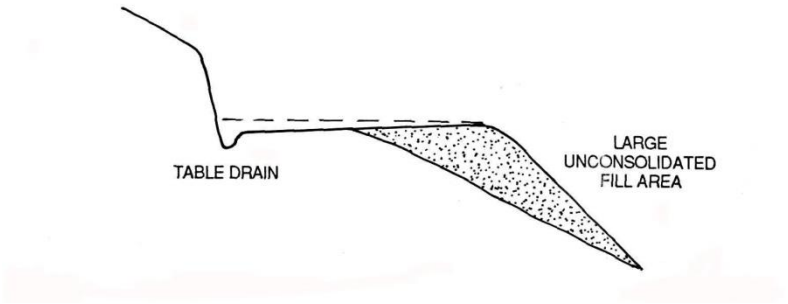
Access tracks are constructed in accordance with appropriate standards such as those described in *Managing Urban Stormwater: Soils and Construction Vol. C - Unsealed Roads*. Surface drainage is optimised and stabilised, thereby reducing roadside erosion and sedimentation. Appropriate control measures are constructed on all access roads with cross fall drainage at 3% either side of the road crown to be largely responsible for immediate water shed from the road surface. Techniques that could be used to provide crossfall on the track include crowing, infall and outfall

- Crowning



Crowning allows water to be shed on both sides

- Infall



- Outfall

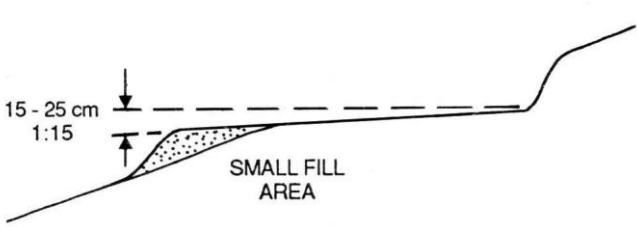


Table Drains, Mitre Drains, Culverts and Cross Drains are used where required to safely convey the water from the track surface so to prevent runoff from eroding them or adjacent land. Mitre Drain spacing should not exceed 50m even on soils with low erodibility. Cross Drains are placed every 20m to 90m depending on the road grade and soil erodibility as required. Refer to Table 5.2 of Vol2C – Unsealed Roads of the 'Blue Book' for more detail.

Cut and fill batters associated with service tracks are formed to a safe slope and stabilised by vegetation. Where cut batters are greater than 1.5m, stabilisation methods are applied to these areas such as laying back, revegetation and drainage. Stabilisation is assisted by spreading topsoil and/or by applying chemical or organic mulch over the exposed batter surface. Where fill batters are greater than 2:1, re-grading may be required.

Planning and construction of new tracks is undertaken in accordance with the guidelines presented Vol. 2C - Unsealed Roads of the 'Blue Book'.

Haul Roads

Run off from haul roads to be constructed within Chain Valley Colliery is to be contained within the mine water management system. The ultimate goal for the site is that water is not allowed to discharge from the site unless through a LDP. If the runoff from future haul road constructions are not contained within the existing mine water system, dams will be constructed to contain this water and allow it to be pumped back into the mine water management system for release through the LDPs.

During any construction of haul roads, temporary erosion and sediment controls (see **Section 1.1.8**) will be implemented. Sediment fencing will be strategically located around fill termination points as the road alignment approaches clean water drainage lines. The silt fencing will not be removed until construction of the appropriate drainage and culverts are completed. Temporary sediment trapping devices may be required during construction to treat sediment-laden runoff from small areas (0.5 ha or less). Where haul roads are required to cross any watercourses, they will generally be constructed so that they cross perpendicular to the watercourse, subject to other constraints. Once constructed, long term sediment controls such as mine water sediment dams will be constructed at the outlet points of the storm water drains to contain water within the mine water management system. However haul roads at Chain Valley are currently sealed bitumen surfaces and erosion of the permanent structures may be effectively controlled by regular cleaning to prevent the accumulation of coal fines.

Diversion Structures (Clean Water)

In order to minimise the volume of dirty and mine water to be treated, all clean run-on water is diverted where possible into clean water drainage lines to be directed off-site. This not only reduces the potential for erosion to occur on disturbed areas, but also reduces the pressure on the dirty and mine water management controls which are required to treat sediment-laden runoff to an acceptable standard for discharge. Suitably designed and constructed diversion drains are implemented where practical around the Chain Valley Colliery in accordance with 'Blue Book' standards relating to channel design. In general, the drains should be trapezoidal in shape with maximum side slopes of 1V:2H. Where peak design water velocities exceed 1.5m/s, the drains should be protected from scour using either erosion channel liners and/or geofabric with rock rip-rap armouring.

Diversion Structures (Mine and Dirty Water)

Catch drains are utilised throughout the site to minimise erosion and re-direct potentially contaminated runoff into dirty water sediment dams and mine water dams. Runoff from disturbed areas, such as stockpile areas, is conveyed to these dams by catch drains and bunds.

Bunds shall be constructed similar to top soil emplacement areas, bunds shall be shaped, trimmed (max batter slope 3H:1V) then ripped and immediately sown with a cover crop and permanent pasture species to provide bund stabilization.

For runoff from rehabilitation areas, the water management structures should be appropriately designed before layout and construction. Typically the water management structures include contour banks, which are constructed at intervals down the slope of rehabilitation areas to control surface flow and minimize erosion. The effect of these is to divide long slopes into a series of short slopes with the catchment area commencing at each bank. This prevents runoff from reaching a depth of flow or velocity which would cause erosion. As the slope angle of the landform increases, the banks are spaced closer together. Bank spacing is determined based on the surrounding catchment layout and the bench spacing guide contained in Table 4.1 of *Vol2E – Mines and Quarries* of the 'Blue Book'. The banks should have a longitudinal grade of 1.2%. Where peak design water velocities exceed 1.5m/s, the drains should be protected from scour using either erosion channel liners and/or geofabric with rock rip-rap armouring.

Control Devices

Mine water dams and mine water sediment dams (generally smaller structures) are used at Chain Valley Colliery to contain potentially contaminated 'mine' water. This water has the potential to contain elevated salinity concentrations and/or potential hydrocarbon contamination as a result of runoff from haul roads, workshop areas and areas exposed to carbonaceous material. They also function as sediment dams for sediment control but are not allowed to spill into neighbouring watercourses unless released through a LDP.

Dirty Water sediment dams are intended to catch runoff from disturbed areas that are not exposed to potential contamination of hydrocarbons or carbonaceous material. These include general construction areas and rehabilitation areas. In general dirty water sediment dams should be constructed on all disturbed areas not draining to mine water dams. The dams are constructed for the purpose of capturing sediment-laden runoff prior to off-site release. Dirty water sediment dams assist in improving water quality throughout the mine site.

The number and capacity of dams will be related to the total area of catchment, the duration of disturbance and the anticipated soil loss. The capacity of each dam is derived from the benchmark design reference for sediment control, *Managing Urban Stormwater: Soils and Construction Vol. 1* and *Vol. 2E Mines and Quarries* (the Blue Book) (Landcom, 2004 and DECC, 2008). The dams are constructed to at least the recommended minimum design criteria as presented in Table 6.1 of Vol 2E Mines and Quarries of the Blue Book. For most areas, this is the 90th percentile, 5 day rainfall event for a Type F/D basin (soils that are fine textured and possibly dispersive).

The following points will be considered when selecting future sites for sediment dams:

- Each dam will be located so that runoff may easily be directed to it, without the need for extensive channel excavation or for excessive channel gradient. Channels will discharge into the dam without

risk of erosion. Similarly, spillways will be designed and located so as to safely convey the maximum anticipated discharge.

- The material from which the dam is constructed will be stable and be imported from elsewhere on the mine, if necessary. Highly dispersible clays will require treatment with gypsum and/or bentonite to prevent failure.

Temporary Erosion and Sediment Controls

Prior to any construction activity (including soil stripping, road construction, bulk earthworks), temporary erosion and sediment control measures are installed. The following sub-sections include temporary erosion and sediment control features that may be utilized at the site.

Sediment Filter Fences

There may, on occasion, be a disturbance area which is either not protected by existing structures or requires additional temporary protection against erosion and sedimentation. In these cases it may be suitable to install sediment filter fencing. Sediment filter fences filter run-off leaving the site, trapping sediment and allowing filtered water to pass. Sediment filter fences are constructed around the base of any areas of exposed land that are not subject to concentrated overland flow, that are not adequately protected by existing structures and that are not within the mine water management system. Sediment filter fencing is installed around the extent of the disturbance areas where sediment-laden water could potentially enter clean downstream receiving waters.

Sediment filter fences are normally placed on the contour or slightly convex to the contour. The contour on each end of the fence should be turned to create a stilling dam up slope of the fence. Where possible, a silt fence system should consist of a series of overlapping fences. Each fence should be NO longer than about 40 metres. They should not intercept large concentrated or channelised flows. The fences are constructed in accordance with the Sediment Fence Standard Drawing (SD6-8) of the 'Blue Book'. Silt fences require regular maintenance. Trapped sediments should be removed, pickets straightened, filter cloth re-secured and tightened.

Sandbag Weirs

Sandbag weirs are sometimes installed within existing swale drains or existing drainage channels, which are not able to be regularly graded. The use of these devices is limited to temporary erosion and sediment control in channels during construction or high disturbance phase mining.

The weirs are typically installed at a minimum of 40 metre intervals. As with sediment filter fences, sandbag weirs may be installed prior to any works commencing on the site in existing channels and immediately after the construction of new channels. Inspections of the sandbag weirs after rain should take place with removal of the collected sediment as required. Damaged/shifted bags should be repaired or replaced.

Temporary Drains

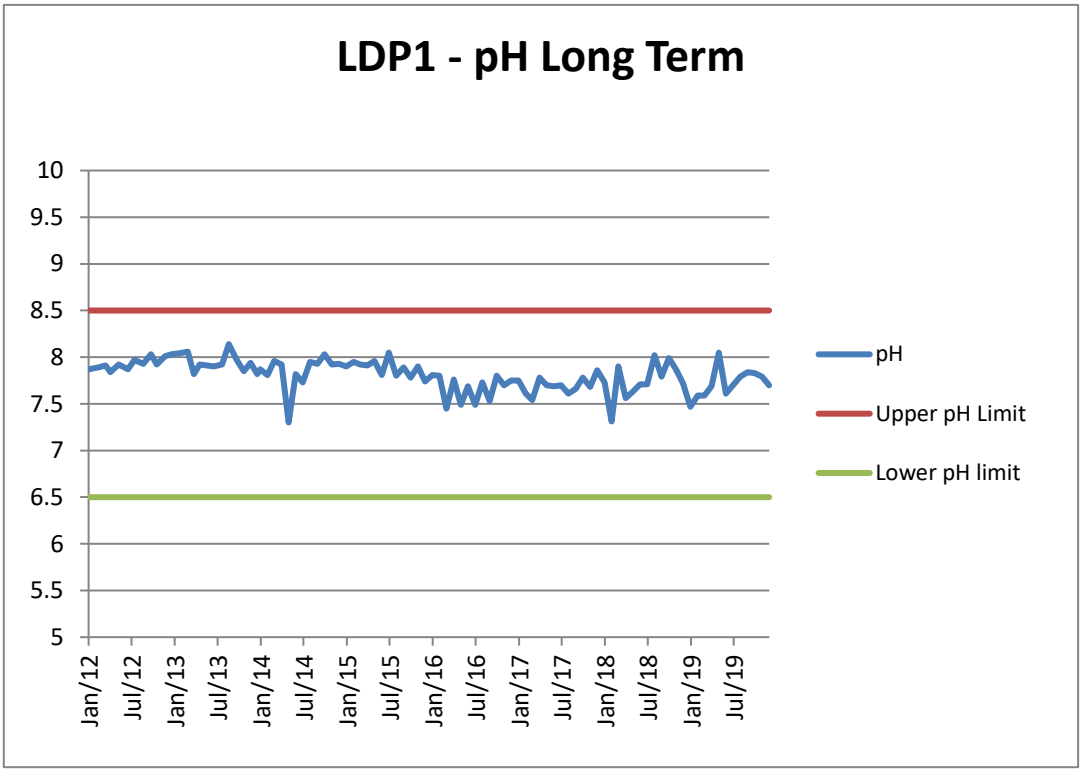
Runoff from areas exposed during the works is to be controlled by construction of temporary contour and diversion drains. These drains generally take the form of channels constructed across a slope, with a ridge of the lower side. They should be implemented immediately after a construction site is cleared to intercept and divert runoff from the site to nearby stable areas at non-erosive velocities. The drains should be formed with a gentle grade of approximately 1.2%

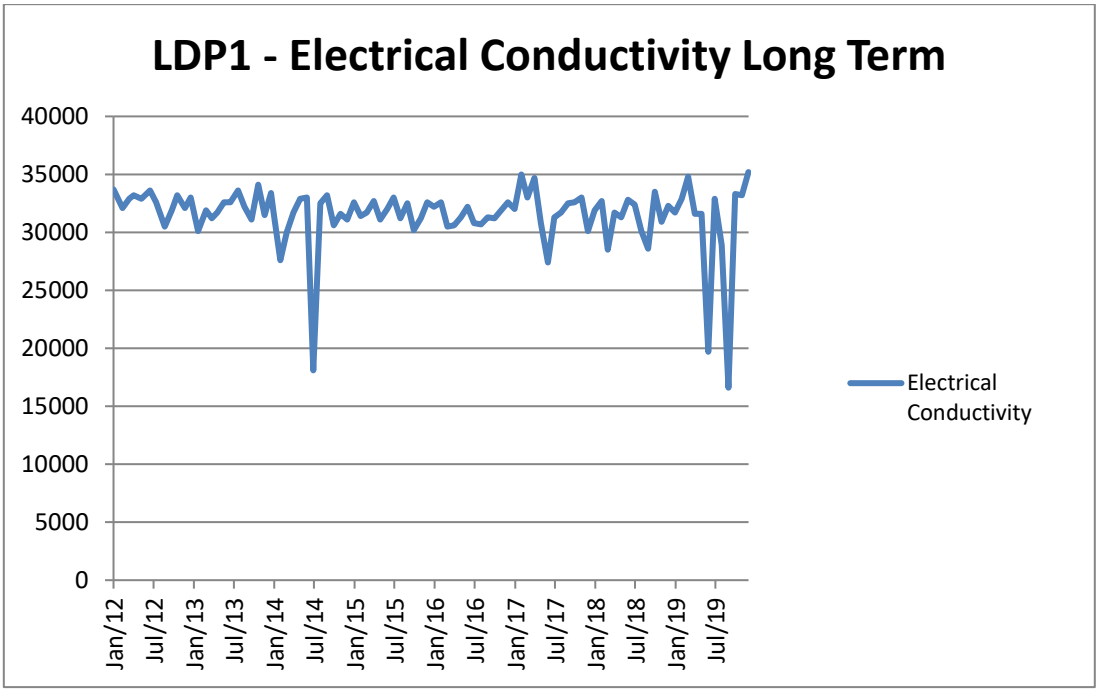
Temporary Silt Traps

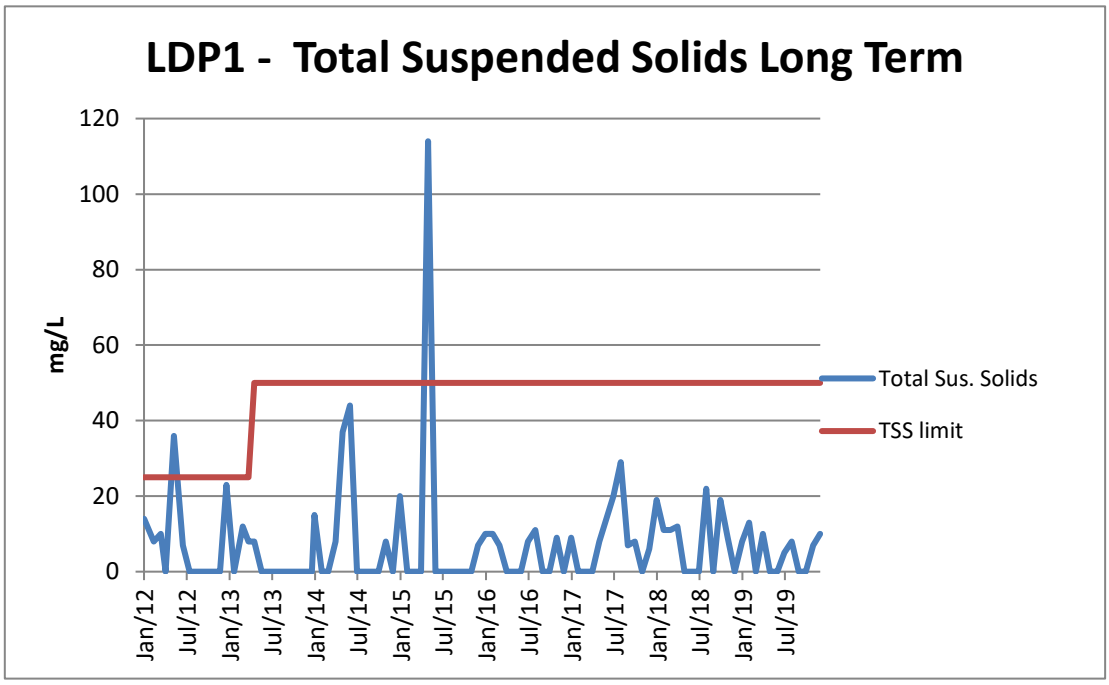
Temporary sediment trapping devices may be required during construction to trap and filter sediment-laden runoff from small areas (0.5 ha or less) prior to discharge. They are used to trap small amounts of run-off water and filter sediment from runoff before entering the natural watercourses or to protect adjacent lands. These would typically be used at the discharge point of mitre drains and other similar devices.

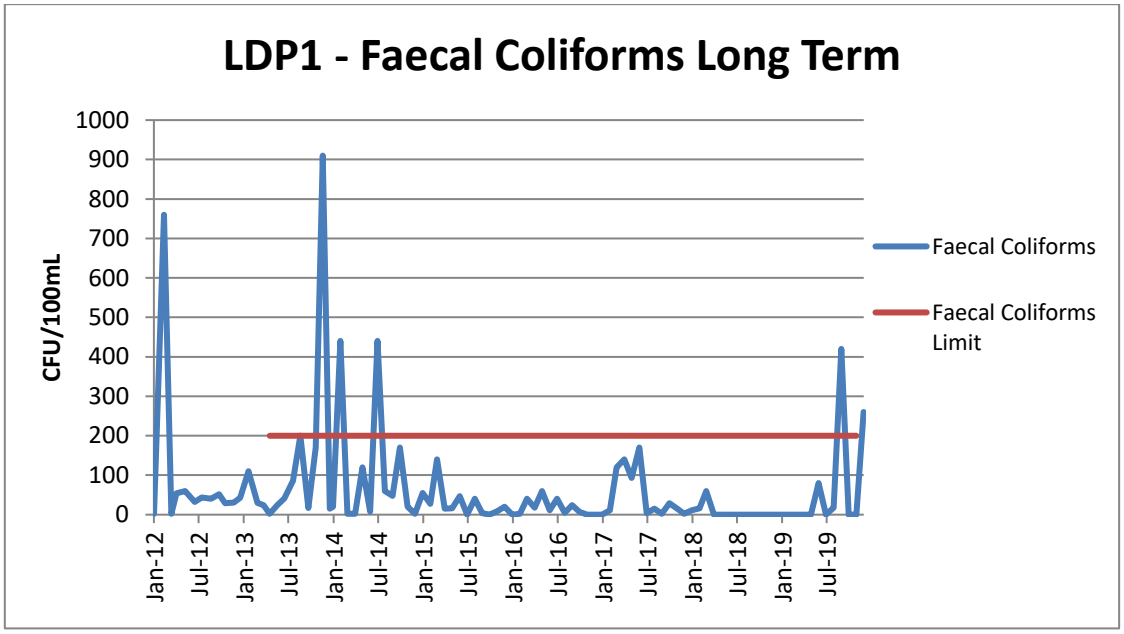
Appendix 4: EPL 1770 Water Quality Monitoring Results

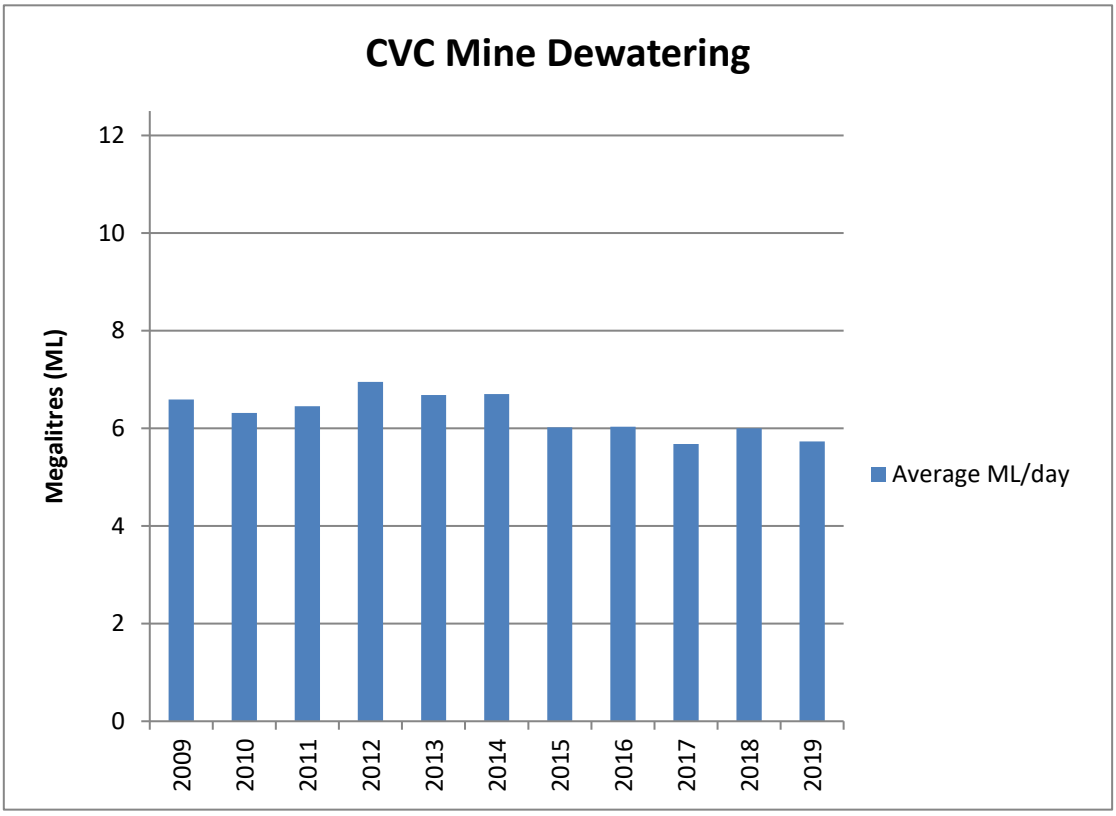
Long term monitoring results from the 2019 Annual review detailed below.




LDP1 - Electrical Conductivity Long Term
40000
35000
30000
25000
20000
15000
10000
5000
0
Jan/12
Jul/12
Jan/13
Jul/13
Jan/14
Jul/14
Jan/15
Jul/15
Jan/16
Jul/16
Jan/17
Jul/17
Jan/18
Jul/18
Jan/19
Jul/19
Electrical Conductivity


LDP1 - Total Suspended Solids Long Term
mg/L
120
100
80
60
40
20
0
Jan/12
Jul/12
Jan/13
Jul/13
Jan/14
Jul/14
Jan/15
Jul/15
Jan/16
Jul/16
Jan/17
Jul/17
Jan/18
Jul/18
Jan/19
Jul/19
Total Sus. Solids
TSS limit


LDP1 - Faecal Coliforms Long Term
CFU/100mL
1000
900
800
700
600
500
400
300
200
100
0
Jan-12
Jul-12
Jan-13
Jul-13
Jan-14
Jul-14
Jan-15
Jul-15
Jan-16
Jul-16
Jan-17
Jul-17
Jan-18
Jul-18
Jan-19
Jul-19
Faecal Coliforms
Faecal Coliforms Limit


CVC Mine Dewatering
Megalitres (ML)
12
10
8
6
4
2
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Average ML/day

Appendix 6 Biodiversity Management Plan

Delta coal	Doc Owner: Environment and Community Coordinator Doc No:

CHAIN VALLEY COLLIERY

Biodiversity Management Plan

ENVIRONMENTAL MANAGEMENT PLAN

Reviewer	Katie Weekes – EMM Consulting Eugene Dodd – EMM Consulting Chris Armit – EMM Consulting
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Date:	1 December 2019

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1 Introduction

1.1 Purpose

This management plan addresses the requirements for Development Consent SSD-5465, Schedule 3, Condition 20 which specifies that a Biodiversity Management Plan (BMP) be prepared.

The BMP applies to the surface operations at Chain Valley Colliery (CVC), including pit top facilities and lands where additional infrastructure may be constructed.

The purpose of this management plan is to:

- provide an overall framework for consultation related to biodiversity;
- set out the rehabilitation objectives for CVC;
- meet the requirements of the development consent in respect of the BMP;
- detail monitoring requirements (if required);
- minimise and appropriately control potential impacts to biodiversity from operations;
- minimise potential impacts on biodiversity surrounding the operational areas;
- define specific responsibilities of all stakeholders and function as a management tool for all relevant operational personnel; and
- identify the requirements for review of the document and a procedure for continual improvement.

The BMP includes a Biodiversity Enhancement Strategy, which will implement measures to enhance and restore the endangered ecological communities (EECs) in the Biodiversity Enhancement Area, including:

- weed and rubbish removal;
- return of the natural hydrological regime; and
- regeneration with native endemic species.

The overall aim of this management plan is to promote a high level of environmental performance through the minimisation of impacts.

1.2 Background

CVC is an underground coal mine located on the southern side of Lake Macquarie approximately 60 km south of Newcastle and 80 km north of Sydney (see **Figure 1**). The pit-top is located approximately 1 km south-east of the township of Mannering Park at the southern extent of Lake Macquarie.

In August 1960, J&A Brown and Abermain Seaham Collieries Ltd commenced clearing the present site with drift and shaft sinking starting a few months later. Production of coal from the Wallarah Seam, commenced with the first delivery to the adjacent Delta Electricity's Vales Point Power Station (VPPS) in April 1963.

LakeCoal was formed in 2001 to acquire BHP Billiton's 80% share in the Wallarah Coal Joint Venture (WCJV), the remaining 20% share was owned by Sojitz. In October 2006, Peabody Energy, a US listed company acquired LakeCoal Pty Limited.

In November 2009 LDO Coal Pty Limited purchased LakeCoal Pty Limited. LDO Coal is a consortium consisting of LD Operations, AMCI and private investors. In March 2011 the 20% share in the WCJV which Sojitz held was acquired by LDO Coal shareholders through the entity Fassi Coal Pty Ltd. The WCJV had operated the Wallarah, Moonee and Chain Valley underground coal mines and the Catherine Hill Bay Coal

Preparation Plant, all located at the southern end of Lake Macquarie. At the time of LakeCoal's acquisition by LDO Coal, both the Wallarah and Moonee mines were closed.

In 2013 the owners of Mannering Colliery (MC) and CVC entered into an agreement which enabled LakeCoal to operate the MC until 2022. LakeCoal became the operator of MC effective 17 October 2013, with the underground link between CVC and MC completed in October 2017.

LakeCoal was placed into Voluntary Administration on 3 October 2018. The receivers continued operation of the mines in the period 3 October 2018 to 1 April 2019. As of 1 April 2019, Great Southern Energy Pty Ltd (trading as Delta Coal, DC) own and operate the two underground coal mines, CVC and MC. Mining is currently undertaken at CVC, with the coal being transported underground to MC where the coal is crushed and screened and sent directly to VPPS.

1.3 Operation

With changes to the *Mining Act 1992* and amendments to the Environmental Planning and Assessment Regulation 2000, LakeCoal was required to obtain approval under the *Environmental Planning and Assessment Act 1979* (EP&A Act) to permit continued operation. Approval of the mine was granted on 23 January 2012 (MP10_0161) following submission of an environmental assessment (EA) (AECOM, 2011). Development consent (SSD-5465) was subsequently approved on 23 December 2013, granting approval for underground mining over an additional area of Lake Macquarie and a consolidation of approved activities granted by virtue of MP10_0161. Mining operations are approved to occur until 31 December 2027.

1.4 Construction

No above-ground construction works are planned that would result in significant vegetation changes or removal. As a result of construction, the following biodiversity issues have been identified:

- clearing of vegetation and fauna habitat for water management and maintenance (dams and embankments) works;
- clearing of vegetation and fauna habitat for bushfire management and maintenance (asset protection zone) works; and
- potential for invasion and spread of weeds and soil pathogens into areas of remnant vegetation.

Commitments related to the clearing of fauna habitat and weed management during the ventilation fan augmentation project which was approved under MP10_0161 have already been undertaken during construction under a specific management plan and are therefore not included within this BMP. However, follow-up measures to monitor the effectiveness of these measures and potential impacts post-construction activities have been included within this plan.

1.5 Consultation

The BMP was originally developed in 2012 and, following some minor changes to the original document as a result of comments from the then Department of Planning and Infrastructure (DPI), the final plan was subsequently approved on 6 November 2012.

This BMP has been subsequently updated to be consistent with the requirements of the most recent development consent (SSD-5465 dated 16 December 2015) and the commitments made within Chain Valley Colliery's Mod 2 Statement of Environmental Effects (SEE). Extensive consultation was undertaken with the then Office of Environment and Heritage (OEH) by LakeCoal during the approvals process.

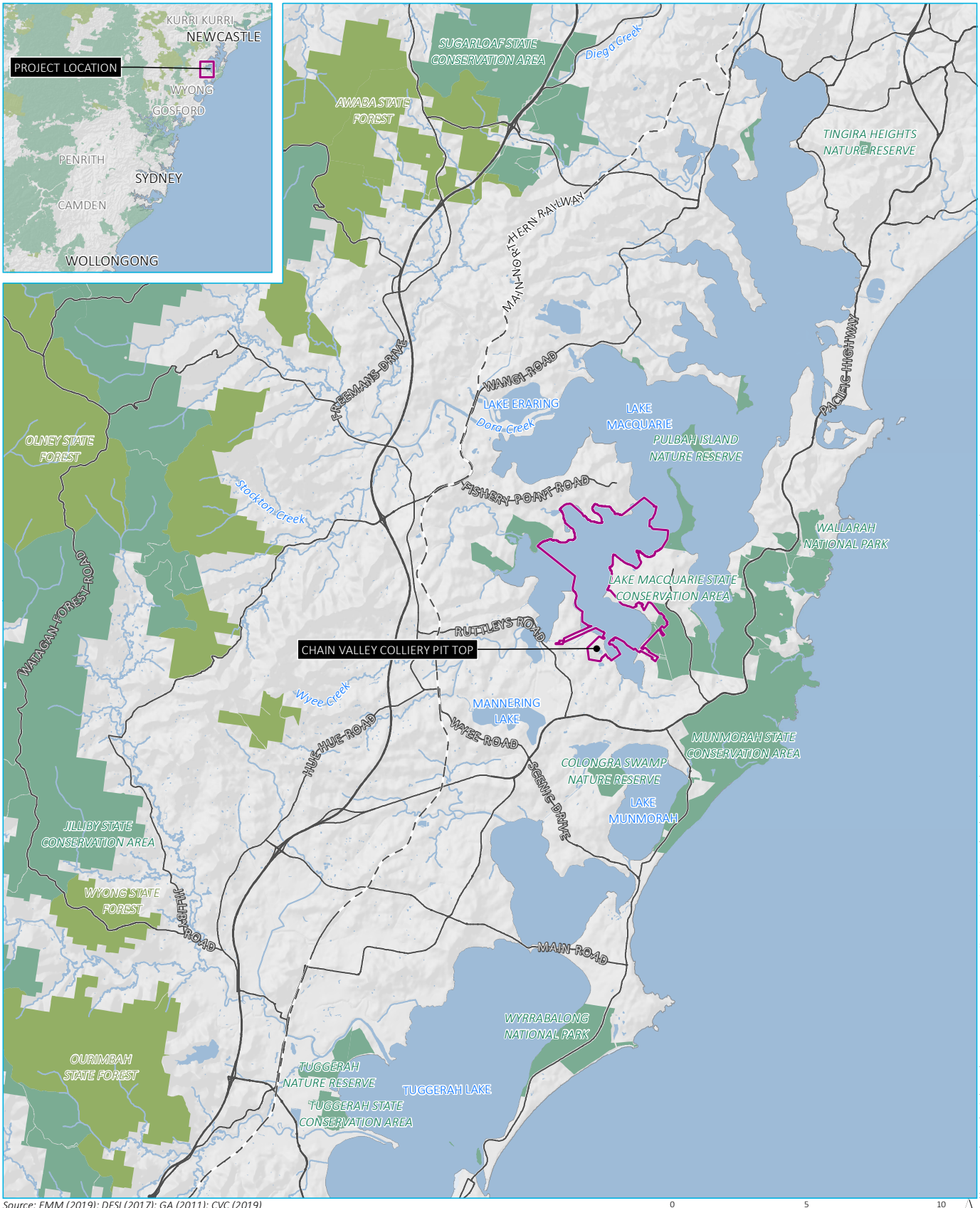
This BMP, while based substantially on the previously approved LakeCoal BMP (V3), has been updated to reflect the recommendations of the Independent Environmental Audit (IEA) conducted by SLR in June 2019. These updates are administrative only and there are no changes to activities, impacts, the mine footprint or development consent requirements associated with CVC.

Endorsement of individuals undertaking the review of this management plan was received from DPIE on the14 August 2019.

This BMP was provided to the Environment Protection Authority (EPA), Biodiversity Conservation Division (BCD) and Department of Planning, Industry and Environment (DPIE) on 1 December 2019 for their review and comment. A summary of the comments received, and amendments subsequently made to the document prior to finalisation are detailed in **Table 1**. Evidence of consultation is provided in **Appendix 1**.

Table 1: Consultation Summary

Stakeholder	Comments	Response/Action
NSW EPA	•	•
NSW DPIE	•	•
NSW BCD	•	•



\\emmsvr1\EMMJobs\2019\H190358 - Mannering Colliery Mgt Plan Updates\GIS\02_Maps\MCMP001_RegionalLocation_20191021_02.mxd 21/10/2019

Source: EMM (2019); DFSI (2017); GA (2011); CVC (2019)

0 5 10 km

GDA 1994 MGA Zone 56

N

KEY

- Chain Valley Colliery development consent boundary
- Rail line
- Main road
- Watercourse/drainage line
- Waterbody
- NPWS reserve
- State forest

CVC regional context

Chain Valley Colliery
Figure 1

EMM
creating opportunities

2 Statutory Requirements

2.1 Key Legislation, Policy and Guidelines

Both State and Commonwealth environmental legislation applies to DC's operation and activities. Compliance with State regulations requires the implementation of activities ranging from the control of priority weeds (*Biosecurity Act 2015*), monitoring for threatened species (*Biodiversity Conservation Act 2016)* and management of forest fuels to prevent fire spread (*Rural Fire Services Act 1997).*

A number of legislative requirements, government policies and guidelines relating to biodiversity are applicable, key items relevant to this BMP are:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Protection of the Environment Operations Act 1997* (POEO Act);
- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Mining Act 1992*;
- *Biosecurity Act 2015* and Biosecurity Regulation 2017;
- *Local Land Services Act 2013*,
- *National Parks and Wildlife Act 1974*;
- *Biodiversity Conservation Act 2016*;
- *Rural Fires Act 1997;*
- Central Coast Council Tree Works Permit (former Wyong Local Government Area); and
- Auld, B. (2009). Guidelines for monitoring weed control and recovery of native vegetation, NSW Department of Primary Industries (DPI).

Delta lands are within the Lake Macquarie City Council (LMCC) and Central Coast Council (CCC) local government areas (LGAs).

2.2 Development Consent (SSD-5465) Requirements

Biodiversity related requirements of the development consent (SSD-5465) include specific conditions that are to be addressed. **Appendix 1** details where in the BMP they are addressed.

DC will also carry out works generally in accordance with the Environmental Assessment (EA), EA (Mod 1), EA (Mod 2), Project Layout Plans, and Statement of Commitments.

3 Existing Environment

3.1 Previous Assessments

Several biodiversity assessments have been undertaken in the Wyong Local Government Area (LGA), for the nearby VPPS, and for CVC. This section provides a summary of previous assessments in relation to management of biodiversity values within and surrounding the CVC.

Ecotone Ecological Consultants undertook detailed biodiversity surveys within and surrounding the study area in June 1997 and April 2010. Their study area included the CVC pit top area with the following biodiversity values identified:

- Narrow-leaved Scribbly Gum Open Forest in vegetated areas;
- potential habitat for threatened flora listed under the *Threatened Species Conservation Act 1995* (TSC Act): Black-eyed Susan (*Tetratheca juncea*); Leafless Tongue Orchid (*Cryptostylis hunteriana*) and *Angophora inopina*; and
- a record of the threatened Grey-headed Flying-fox (*Pteropus poliocephalus*), listed under the TSC Act and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The CVC EA for continued operations (MP10_0161) identified the following biodiversity values at the pit top and ventilation shaft site at Summerland Point.

- pit top area:
  - Contains remnant and regenerating vegetation including Coastal Plains Smooth-barked Apple Woodland, Riparian Melaleuca Swamp Woodland, and Swamp Mahogany Paperbark Forest. The latter two communities are part of the Swamp sclerophyll forest which is listed as an EEC under the TSC Act.
- ventilation shaft site at Summerland Point:
  - Contains remnant vegetation including Coastal Plains Smooth-barked Apple Woodland, Coastal Wet Sand Cyperoid Heath and some areas of Riparian Melaleuca Swamp Woodland, and Swamp Mahogany Paperbark Forest, which are part of the Swamp Sclerophyll Forest EEC.
- Both sites:
  - contain potential habitat for threatened species: Regent Honeyeater (*Anthochaera phrygia*), Swift Parrot (*Lathamus discolor*), Osprey (*Pandion haliaeetus*), Squirrel Glider (*Petaurus norfolcensis*) and Grey-headed Flying-fox (*Pteropus poliocephalus*). An additional ten threatened fauna species may utilise the habitats in the pit top area on occasion.

Under the Wyong Local Environmental Plan 2013 the pit top area and sediment dams are zoned as SP2 Infrastructure, with the vegetation east of the sediment dams zoned as E2 Environmental Conservation.

The infrastructure area and surrounds of the ventilation shaft site at Summerland Point are zoned E1 National Parks and Nature Reserves under the Wyong Local Environmental Plan 2013.

3.2 Baseline Monitoring

3.2.1 Native Vegetation

Baseline data on vegetation condition in the area of Swamp oak forest enhancement areas was collected in 2013 in accordance with the monitoring program outlined in this BMP (see **Table 2**).

Table 2 provides baseline data for site attributes for Swamp Oak Forest in the Biodiversity Enhancement Area. It provides the site attribute score (plot score) and calculates the weighted score of each site attribute to give an overall weighted score.

Table 2: Baseline (2013) Swamp Oak Forest Data

Site attribute	Benchmark	Plot 1 score	Plot 2 score	Average	Weighting %	Calculation	Weighted score %
Native plant species richness	>6	4	3	3.5	25	21.875	21.9
Native over-storey cover	5 to 18	3	3	3	10	7.5	7.5
Native mid-storey cover	36 to 48	3	3	3	10	7.5	7.5
Native ground-cover (grasses)	3 to 21	4	4	4	2.5	2.5	2.5
Native groundcover (shrubs)	0 to 0	4	4	4	2.5	2.5	2.5
Native groundcover (other)	1 to 13	4	4	4	2.5	2.5	2.5
Exotic plant cover (all strata)	>66%	3	4	3.5	5	4.375	4.4
Number of trees with hollows	> 0	4	4	4	20	20	20.0
Proportion of over-storey species occurring as regeneration	0	1	2	1.5	12.5	4.6875	4.7
Total length of fallen logs	> 20	3	4	3.5	10	8.75	8.8
Total		34	37	35.5	100		**82.2**

Native vegetation in this area is in good to moderate condition, with an overall weighted score of 82.2%. The trigger value for remedial works is when the weighted score is less than 60%. Subsequent monitoring events will be compared against these baseline results for Swamp oak forest in the biodiversity enhancement area to monitor the overall weighted score against this trigger value.

3.2.2 Terrestrial Ecology

Vegetation mapping undertaken during 2012 in areas surrounding the CVC pit top identified the nearby vegetation communities as Coastal Open Woodland, Swamp Oak Forest and Swamp Sclerophyll Forest. Mapping was also undertaken at the ventilation shaft site and identified Coastal Open Woodland, Grassy Open Woodland and Swamp Sclerophyll Forest.

From the above, both the Swamp Oak Forest and Swamp Sclerophyll Forest are listed as Endangered Ecological Communities (EEC s) under the *Biodiversity Conservation Act 2016*.

These vegetation communities are also known to provide habitat for threatened fauna species such as the Squirrel Glider (*Petaurus norfolcensis*), Regent Honeyeater (*Anthochaera phrygia*), Swift Parrot (*Lathamus discolor*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and microbats.

In addition to the natural habitat within the site, built structures are also known to provide potential habitat for a number of fauna species. It is known that threatened microbat populations have inhabited mine portals elsewhere in NSW (Olsen Consulting Group, 2009). In addition, the CVC sediment dams have become used by a number of native fauna species.

3.2.3 Wallum Froglet

A baseline monitoring event was completed to identify the presence of the Wallum Froglet in the pit top area. The survey was completed in accordance with guidelines for the species, described in *Threatened species survey and assessment guidelines: field survey methods for fauna (Amphibians)* (DECCW 2009). The survey was conducted on two separate nights in April 2014, during the breeding and calling season when the species is readily detectable. The surveys were also completed during rain. The survey guidelines note that wet weather conditions are more important for detection of the species than the time of year the survey is completed (DECCW 2009).

The survey was completed by a qualified and experienced ecologist during 2014. Wallum Froglet calls were broadcast at the start of the survey with a five-minute listening period to check for responses. Active searches were then completed with a spotlight and head torch in potential habitat including the Swamp Oak Forest, Swamp Sclerophyll Forest and around the edges of dams.

No Wallum Froglet individuals were identified despite the survey being completed at the correct time of year and in suitable weather conditions. Additionally, the site is not considered to contain optimal habitat for the species which is usually found in acid paperbark swamps. It is not associated with Swamp Oak Forest and only occasionally found in Swamp Sclerophyll Forests (DECCW 2009; OEH 2014). Based on failure to detect the species and sub-optimal nature of the habitat identified, no further monitoring has been conducted.

4 Remnant Native Vegetation

Remnant native vegetation is located within both the CVC pit top area and ventilation shaft site (see **Figure** 2 and **Figure 3**). Vegetation in these areas has been subject to a number of influences from the surrounding areas and uses, including clearing for powerline easements, mine activities and associated infrastructure, and encroachment from adjacent residential areas. However, in general, the native vegetation within the study area is in reasonable condition and is known to contain EECs and threatened fauna species including Squirrel Gliders and microbats. A description of these vegetation communities is provided in the following sections.

4.1 Coastal Open Forests

Coastal open forests (Coastal Open Woodland and Grassy Open Woodland) occur in both the pit top and ventilation shaft areas. These areas contain a mixture of vegetation types dominated by either Narrow-leaved Scribbly Gum (*Eucalyptus haemastoma*), Red Bloodwood (*Corymbia gumifera*) or Smooth-barked Apple (*Angophora costata*). These communities generally occur above 5 metres AHD in the study area, i.e. above the high-water mark, and are not influenced by tidal movements or inundation by floodwaters.

The vegetation within the coastal open forest areas is not considered to meet the description of any EECs, although it provides important habitat for threatened fauna and contains important habitat features such as large hollow-bearing trees.

4.2 Coastal Swamp Forests

Swamp forests occur generally below 5 m AHD within the study area. Several types occur within the study area, including:

- Mangroves;
- Swamp Sclerophyll Forest; and
- Swamp Oak Forest.

4.2.1 Mangroves

Patches of mangroves occur along Swindles Creek, an unnamed creek and Lake Macquarie foreshore. The creek is subject to tidal flows from the lake, which has influenced the occurrence of the mangroves in this area. Mangrove areas are within the intertidal zone, inundated more frequently than other communities such as saltmarsh and Swamp Oak Forest.

4.2.2 Swamp Sclerophyll Forest

Swamp Sclerophyll Forest occurs on the deeper alluvial soils where drainage is impeded and standing water occurs after rain. These areas are not influenced by saline tidal waters or discharge waters associated with the sediment dams. The community is dominated by Swamp Mahogany (*Eucalyptus robusta*), Broad-leaved Paperbarks (*Melaleuca quinquenervia*), *Melaleuca sieberi*, and Forest Red Gum (*Eucalyptus teriticornis*).

This community is listed as an EEC in NSW under the TSC Act. In the study area, it surrounds some of the ventilation fan site (**Figure 3**). Microclimatic changes to this vegetation could occur from the outputs of the shaft, which could influence the health of the community. Therefore, the health of vegetation in this area will be monitored during operations.

4.2.3 Swamp Oak Forest

Swamp Oak Forest typically occurs in estuaries where tidal influence has created saline groundwater. These areas are not always inundated by saline or freshwater, with the understory within the community determined by the amount of tidal influence and salinity within floodwaters. Within the Lake Macquarie area, this community typically fringes the lake foreshore.

The area to the east of the sediment dams has been mapped as containing Swamp Sclerophyll Forest, a listed EEC. The vegetation in this area is considered to more accurately represent a Swamp Oak Forest community as it is dominated by Swamp Oak (*Casuarina glauca*). Some dead trees do occur in this area and it is likely that it previously contained species such as Swamp Mahogany (*Eucalyptus robusta*) and Broad-leaved Paperbark. These species, when dominant are indicative of Swamp Sclerophyll Forest, though have the potential to also occur in Swamp Oak forest in low quantities or in transitional areas. Regardless, the decline of these species and the lack of subsequent recruitment is a potential indicator that the area has become too saline and/or too waterlogged to provide suitable habitat.

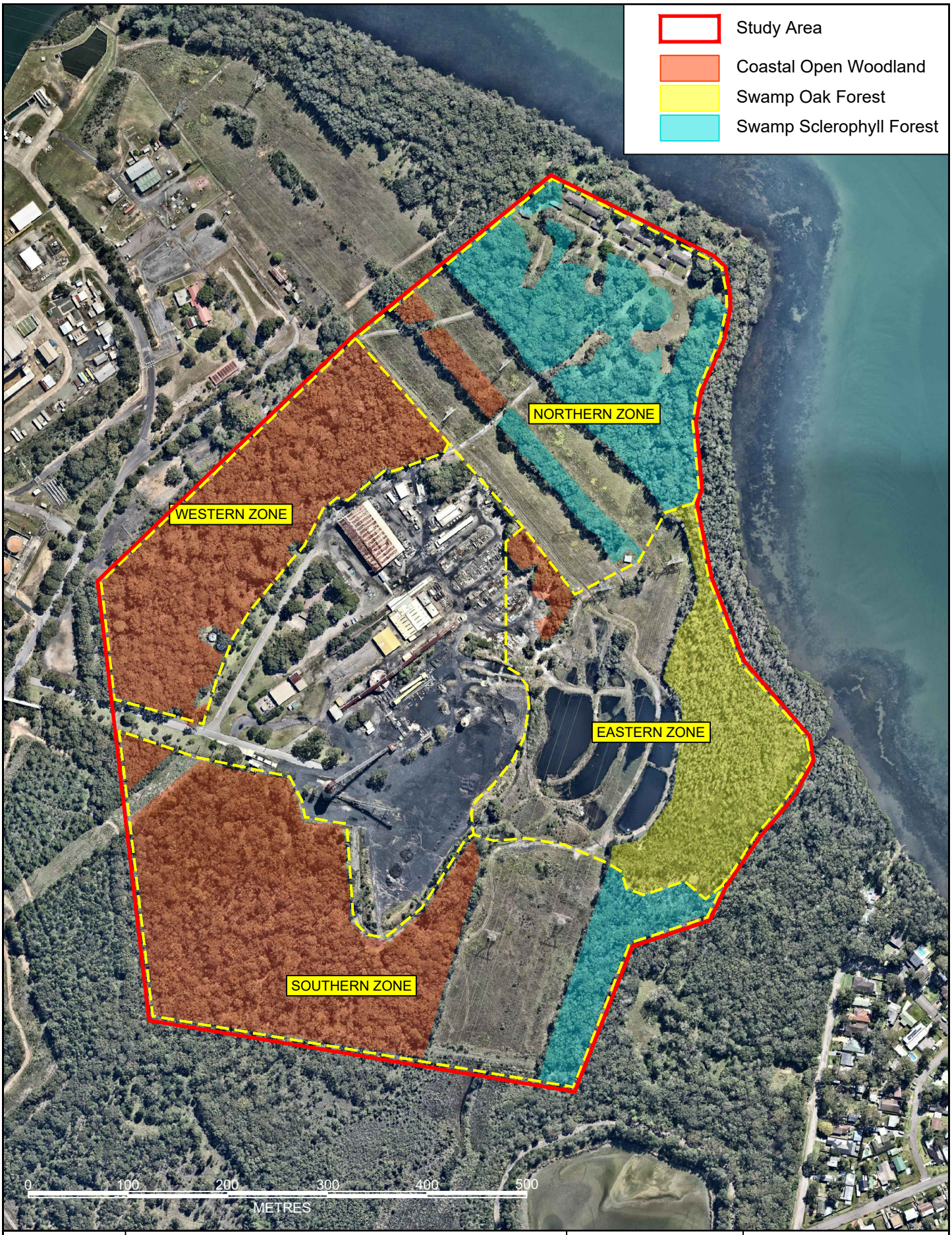
The Swamp Oak Forest is listed as a EEC under the TSC Act and is differentiated from the Swamp Sclerophyll Forest by Swamp Oak being dominant canopy species, the low abundance of eucalypt species and the position of the landscape (where flooding is periodic and soils show some influence of saline groundwater).

The area to the east of the sediment dams is unlikely to be subject to tidal influence. However, saline groundwater from the underground workings is continually discharged (via the sediment dams). This in conjunction with consequential ponding due to the relatively flat nature of the area, is likely to have influenced the vegetation present, increasing the presence of species which are adapted to higher levels of saline inundation (halophytes). Several Saltmarsh species, which tolerate inundation with saline water, occur throughout the Swamp Oak area, including *Selliera radicans*, *Suaeda australis* and *Samolus repens.* Other understory species include sedges and rushes such as *Juncus spp., Schoenus brevifolius*, *Chorizandra cymbaria* and Water Couch (*Paspalum distichum*).

Without the sediment dam discharge water, this area is likely to only be inundated after large flood events, by freshwater from Swindles Creek and runoff from other areas associated with the mine. The community present in 2014 therefore appears to be in transition and generally in poor health as is evident from the presence of weed species, dominance of sedges and rushes, and the density and health of Swamp Oaks.

Any changes to the current hydrological cycle (even though it is not natural), may impact on this community. Too much or not enough water could have effects on future species composition in this area. Changes in the quality and quantity of water discharges from the sediment dams and through seepage from the dam walls could also affect the health of the vegetation in this area.

While Swamp Oak can tolerate saline groundwater, too much saline water may lead to dieback, as is evident from the baseline monitoring in 2013, where the sediment dams have permanently inundated areas of the community. Conversely, too little inundation may cause changes to the composition of the community allowing further invasion of weeds. Changes in the condition and composition of the community present will be monitored during operations to ensure that the vegetation in this area is not negatively impacted by the operation of CVC.



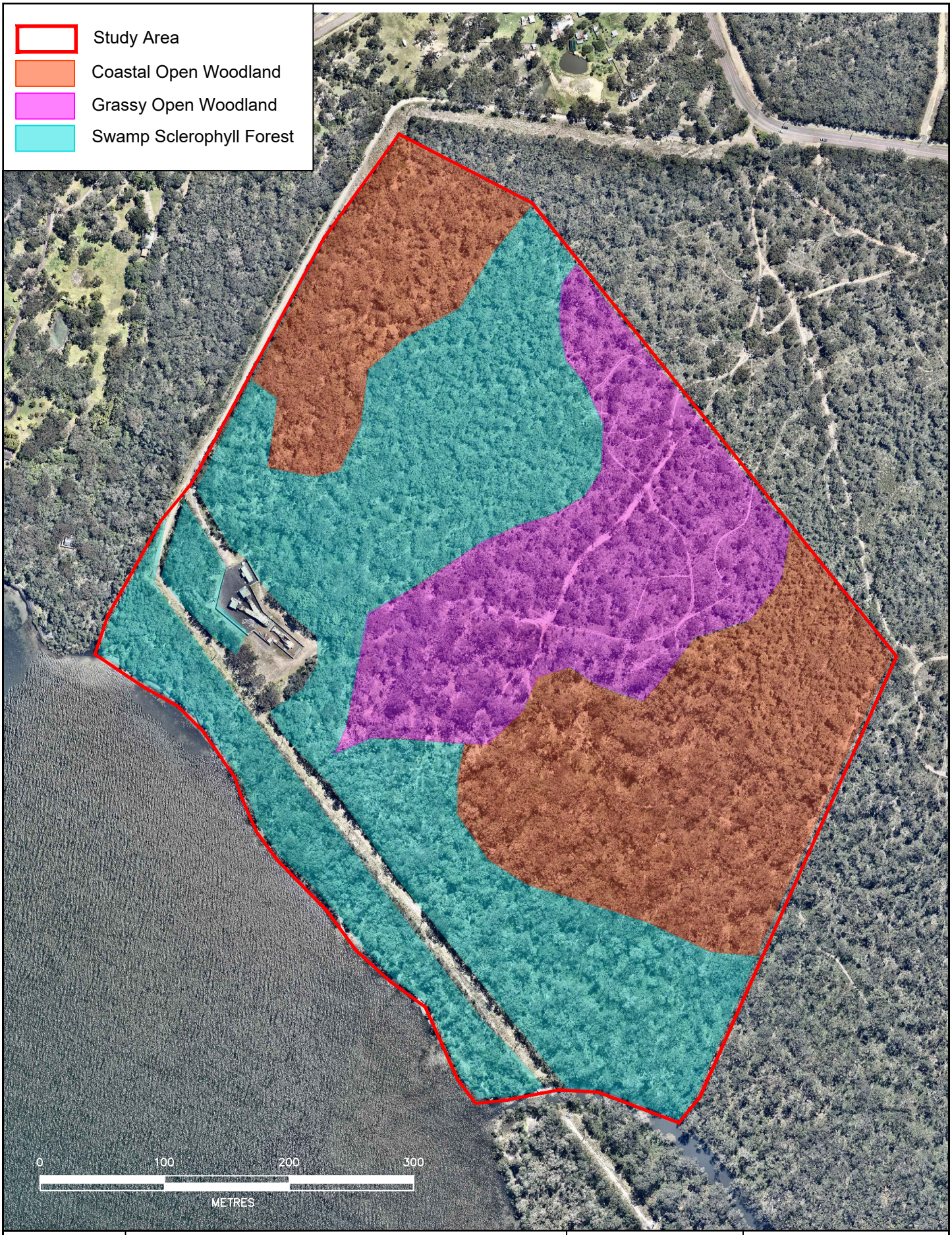
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DELTA COAL
CHAIN VALLEY COLLIERY

SURFACE FACILITIES
BROAD VEGETATION TYPES

SCALE:	1:5000	DATE:	29 Nov 2019
DRAWN:	R Tubridy	DRG NO:	C1S0270
CHECKED:	K Weekes	REV NO:	1
SIGNED:	-	SIZE:	A4

Delta coal



N
W E
S

DELTA COAL
CHAIN VALLEY COLLIERY

VENTILATION FAN COMPOUND
BROAD VEGETATION TYPES

SCALE:	1:4000	DATE:	29 Nov 2019
DRAWN:	R Tubridy	DRG NO:	C1S0271
CHECKED:	K Weekes	REV NO:	1
SIGNED:	-	SIZE:	A4

Delta coal

5 Design and Construction Environmental Management

5.1 Ecological Inputs to Design

CVC designed the dam embankment and spillway in consultation with an ecologist to minimise potential impacts on the Swamp Oak Forest.

5.2 Pre-clearance Ecological Surveys

Pre-clearance ecological surveys will be undertaken by a qualified ecologist prior to any future construction works. They will clearly identify sensitive fauna habitats and significant vegetation and be undertaken during the appropriate flowering time for the particular flora species. Identification of sensitive features will potential impacts during construction to be minimised.

The following activities will be completed during the pre-clearance ecological survey:

- clear delineation of the clearing footprint;
- classification of the surrounding vegetation as a 'no go zone' during construction activities;
- installation of protective fencing/markers; and
- designating sites in previously cleared areas for material stockpiles and machinery parking.

5.3 Environmental Management Prior to and Following Construction Activities

The following measures will be implemented prior to and during any construction activities, particularly the maintenance of Asset Protection Zones (APZs) to minimise impacts to native vegetation and fauna habitats:

- installing erosion and sediment controls around any proposed earthworks;
- installation of delineation fencing around threatened flora populations (if found) to ensure their protection during development and maintenance of APZs;
- condition monitoring for threatened flora populations (if found) in APZ areas;
- retention of hollow-bearing trees in the APZs, where possible, with details to be included in a hollow tree register;
- installation of nest boxes (or salvaged hollows) under the supervision of a suitably qualified ecologist or wildlife carer to replace hollows where hollow-bearing trees cannot be retained;
- measures for APZ maintenance that include weed control;
- clearing of hollow-bearing trees (if required) under the supervision of a suitably qualified ecologist;
- any injured fauna would be taken to the nearest veterinary hospital for treatment before release;
- felled trees to augment nearby habitat, i.e. woody debris to be placed on the ground to create additional habitat;
- avoiding disturbance to dead standing timber and fallen timber during clearing works, or if required to be removed, timber will be relocated into suitable habitat areas nearby; and
- clearing all earthworks equipment of excess soil, potentially containing pathogens and weed seeds, prior to entering the site.

6 Native Vegetation Enhancement Strategy

The development consent and commitments for the CVC related to the enhancement of native vegetation comprise:

- the improvement and enhancement of the Swamp Oak Forest and Swamp Sclerophyll Forest to compensate for potential impacts on EECs;
- development of rehabilitation methods in accordance with the Saltwater Wetlands Rehabilitation Manual (DECC 2008), with the methods potentially including:
    - restoration of natural flow regimes;
    - rubbish and litter removal;
    - control and removal of competitive introduced species to allow for regeneration of native species;
    - revegetation where natural regeneration processes are interrupted; and
    - condition monitoring.

The native vegetation enhancement strategy aims to compensate for the potential impacts on the Swamp Oak Forest and Swamp Sclerophyll Forest and covers all the areas identified as these EECs within the pit top area, including those adjacent to the sediment dams and in areas to their north and south.

The strategy builds on existing actions and monitoring programs identified in the previous versions of the BMP to ensure that the Swamp Oak Forest and Swamp Sclerophyll Forest are enhanced and improved. The extent of the Enhancement Area is shown on **Figure 4**.

The main issues in the area adjacent to the sediment dams are:

- continuous presence of standing saline mine discharge water;
- limited canopy regeneration and canopy senescence;
- lack of understory diversity; and
- presence of weeds and rubbish.

In accordance with the SSD-5465 Statement of Commitments for Terrestrial Ecology, upgrade works to the sediment dam (D10) wall, which is located adjacent to the Swamp Oak Forest area, was completed in February 2015 in order to prevent future leakage through the wall. At the same time a new discharge monitoring system and spillway were installed.

Any changes to the hydrological cycle (even though it is not natural), also has the potential to impact on this community.

Table 5 outlines the goals, objectives and actions for native vegetation enhancement.



Figure 4 Native Vegetation Enhancement Area

Table 3: Native Vegetation Enhancement Strategy

Issue	Goal	Objective	Action
EASTERN ZONE			
Continuous presence of standing saline water from mine discharge	Restoration of natural flow regimes to the EEC areas	Water quality values in the EEC areas are within or better than the trigger values identified in Table 10 of this BMP.	1. Spillway and improvements to dam wall embankment to direct saline water away from EECs completed; 2. Water quality monitoring undertaken in accordance with the CVC Water Management Plan.
Weed invasion	Weeds are controlled in EEC area	Weeds of national environmental significance are controlled in EEC areas to a level where low maintenance is required.	1. Weed management is completed in line with **Section 7** of this BMP; 2. Weed monitoring is undertaken in accordance with **Section 11** of this BMP.
Presence of rubbish and litter	EEC area is rubbish and litter free	EEC areas are rubbish and litter free and continues to be litter free for the life of the mine.	1. Collection and disposal of rubbish and litter; 2. Type and location of rubbish/litter recorded during compliance monitoring.
Limited canopy regeneration and canopy senescence	Native species regeneration is evident in the EEC areas	Native species regeneration is at least 20% in plots by 2022	1. Annual monitoring of EEC areas downstream of D10 in accordance with **Section 11**, with regeneration values investigated and rehabilitation actions undertaken as required to ensure that the objectives are achieved; 2. Native vegetation monitoring in accordance with **Table 6** to determine if active rehabilitation is required; 3. Weed management is completed in line with **Section 7** of this BMP; 4. Weed monitoring is undertaken in accordance with **Section 11** of this BMP.
Lack of understorey diversity	Ecologically functional and diverse EECs	Final weighted condition criteria from plots in the swamp oak forest are above the trigger value (60%). Condition criteria should increase over time and meet benchmark conditions for the EECs present.	1. Monitoring EEC areas downstream of D10 in accordance with **Section 11**, to assess condition values against the trigger value and to ensure that the condition of the EEC areas is improving over time; 2. Native vegetation monitoring in accordance with **Table 6** to determine if active rehabilitation is required; 3. Weed management is completed in line with **Section 7** of this BMP; 4. Weed monitoring is undertaken in accordance with **Section 11** of this BMP.

Issue	Goal	Objective	Action
SOUTHERN ZONE			
Weed invasion	Weeds are controlled in EEC area	Weeds of national environmental significance are controlled in EEC areas to a level where low maintenance is required.	1. Weed management is completed in line with **Section 7** of this BMP; 2. Weed monitoring is undertaken in accordance with **Section 11** of this BMP.
Presence of rubbish and litter	EEC area is rubbish and litter free	EEC areas are rubbish and litter free and continues to be litter free for the life of the mine.	1. Collection and disposal of rubbish and litter; 2. Type and location of rubbish/litter recorded during compliance monitoring.
NORTHERN ZONE			
Weed invasion	Weeds are controlled in EEC area	Weeds of national environmental significance are controlled in EEC areas to a level where low maintenance is required.	1. Weed management is completed in line with **Section 7** of this BMP; 2. Weed monitoring is undertaken in accordance with **Section 11** of this BMP.
Presence of rubbish and litter	EEC area is rubbish and litter free	EEC areas are rubbish and litter free and continues to be litter free for the life of the mine.	1. Collection and disposal of rubbish and litter; 2. Type and location of rubbish/litter recorded during compliance monitoring.
WESTERN ZONE			
Weed invasion	Weeds are controlled in native vegetation area	Noxious weeds and weeds of national environmental significance are controlled in native vegetation to a level where low maintenance is required.	1. Weed management is completed in line with **Section 7** of this BMP; 2. Weed monitoring is undertaken in accordance with **Section 11** of this BMP.

Active rehabilitation will be undertaken in the EEC areas if condition criteria fall below the trigger values, or if natural regeneration is not occurring sufficiently to meet the objectives nominated in Table 5, as determined by the monitoring program. Supplementary planting with suitable species for each of the communities present, where required, would assist to meet the rehabilitation objectives. Suitable species would include:

- Swamp Oak Forest:
    - canopy species: Swamp Oak (*Casuarina glauca*); and
    - understorey and groundcover species: Water Couch (*Paspalum distichum*), *Baumea juncea* and *Selliera radicans*,
- Swamp Sclerophyll Forest:
    - canopy species: Swamp Mahogany (*Eucalyptus robusta*), paperbarks (*Melaleuca sieberi*, *Melaleuca quinquenervia*) and Forest Red Gum (*Eucalyptus tereticornis*); and
    - understory and groundcover species: *Gahnia clarkei*, Bracken (*Pteridium esculentum*), Large-leaf Hopbush (*Dodonaea triquetra*) and Whiteroot (*Pratia purpurascens*).

7 Weed Management

7.1 Background

Weed invasion impacts on species biodiversity and may alter habitats through processes such as competition and erosion. They also have the potential to impact on DC's commercial operations and reputation as a responsible land manager. Biosecurity at the land management level is the protection of environmental, economic and community values from the impacts of invasive weed species.

Some of the most common disturbance triggers are land clearing, soil disturbance, fires or change in fire regimes, and drought.

The greatest threat to the ecological integrity of the threatened ecological communities at CVC is the invasion by weeds, particularly associated with disturbance/construction activities.

This had the potential to occur with the planned embankment and spillway works on dam D10 and, subsequently, when inundation and salinity regimes are changed as a result of those works In order to facilitate weed management.

7.2 Weed Species

Total Earth Care undertook a weed survey in October 2019 which identified 36 weed species listed under the *Biosecurity Act 2015* and Biosecurity Regulation 2017 (Total Earth Care Weed Action Plan, 2019). Of these, there are various weed species which have been identified as priority species on site. The weeds detailed fall under some of the following categories:

- a declared weed under the *Biosecurity Act 2015* / Biosecurity Regulation 2017;
- listed as a Weed of National Significance (WoNS);
- listed in the Greater Sydney Regional Strategic Weed Management Plan; and
- considered a significant environmental weed which has the ability to spread rapidly and substantially reduce biodiversity.

Table 4 details the priority weed species. The ranking of 1 indicates the highest priority of control required for a weed that is recognised on a national level (WoNS) and is regionally declared weed. A ranking of 2 indicates that significant management would be required before the next monitoring survey to reduce presence, abundance and spread. Controls should be undertaken with ongoing monitoring to ensure significant reduction in distribution.

Table 4: Priority Weed species

Priority Ranking Category	Weed common name (*scientific name*)	WoNS	State Priority	Regional Priority	Duties for Priority Weeds of Greater Sydney
1	Bitou Bush (*Chrysanthemoides monilifera* subspecies *rotundata*)	Yes	Containment		Prohibition on dealings, B Zone; The Bitou Bush Biosecurity Zone is established for all land within the State except land within 10 kilometres of the mean high water mark of the Pacific Ocean between Cape Byron in the north and Point Perpendicular in the south.

Priority Ranking Category	Weed common name (*scientific name*)	WoNS	State Priority	Regional Priority	Duties for Priority Weeds of Greater Sydney
1	Blackberry (*Rubus fruticosis* aggregate species)	Yes			Prohibition on dealings.
2	Crofton Weed (*Ageratina adenophora*)	-			Potential risk to environment and agriculture.
2	Asparagus Fern (*Asparagus aethiopicus*)	Yes			Prohibition on dealings.
2	Lantana (*Lantana camara)*	Yes	Asset protection		Prohibition on dealings.
1	Pampas Grass (*Cortaderia jubata*)			Asset protection	Regional recommended measure. Land managers mitigate the risk of the plant being introduced to their land or spread from their land where feasible. It should not be bought, sold, grown, carried or released.
1	Fireweed (*Senecio madagascariensis)*	Yes	Asset protection		Prohibition on dealings.
1	Giant Reed (*Arundo donax)*			Asset protection	Regional recommended measure. Land managers mitigate the risk of the plant being introduced to their land. It should not be bought, sold, grown, carried or released.

7.3 Weed Management

For ease of management, monitoring and reporting, areas infested with weeds have been divided into the following zones shown on Figure 5 and Figure 6:

- Northern zone;
- Southern zone;
- Eastern zone;
- Western zone; and
- Ventilation shaft.

Several parties have management interests within the study area. Delta Electricity owns the land while DC manages CVC. TransGrid also has rights over the land in the transmission line easements. Though ultimate legal responsibility for weeds rests with Delta Electricity, as land managers, DC will undertake weed management as part of its operations on Delta Electricity owned land.

The principal objectives of weed management are guided by national, state and local legislation. The guidelines and the legislation used to determine the prioritisation of weed species for targeted control are:

- preventing the introduction of weeds into new and highly desirable areas such as rehabilitation areas, APZs and high biodiversity value areas;
- eradicating high risk infestations that are new and/or have the potential to spread quickly or significantly impact biodiversity is left unmanaged;
- containment and management of WoNs that are widespread; and
- containment and control of environmental weeds that pose a high risk to biodiversity in riparian, bushland and grassland habitats. This includes areas where control measures have already been undertaken.

For areas such as exploration sites and rehabilitation areas, the revegetation programs limit initial weed infestations, however the early control of naturally introduced weeds will minimise competition and maximise early growth and survival of desired species. This can and will be achieved by physical removal, mulching and/or chemical control as required.

When any activity results in vegetation disturbance, DC has committed to undertaking:

- seasonal monitoring and weed control as necessary to minimise the spread of weeds into nearby remnant vegetation;
- delineate the clearance footprint for works and to cordon off all surrounding vegetation as a 'no go' zone; and
- minimising disturbance areas where possible; and
- stockpiling materials, parking machinery etc. in previously cleared areas.

7.4 Weed Control

Table 5 provides recommendations for the control of the priority weed species within the site, i.e. the weeds identified within the study area during site visits, those listed in the Greater Sydney Regional Strategic Weed Management Plan and listed WoNS.

Weed control should minimise the requirements for herbicide usage, particularly given the sensitive location of the infestations and the potential for the spread of herbicides into surrounding water bodies and wetland communities.

Other environmental weeds recorded in the study area include Whisky Grass (*Andropogon virginicus*), Scotch Thistle (*Onopordum acanthium*), Large-leaved Privet (*Ligustrum lucidum*), Cassia (*Senna pendula*), Asparagus Fern (*Asparagus virgatus*), Fishbone Fern (*Nephrolepis cordifolia*), Coral Tree (*Erythrina x sykesii*) and Radiata Pine (*Pinus radiata*).

There is no legal obligation to control these weeds, but in most cases it is good practice to remove them as well as any other weeds of significance to protect the health of native vegetation communities. These infestations will be visually inspected during the weed monitoring program. If infestations increase significantly, appropriate control methods will be implemented in consultation with an approved ecologist and/or Central Coast Council.

Table 5: Recommended Weed Control

Weed	Photo	Control technique	Control priority
Bitou Bush		Hand-weeding and/or cut and paint with Glyphosate in winter. Do not undertake weeding when plants are seeding or bear fruit due to the risk of spread.	High – WoNS
Blackberry		Brush cut. Scrape and paint stem with Glyphosate in spring/summer. N.B. Gloves should be worn during application due to thorns.	High – WoNS
Croton Weed		Hand-weed individual plants.	Moderate – Weed of concern.
Ground Asparagus		Cut underground tubers with secateurs out of ground around root base and remove from site. This is most easily done by cutting a small square of ground around the above ground stems.	Moderate – WoNS which occurs in sensitive EEC areas
Lantana		Cut and paint stem with Glyphosate.	Moderate – WoNS which occurs in sensitive EEC areas

Weed	Photo	Control technique	Control priority
Pampas Grass		Remove seed heads, place in plastic bags and remove from site. Slash/brush cut plant down to bottom of stem and remove from site. Dig out roots with a mattock and remove from site. N.B. Eye protection should be worn during all stages of removal as Pampas Grass contains fine hairs that can irritate the eye.	Moderate
Fireweed		Foliar spraying with Glyphosate, hand pulled and brush cut.	High – WoNS
Giant reed		Cut and paint with neat Glyphosate.	Moderate

Sources: NSW, Australian and QLD Government 2009; DLWBC 2006; NSW Primary Industries Weed Management Unit 2009; Primary Industries (Agriculture) 2012; NSW; Sydney Weeds Committee 2012; Winkler, Cherry and Downey (eds) 2008; Total Earth Care Weed Management Plan 2019.

Weed control is undertaken by a suitably qualified contractor who will undertake mechanical removal, spraying of weeds or other treatment measures in the correct periods to maintain effective control. The contractor will use approved herbicides at the required volumes according to manufacturer's instructions.

Areas that are targeted include predominantly disturbed grassland, fragmented forested and woodland zones in the vicinity of the pit top prior to rehabilitation. These areas exhibit signs of previous agricultural use and mining-related activities. All other areas remain largely undisturbed by DC mining activities.



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DELTA COAL
CHAIN VALLEY COLLIERY

SURFACE FACILITIES
VEGETATION MAPPING ZONES

SCALE:	1:5000	DATE:	21 Nov 2019
DRAWN:	T Chisholm	DRG NO:	C1S0272
CHECKED:	K Weekes	REV NO:	0
SIGNED:	-	SIZE:	A4

Delta coal



Figure 6: Ventilation Shaft Weed Management Zone and Distribution

8 Feral Animal Management

Although there are no specific conditional requirements in SSD-5465 relating to feral animal management, the Statement of Commitments requires the abundance and distribution of feral animals to be identified.

Feral animals and/or evidence of their presence (i.e. tracks and scats) have been observed within the Pit Top and Ventilation Shaft areas at CVC. Feral animals recorded within the area include:

- European Red Fox (*Vulpes vulpes*);
- Feral Rabbit (*Oryctolagus cuniculus*);
- Feral Pig (*Sus scrofa*);
- Feral Cat (*Felis catus);*
- Dog (*Canis lupus familiaris); and*
- Feral Pigeons (*Columba livia*).

The species listed above are of concern through the potential environmental impacts they generate and their capacity to establish quickly from neighbouring areas. The European fox, dogs and feral cats have been identified as the most ecologically damaging species present due to their predation of native species. The most likely prey onsite is frogs, small mammals, birds and small reptiles. A proportion of cats and dogs preying on native species are likely to be domestic pets from adjoining properties.

Feral animals currently (and historically) do not appear to be abundant or causing adverse impacts at CVC. Monitoring is undertaken during monthly inspections and biodiversity monitoring. Only in the event that these species become an issue, or a clear trend if increasing observations become apparent, would control measures be implemented by an appropriated licenced contractor.

Other common pests identified and controlled on site include spiders, rodents (rats and mice), cockroaches, and other invertebrates.

9 Fire Management

9.1 Background

As CVC is not a residential development and there are no strict requirements for fire management, with the exception of preventing fires within the project area and their spread to surrounding land. However, Condition 24 within Schedule 3 of SSD-5465 identifies a requirement that DC be sufficiently equipped to respond to fires on site and to assist the NSW Rural Fire Service (RFS) in the event of a fire in the vicinity of the surface facilities.

There is also a statutory responsibility under the *Rural Fires Act 1997* that requires the owners of land to prevent the ignition and spread of bushfires on their land. This act provides for the prevention, mitigation and suppression of bush and other fires in NSW. Section 63(2).

9.1.1 Existing Environment

Topography can have a great impact on bushfire behaviour. For every increase in slope gradient, there is a similar increase in fire intensity and rate of fire spread. The topography of CVC is relatively flat. According to classifications in the PBP guideline, the vegetation surrounding CVC comprises forests and forested wetlands. Forests are particularly vulnerable to bushfire.

9.1.2 Key Stakeholder and Emergency Response Details

The key stakeholder and emergency response details and contacts are contained within the Pollution Incident Response Management Plan (PIRMP) which is retained in the CVC operations room, Control Room and on the DC website.

9.1.3 Bushfire Risk

Bushfire risks have been assessed in accordance with the NSW Rural Fire Service's (RFS) Planning for Bush Fire Protection Guideline (the PBP guideline). The majority of CVC is on land mapped as being in the Vegetation Category 1 on the Wyong Bushfire Prone Land Map, which is considered high risk. Category 1 vegetation comprises areas of forest, woodlands, heaths (tall and short), forested wetlands and timber plantations and requires a 100 m buffer.

As with all rural settings where vegetation is present, there is a risk that bushfires could occur in or near CVC. There is therefore a risk that a bushfire could damage buildings and present a hazard to human life. This was demonstrated in October 2013 when CVC's pit top area was threatened by a bushfire.

9.2 Land Management Zones

Fire management is addressed in this BMP as fire can present a threat to biodiversity at both the pit top and ventilation facility as these areas contain vegetation which is considered to be bushfire prone land (Category 1).

Bushfire prone land surrounding the CVC pit top and ventilation facility are shown in **Figure 7** and **Figure 8** respectively.



Figure 7: Bushfire Prone Land Map for the Pit Top Area (Source: Central Coast Council, 2015)



Figure 8: Bushfire Prone Land Map for the Ventilation Shaft Area (Source: Central Coast Council, 2015).

9.3 Defendable Space

Fire protection zones or defendable space around assets which assist in fire prevention comprise three zones:

1st Zone -APZ (Asset Protection Zone);

2nd Zone -SFAZ (Strategic Fire Advantage Zone); and

3rd Zone - LMZ (Land Management Zone).

The fire protection zones are positioned between a bush fire hazard and the asset and minimise fuel loads via hazard reduction; inhibit a fire path, and reduce the effects of heat, flame, ember and smoke attack.

Following the bushfires which occurred in 2013, DC undertook a risk assessment of bushfire controls across the operation. This review concluded that improvements to the sites APZ's around the pit top area and ventilation fan site were required. The proposed improvements to the existing APZ's were approved as part of the most recent approval modification to SSD-5465 in December 2015. The APZ's as they were approved in December 2015 are shown in **Figure 9**.

9.3.1 Asset Protection Zones

APZs provide fire vehicle access, reduce radiant heat, reduce convection winds, reduce ember attack and allow smoke to disperse. APZs are divided into an inner protection area (IPA) and an outer protection area (OPA) for forest vegetation.

APZs were determined using the PBP guideline which compares the bushfire hazard vegetation classification, bushfire weather and slope classes on bushfire prone land to derive their minimum extent. The vegetation communities and slope classes were characterised in accordance with Appendix 4 of the PBP. CVC is located in the Greater Hunter Fire Weather Area (Fire Danger Index 100).

As the topography around the CVC pit top area is relatively flat, with the primary slope class identified in the PBP guideline as class (ii) (any vegetation greater than 0° and up to 5° downslope vegetation).

The APZs for the pit top infrastructure are 25 m, comprising a 15 m inner protection area (IPA) and a 10 m outer protection areas (OPA), while the APZ for the ventilation fan site is 20 m with no requirement for an OPA. Where unimpeded access is not already available, the IPAs will also include the establishment of a 4 m wide fire trail around certain assets (ie structures, buildings and the ventilation fan site) to enable access for fire fighting vehicles.

A buffer or Asset Protection Zone (APZ) is provided between areas of vegetation and the main offices, workshops and infrastructure at the pit top and, currently, in limited areas around the perimeter of ventilation facility. Within the pit top, the APZ is landscaped to minimise fuel loads and reduce potential radiant heat levels, flame, ember and smoke attack to the buildings.



Figure 9: Asset Protection Zones

An example of the pit top APZ can be seen in **Figure 10**.



Figure 10: Firebreak between CVC Pit Top Area and Surrounding Bush

9.4 Access and Egress

Fire trails and access roads provide an important line of defence for fighting bushfires. An extensive array of fire trails and tracks are located around the pit top area to provide access for emergency services in case of a bush fire. These also provide access to easements throughout the study area which are maintained by TransGrid to provide vertical clearance and buffers for high-voltage transmission lines.

Though there is an existing road access to the ventilation facility and some fire trails, the November 2013 risk assessment and review of the October fires incident identified a risk due to access and an inadequate turnaround for fire tankers at the facility. APZs were approved and established to account for this risk and a clear area maintained around the Ventilation shaft site.

Fire trails will be inspected annually prior to the start of the Bushfire Danger Period.

9.5 Water Supply

Existing fire management infrastructure surrounds the pit top area, with water tanks and a distribution system (100 millimetre diameter water reticulation line). Fire hydrants, fire reels and depots are also placed in strategic positions to enable rapid response to fires on site. Though no reticulated water is available at the ventilation facility, its proximity to Lake Macquarie provides an emergency source of water if required.

CVC has 10 dams which can also be used if required.

Following the cessation of mining and surface operations, DC will consider maintenance of applicable controls during rehabilitation establishment (e.g. maintain APZs or other controls until rehabilitation vegetation is adequately established).

9.6 Prohibition on Hot Work Activities During Extreme and Catastrophic Fire Periods

Welding, cutting, grinding and other within vegetated area activities should not be undertaken on Extreme and Catastrophic fire danger rating days. All site vehicles should carry portable fire extinguishers and be able to communicate with the CVC Control Room in case of an emergency.

9.7 Water Access Points and Fire Fighting Equipment Locations

Existing fire management infrastructure surrounds the MC surface infrastructure areas, with water tanks and a distribution system (100-millimetre diameter water reticulation line). Fire hydrants, fire reels and depots are also placed in strategic positions to enable rapid response to fires on site. An example is shown in **Figure 11**. CVC also has 13 dams, however, due to their saline nature, they would not be an ideal source of water.

Following the cessation of mining and surface operations, DC will consider maintenance of applicable controls during rehabilitation establishment (e.g. maintain APZs or other controls until rehabilitation vegetation is adequately established).

9.8 Controls

The APZs will be managed in accordance with the PBP guideline. Maintenance will be undertaken in a manner that prevents accumulation of fine flammable debris on the ground so that fuel quantities are reduced, thus lessening flame heights and potential crowning. General maintenance guidelines are described in Appendix 2 of the PBP guideline.

The PBP guideline nominates that APZs should be maintained as follows:

- Inner protection areas (IPAs):
  - canopy cover kept at less than 15% of total surface area and at least 2 m from the roof line of a building;
  - garden beds and shrubs not to be located under trees and sited at least 10 m from any exposed windows or doors; and
  - lower limbs of trees up to 2 m above the ground are removed.
- Outer protection areas (OPAs):
  - canopy cover kept at less than 30% of total surface area; and
  - understorey mowed annually before the fire season (usually September) to remove shrubs and long grasses.



Figure 11: CVC Water Access Points

DC has, and will continue to, implement appropriate controls to assist in the management of bushfires that may impact the mining operations, including:

- Defendable Space - A buffer or APZ is provided between areas of vegetation and the main offices, workshops and infrastructure at the pit top and, currently, in areas around the perimeter of ventilation facility. Within the pit top, the APZ is landscaped to minimise fuel loads and reduce potential radiant heat levels, flame, ember and smoke attack to the buildings. The size of the protection zones will take into consideration matters such as the type of vegetation, slope of the land, fuel load source and criticality of the asset to the operation. The APZ areas will be maintained and inspected prior to the start of the fire season (1st October to 31st March unless advised otherwise). In the event additional bush fire hazard reductions works are proposed, they will be undertaken only after obtaining the requisite Bushfire Hazard Reduction Certificate from the NSW Rural Fire Service. Regular training of mine firefighting crews is also undertaken.

The APZ areas will be inspected prior to the start of the fire season (1st October to 31st March). In the event additional bush fire hazard reductions works are proposed, they will be undertaken only after obtaining the requisite Bushfire Hazard Reduction Certificate from the NSW Rural Fire Service. Regular training of mine firefighting crews is also undertaken.

10 Public Access Management

10.1 Background

While public access management is not specified in SSD-5465 as a matter to be addressed within the BMP, it has been identified as an issue within the larger surrounding Delta Electricity land (Connell Wagner 2008). Though primarily a concern from a safety management perspective, uncontrolled access to bush land areas, particularly by motor-bikes, has the potential to introduce and/or spread weeds and be a cause of erosion, both of which have the potential to affect biodiversity in remnant areas, rehabilitation or biodiversity enhancement activities.

Uncontrolled public access does not appear to be an issue within the pit top area even though some small access tracks occur throughout the areas of remnant vegetation and function as fire trails and access routes to the power line easements. These do not however appear to be commonly used and rubbish dumping does not appear to be a significant problem in this area. Motorbike tracks have been observed on the fire trails of the Ventilation Facility area and, given its location relative to local rural residential properties, it is possible that it is accessed by locals on occasion.

10.2 Management and Control

A security firm is engaged to undertake scheduled site security checks and remote alarm monitoring and reporting with these security checks e generally undertaken at times of higher unauthorised access risk such as nights and weekends.

As uncontrolled public access or potential associated problems does not appear to be a major issue at either the pit top area or the ventilation facility, it is not considered that any further management actions are required to control public access. Public access will be monitored and managed during operation of the mine through the standard incident reporting process which would include reporting of unauthorised access. Similarly, the monitoring programs such as for weeds and erosion, are considered appropriate for the management of any potential uncontrolled access issues.

Any reported incidents concerning public safety or access will be detailed in the Annual Review.

11 Biodiversity Monitoring

11.1 Overview

Table 6 provides an overview of the biodiversity monitoring programs which are identified in this BMP. Further details are provided for each of the monitoring program methodologies within the following sections. As required by the project approval conditions, this includes ecological monitoring of the:

- weed occurrence and control effectiveness;
- feral animals;
- fire risk (including asset protection zones);
- uncontrolled public access; and
- Ecological aspects including:
    - receiving waters;
    - the EEC downstream of the discharge point;
    - remnant vegetation around ventilation facilities at Summerland Point; and
    - habitat within the Biodiversity Enhancement Area as detailed in **Figure 4**.

Table 6: Biodiversity Monitoring Details

Monitoring Regime	Site	Monitoring Frequency	Methodology
Weeds	Pit Top area Ventilation Shaft	Bi-annual (seasonal)	Target existing locations and significant new occurrences of weed species (**Figure 5** and **Figure 6**) in each management zone. Record: - the number of individuals, the estimated size of infestation (i.e. m² for large infestations); - the estimated distance to native vegetation; and - recommended control measures.
Feral animals	Pit Top area and Ventilation Shaft	Annually	Monitor activity of feral species by searching for tracks, diggings, scats, burrows and sightings of individuals. Monitoring to be undertaken in conjunction with weed monitoring.
Bushfire risk /uncontrolled public access	Pit Top area Ventilation shaft	Annually prior to the fire season	APZ and fire trails (access to ventilation shaft area, access to houses to the north of the pit top area and tracks south of the pit top area to the transmission lines) to be visually inspected annually prior to the fire season (1st October – 31st March). Security firm to continue site security patrols and remote monitoring of security systems/alarms. Public access issues to be reported via standard incident form or in conjunction with weed/feral animal monitoring programs.
Receiving waters	Pit Top area	n/a	Monitoring requirements related to receiving waters are documented in the Water Management Plan.Results will be considered in conjunction with the outcomes of biodiversity

Monitoring Regime	Site	Monitoring Frequency	Methodology
			monitoring.
EEC areas downstream of the D10 discharge	Pit Top area	Annually	Continuation of surveys in the identified swamp oak forest areas. Two BioBanking plots have been established within the Swamp Oak forest which will be monitored annually. Refer to **Section 11.1** for further information.
Native vegetation	Ventilation Shaft	Annually	Monitoring of the health and condition of vegetation surrounding the ventilation shaft area. Two large Rough-barked Apple (*Angophora floribunda*) occurring directly adjacent to the Ventilation Shaft will be monitored for condition and health.

11.2 Monitoring of the Biodiversity Enhancement Area

The Biobanking methodology provides a means of determining the baseline condition, structure and composition of vegetation communities. Repeating this method over time allows changes in these variables to be identified.

A baseline event was completed in 2013 where vegetation data was collected from two plots and transects across the swamp oak forest at the site, in accordance with the Biobanking methodology (**Table 7**). The baseline monitoring identified that the generic benchmark values for the swamp oak forest (HU635) were much higher than the condition identified onsite, and would not provide a useful value to compare changes over time. Accordingly, local benchmarks (

Table 8) were assigned for Swamp Oak Forest using the baseline surveys results. These local benchmarks will provide an accurate point of comparison with site attribute scores collected in the future to determine any changes in condition resulting from management and the proposed discharge works.

Using the local benchmarks, the weighted site attribute score for these plots has varied between 65.0 – 80.3% during monitoring conducted 2016 and 2018. A value of 60% has been assigned which will trigger management in addition to the proposed enhancement strategy, if the weighted site attribute score drops below this value. A high degree of flexibility has been applied in assigning this trigger value.As this trigger is based on local benchmark data of a system already in low condition, any significant changes are likely to result in a noticeable decrease in scores. Trigger values will be reviewed and updated to reflect these changes if they occur as part of the review of the BMP.

Coupled with the water quality data, the monitoring will be able to detect changes in the composition and health of the community. **Table 7** describes the attributes to be measured during the ecological monitoring of the EEC area.

Trigger values will be determined using the final weighted site score out of 100, based on the benchmark conditions.

Table 7: Condition Criteria for Monitoring as per the Biobanking Methodology

Site attribute		Site attribute score				Weighting for site score attribute
		1	2	3	4	
A	Native plant species richness	0	0-<50% of benchmark	50-<100% of benchmark	≥ benchmark	25%
B	Native over-storey cover	0-10% or >200% of benchmark	0-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	10%
C	Native mid-storey cover	0-10% or >200% of benchmark	0-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	10%
D	Native ground-cover (grasses)	0-10% or >200% of benchmark	0-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	2.5%
E	Native groundcover (shrubs)	0-10% or >200% of benchmark	0-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	2.5%
F	Native groundcover (other)	0-10% or >200% of benchmark	0-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	2.5%
G	Exotic plant cover (all strata)	>66%	>33-66%	>5-33%	0-5%	5%
H	Number of trees with hollows	0 (unless benchmark includes 0)	0-<50% of benchmark	50-<100% of benchmark	≥ benchmark	20%
I	Proportion of over-storey species occurring as regeneration	0	>0-<50%	50-<100%	100%	12.5%
J	Total length of fallen logs	0-10% of benchmark	>10-<50% of benchmark	50-<100% of benchmark	≥ benchmark	10%
Total weighted score						100%

Table 8 provides the local benchmarks that have been developed as a baseline for the Swamp Oak Forest. This information will form the basis against which changes will be assessed using the above criteria (**Table** 7).

Table 8: Benchmarks to measure changes within the Swamp Oak Forest Community

Criteria	Benchmarks	
	Biobanking Benchmark (HU635)	Local Benchmark
Native plant species	15	≥ 6
Native overstorey cover	15 to 65	5 to 18
Native midstorey cover	0 to 50	36 to 48
Native ground cover (grasses)	0 to 90	3 to 21
Native ground cover (shrubs)	1 to 15	0 to 0

Criteria	Benchmarks	
	Biobanking Benchmark (HU635)	**Local Benchmark**
Native ground cover (other)	2 to 90	1 to 13
Number of trees with hollows	0.8	≥ 0
Total length of fallen logs (m)	10	≥ 20

11.3 Weed Control

Monitoring is vital to assessing the effectiveness of the treatment methods carried out. Assessing the site response to any treatments is also essential in providing any follow-up actions. This will be conducted by collecting information about the site and the treatment methods used in the following ways:

- using photographic monitoring points;
- mapping of weed species, their location and densities;
- noting if the weeds have been previously treated; and
- recording significant native species and their density within the treatment area.

Information on the best practice for weed monitoring and detail on the monitoring techniques to be applied will be utilised from guidelines for monitoring weed control and recovery of native vegetation.

The results and recommendations from any monitoring will be detailed in a report or Weed Action Plan and supplied to the Environment and Community Coordinator.

Baseline information and data should be collected and assessed when measuring the effectiveness of presence and/or densities of weed species over time. The weed contractors must maintain daily activity reports detailing the following information:

- number of contractors and total number of person/people hours worked;
- weed control methods used;
- herbicide application (if any) and the type of chemical and quantity/volume used;
- weather conditions, morning, midday and afternoon, including Delta T measurements;
- location of work performed;
- the approximate area (m^2) or % of weeds treated within each management area;
- consider establishing photo points at significant infestation areas;
- other information or observations that may be relevant;
- provide this information in a report to DC, summarising weed management activities undertaken; and

record threatened or endangered flora or fauna identified within the study area.

12 Compliance Management

12.1 Introduction

The biodiversity monitoring results will be reviewed on an annual basis to confirm compliance with the conditions specified in SSD-5465.

The results will also be presented in the Annual Review and include a summary of monitoring results during the past year; a comparison against the impact assessment criteria; a summary of previous years' monitoring results; a comparison of the impacts with those predicted in the EIS and present an analysis of the potential cause(s) of significant discrepancies, if any. The Annual Review will also identify any relevant trends and any non-conformance over the year as well as describing any actions currently implemented or planned to ensure compliance with the impact assessment criteria. The Annual Review will be forwarded to the relevant authorities including the DPIE and the EPA. The Annual Review will also be forwarded to members of the Community Consultative Committee and local Councils (Central Coast and Lake Macquarie) and will also be placed on the company's website along with a summary of environmental monitoring results.

12.2 Compliance Monitoring

Trigger values have been identified for each of the biodiversity monitoring regimes implemented within this BMP based on the compliance criteria specified in Section 1. These are outlined in **Table 9** with recommended actions if trigger values are exceeded.

Table 9: Biodiversity Monitoring Triggers and Actions

Management Issue	Compliance Criteria	Triggers	Action
Weeds	Control and suppress the spread of weeds into remnant vegetation around the ventilation facility and pit top areas.	Spread of weed infestations into remnant vegetation as determined by monitoring.	Include findings in the Annual Review and undertake targeted weed control as per **Table 5** in identified areas.
Feral animals	Control feral animals.	Feral animal monitoring will identify if the number of individuals and activity levels increase. As current levels are low, the trigger value is an increase in activity levels of 2 points from the previous monitoring period for any given species.	Include findings in Annual Review and employ a suitably qualified person to undertake feral animal control for the identified species in accordance with local control programs.
Bushfire risk	Asset Protection Zones (APZs) are well maintained.	Growth of vegetation in asset protection areas surrounding the pit top and ventilation shaft areas.	Include findings in the Annual Review and undertake firetrail and APZ maintenance.
Uncontrolled public access	Control public access	Public accesses prohibited areas.	Restrict public access as required.
Receiving waters	Ecological monitoring of the receiving waters of the mine water discharge.	Use results of the Water Management Plan (EMP-D-16368) monitoring to compare to the trigger values in **Table 10**.	Monitoring requirements related to receiving waters are documented in the Water Management Plan. Results will be considered with the outcomes of biodiversity monitoring and will be included in the Annual Review. If ecological triggers are exceeded (based on annual averages), amelioration measures to improve water quality will be determined in accordance with the Water Management Plan.
EEC areas downstream of the discharge from D10 (Pit top area)	Any harm to EEC vegetation due to mine water discharge would be offset in accordance with the Office of Environment and Heritage (OEH) policy.	A decrease in the total weighted score to less than 60% for any Biobanking plots (decrease in condition and health of the EECs) within the swamp oak forest and below trigger values identified by baseline monitoring for the Swamp Sclerophyll Forest.	If the trigger is exceeded, amelioration and compensatory measures will be adopted. See Section 12.4 for details.
Native vegetation (Ventilation shaft)	Condition of remnant native vegetation around the ventilation shaft to be monitored.	Observable decrease in health of the two Rough-barked Apple in close proximity to the ventilation shaft. Observable dieback in vegetation surrounding the ventilation shaft from monitoring photos.	Amelioration measures to be discussed with the Project Ecologist to minimise impacts. This could include additions to fencing, restrictions for access and rehabilitation of disturbed vegetation.

12.3 Water Quality Triggers

The water quality triggers detailed in **Table 10** have been devised to maintain the ecological health of the receiving waters and EEC area downstream of dam D10. Trigger values will be determined by averaging the annual water quality parameters over the sampling events to ensure that stochastic environmental events are not influencing the results.

Table 10: Water Quality Triggers for Compliance Monitoring

Water quality parameter (units)	Estuary health (DECC, 2010)			Trigger (averaged annual results)
	Healthy	Fair	Poor	
pH	7 - 9	-	<7 or >9	Poor health
Suspended Solids (mg/L)	<10	10 - 20	>20 (may be influenced by tides)	Poor health
EC (µS/cm)	No trigger value. Area affected by tides			No trigger value – Area affected by tides. Monitoring in association with vegetation condition
Total Phosphorus (mg/L)	<0.02	0.02 - 0.3	>0.3	Poor health

Notes:

- *Suspended solids measurements are used instead of turbidity (as per DECC, 2010) but utilises the same health criteria. Turbidity data will also be collected in the event that the suspended solids trigger is reached.*
- *Total phosphorus used instead of Phosphates (PO_4), with the same estuary health guidelines applied from DECC, 2010.*

Water quality triggers will be investigated when EEC condition appears to be declining, that is when it has a total weighted score of less than 60%. If the threshold is exceeded, annual average water quality values will be investigated to determine if trigger values are being exceeded, to establish whether or not water quality is negatively influencing EEC condition. Results will be included within the annual monitoring report with appropriate recommendations in line with the water quality management plan reporting.

Water quantity (volumetric) triggers have not been proposed as flows may vary significantly on any day as a result of mine dewatering changes and the daily discharge volume is restricted to a maximum of 12,161 kL under EPL 1770. The need for a volumetric trigger will be reassessed in the future if EPL 1770 is varied to include a higher daily discharge volume.

12.4 Swamp Oak Forest Actions

The significance of any degradation in condition of the Swamp Oak Forest community will be determined based on the final weighting of the data from two Biobanking plots undertaken annually. Plot data will be compared to the local benchmark (baseline) data (Table 10) to calculate a final weighting.

A trigger value has been developed for the project of 60% for the total weighted score. If the weighted score for a plot falls below this threshold as a result of impacts from the Colliery, ameliorative measures and compensation will be required. Using the baseline data as a 'before impact condition', the Biobanking calculator (under the Biobanking Assessment Methodology) will be used to determine the compensatory measures required for the decrease in vegetation condition identified. The calculator will generate ecosystem credits required to be retired.

Potential offset sites will then be identified, with a preference for CVC land within the locality, using existing vegetation mapping and ground-truthing by the Project Ecologist. Offset requirements will be determined in consultation with the BCD and in the manner approved at the time.

13 Reporting

13.1 Annual Review

The results of any monitoring will be summarised in the relevant Annual Review. The Annual Review will also include a description of any actions being implemented or planned with respect to biodiversity.

Annual Review will be forwarded to members of the Community Consultative Committee, local Councils (Central Coast and Lake Macquarie), DPIE and other relevant authorities and be placed on the company's website.

13.2 Incident or Non-compliance Reporting

If monitoring reveals that actions by CVC have resulted in an environmental issue or that there has been non-compliance in relation to rehabilitation, then DC will conduct an investigation into the cause of the non-compliance.

The report will:

- describe the date, time and nature of the observation;
- identify the cause (or likely cause) of the damage/incident;
- describe what action has been taken to date; and
- describe the proposed measures to address the incident and prevent further such occurrences.

14 Stakeholder Management and Response

14.1 Complaints Handling

DC has a 24-hour telephone hotline (1800 115 277) through which members of the public can lodge complaints, concerns, or to raise issues associated with the operation. This service aims to promptly and effectively address community concerns and environmental matters.

All complaints are recorded and responded to and if, for some reason, no action is taken then the reason why is recorded. The information recorded in the complaint register includes:

- date and time the complaint was lodged;
- personal details provided by the complainant;
- nature of the complaint;
- action taken or, if no action was taken, the reason why; and
- follow up contact with the complainant.

14.2 Independent Review

As detailed in Condition 2, Schedule 5 of SSD-5465, an Independent Review can be requested by a landowner who "*considers the development to be exceeding the relevant criteria in Schedule 3".*

If the Secretary is satisfied that an independent review is warranted, then within 2 months of the Secretary's decision the Applicant shall:

(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to:
- *consult with the landowner to determine his/her concerns;*
- *conduct monitoring to determine whether the development is complying with the relevant criteria in Schedule 3; and*
- *if the development is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and*

(b) give the Secretary and landowner a copy of the independent review

14.3 Dispute Resolution

If any disputes are not adequately addressed by the complaints handling process then they will be handled by the Environment and Community Coordinator. If the response of CVC is not considered to satisfactorily address the concern of the complainant, a meeting may be convened with the complainant, Mine Manager together with the Environment and Community Coordinator to determine any further options to reduce potential impacts.

Any actions agreed from the meeting will be implemented by CVC. After implementation of the proposed actions the complainant will be contacted and advice sought as to the satisfaction or otherwise with the measures taken.

If no agreed outcome is determined or the complainant is still not satisfied by the action taken, then an Independent Review may be requested by the complainant. If determined to be warranted by the Secretary, an independent review will be undertaken in accordance with the process identified in Schedule 5 of SSD-5465.

15 Audit and Review

The BMP will be kept up to date through DC's standard audit and review process, however it is noted that significant planning for the detailed mine closure plan is not expected until around 2026. Current site audit and review arrangements are set out below.

15.1 Review

This document will be reviewed, and if necessary revised, within three months of the following;

- The submission of an Annual Review;
- The submission of an incident report;
- The submission of an independent environmental audit; and
- Following any modification to the project approval.

Internal and external audits of this document will be carried out as described below. If possible, internal and external audits will be objective and be conducted by a person or organisation independent of the document being audited.

Audits will be carried out by personnel who have the necessary qualifications and experience to make an objective assessment of the issues. The extent of the audit, although pre-determined, may be extended if a potentially serious deviation from this document is detected.

Any audit non-conformances and/or improvement opportunities will have corrective and preventative actions implemented to avoid recurrence, these actions will be loaded into the Colliery Incident Database to ensure the actions are assigned to the relevant people and completed.

15.2 Auditing

The objectives of an audit are to maintain compliance with the BMP. Audits shall be carried out by personnel who have the necessary qualifications and experience to make an objective assessment of the issues. The extent of the audit, although pre-determined, may be extended if a potentially serious deviation from this document is detected.

Any audit non-conformances and/or improvement opportunities will have corrective and preventative actions implemented to avoid recurrence, these actions will be loaded into the site Incident Database to ensure the actions are assigned to the relevant people and completed.

External audits will be conducted utilising external specialists and will consider this document and related documents. External auditors shall be determined based on skills and experience and upon what is to be accomplished.

An Independent Environmental Audit (IEA) was undertaken during June 2019. In accordance with SSD-5465 Schedule 6, Condition 9, IEA's will be scheduled for every three years thereafter (unless the Secretary directs otherwise) by an audit team whose appointment has been endorsed by the Secretary.

16 Records and Document Control

16.1 Records

Generally, the Environment and Community Coordinator will maintain all Environmental Management System records which are not of a confidential nature. Records that will be maintained include:

- monitoring data;
- environmental inspections and auditing results;
- environmental incident reports;
- the complaints register; and
- licences and permits.

All records will be stored so that they are legible, readily retrievable and protected against damage, deterioration and loss. Records will be maintained for a minimum of 4 years or as otherwise required under any legislation, licence, lease, permit or approval.

16.2 Document Control

This document and all others associated with the Environmental Management System shall be maintained in a document control system which is in compliance with the site Document Control Standard which is available to all site personnel. Any proposed change to this document will be via the Environment and Community Coordinator.

A copy of this document is available on the DC website. Details on document revisions are provided in **Table 11**.

Table 11: Document Revision Details

Version	Date	Details of Revision	Company	Reviewed by/ Authorised by
1	06/03/2013	Original BMP	LakeCoal	P. Stewart C. Ellis B. Johnston
2	07/01/2014	Review	LakeCoal	C. Ellis
3	05/12/2014	Review	LakeCoal	C. Ellis
4	01/03/2019	Review	LakeCoal	C. Armit W. Covey
5	1/12/2019	Updated to Delta Coal format	Delta Coal	K. Weekes E. Dodd C. Armit

17 Roles and Responsibilities

Roles and responsibilities specific to completing the requirements of the BMP are identified in **Table 12**.

Table 12: Roles and Responsibilities for Biodiversity Management

Role	Responsibilities
General Manager	• Ensure that adequate financial and personnel resources are made available for the implementation of the BMP, including rehabilitation activities.
Environment and Community Coordinator	• Document owner managing the implementation of the plan. • Coordinate the biodiversity monitoring. • Engage contractors to undertake weed management and feral animal management activities and review plan updates. • Coordinate the required native vegetation enhancement strategy. • Provide results of other environmental monitoring for the project to the Project Ecologist to assist in determining any change and cause of changes to monitored vegetation. • Inspect and report on bushfire risk and management and uncontrolled public access management. • Inspect APZs prior to the start of the fire season. • Arrange for access to site for all personnel involved in implementing this BMP. • Compile data for the Annual Review. • Follow up complaints or disputes. • Respond to any potential or actual non-compliances and report these as required to regulatory bodies and other stakeholders. • Undertake reviews of this document. • Undertake or coordinate the required audits of this document. • Complete notification process for any noncompliance or incident.
Project Ecologist	• Undertake ecological monitoring specified within this BMP. • Determine compliance with approval conditions based on monitoring results and in accordance with the criteria. • Incorporate results of other environmental monitoring into the biodiversity monitoring program. • Provide feedback to the Environment and Community Coordinator for updates to the plan based on monitoring results.
All employees and contractors	• Comply with the requirements of this BMP.

18 References

Documents used in the preparation of this management plan are detailed in Error! Reference source not found..

Table 13: References

Reference	Title
Standards	AS/NZS ISO 14001:2004 Environmental management systems – Requirements with guidance for use AS/NZS ISO 14004:2004 Environmental management systems – General guidelines on principles, systems and support techniques AS2601-2001: The demolition of structures
Legislation and Regulations	*Biodiversity Conservation Act 2016* *Biosecurity Act 2015* Biosecurity Regulation 2017 Environment Protection Licence (EPL) 1770 *Environmental Planning and Assessment Act 1979 (EP&A Act)* *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* *Fisheries Management Act 1994* *Game and Feral Animal Control Act 2002* *Game and Feral Animal Control Regulation 2012* *Local Land Services Act 2013* *Mining Act 1992* *National Parks and Wildlife Act 1974* *Pesticides Act 1999* Development consent SSD-5465 (as modified) *Protection of the Environment Operations Act 1997 (POEO Act)* *Rural Fires Act 1997*
Delta Coal documents	EMS 001 Environmental Management Strategy. Chain Valley Colliery Benthic Communities Management Plan, May 2018. Chain Valley Colliery Biodiversity Management Plan, July 2014. Chain Valley Colliery Heritage Management Plan, June 2014. Chain Valley Colliery Seagrass Management Plan, June 2019. Chain Valley Colliery Water Management Plan, July 2012. LakeCoal 2018, MC and CVC Mine Operations Plan 2018 - 2020. Delta Coal Permit to Clear or Disturb land.
External	AECOM, 2011, Environmental Assessment Chain Valley Colliery Domains 1 &2 Continuation Project, prepared for LakeCoal.

Reference	Title
	Australian Government Weeds of National Significance, www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html, viewed 5 August 2019. Bureau of Meteorology (BOM) 2019, Map of Climate Zones of Australia. Cardno Ecology Lab, 2011, Mannering Colliery Extension of Mining – Aquatic Ecology Assessment, prepared for Centennial Coal. Commonwealth of Australia, September 2016, Mine Closure: Leading Practice Sustainable Development Program for the Mining Industry. Department of Environment, Climate Change and Water (DECCW) 2009, Threatened species survey and assessment guidelines: field survey methods for fauna (Amphibians), NSW Government. Department of Environment, Climate Change and Water (DECCW) 2010, Waterwatch estuary field manual and guide. Ecotone Ecological Consultants 1997, Flora and Fauna Survey and Assessment Vales Point Power Station Perimeter lands Biodiversity. Waratah, NSW. Ecotone Ecological Consultants 2010, Flora and Fauna Investigations Vales Point Power Station Perimeter lands Biodiversity Update. Waratah, NSW. EMGA Mitchell McLennan, 2015 – Statement of Environmental Effects, Chain Valley Colliery – Modification 2, Prepared for LakeCoal Pty Ltd EMGA Mitchell McLennan, 2013 – Environmental Impact Statement, Chain Valley Colliery Mining Extension 1 Project, Prepared for LakeCoal Pty Ltd. Greater Sydney Regional Strategic Weed Management Plan 2017 - 2022 Developed in partnership with the Greater Sydney Regional Weed Committee - Revised September 2019. Kelly, G.L., 2006, Recycled Organics in Mine Site Rehabilitation - A review of scientific literature, prepared for the Department of Environment and Conservation NSW. Kleinfelder 2016, Weed Action Plan - Mannering Colliery and Chain Valley Colliery. NSW Government Department of Land, Water and Biodiversity Conservation (DLWBC) 2006, Asparagus Weeds Best Practice Management Manual, Department of Water, Land and Biodiversity Conservation, South Australia. NSW Government, Australian Government and QLD Government 2009, Lantana Best Practice Manual and Decision Support Tool, Department of Employment, Economic Development and Innovation, Queensland. NSW Minerals Council Improving Mine Rehabilitation Discussion Paper, February 2018. NSW Office of Environment & Heritage (OEH) 2014, BioBanking Assessment Methodology 2014. Office of Environment and Heritage for the NSW Government, Sydney. NSW Primary Industries Weed Management Unit 2009, Blackberry control manual: Management and control options for Blackberry (Rubus spp.) in Australia, Department of primary Industries, Victoria. NSW Rural Fire Service (RFS) 2006, Planning for bush fire protection: a guide for councils, planners, fire authorities and developers. NSW

Reference	Title
	Government. Office of Environment and Heritage (OEH) 2014, *Wallum Froglet – profile,* www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10183, viewed 29 November 2019. Sydney Weeds Committee 2012, Groundcovers: Nasturtium (Tropaeolum majus), www.sydneyweeds.org.au/nasturtium, viewed 29 November 2019. Total Earth Care 2019, Weed Action Plan - Mannering Colliery and Chain Valley Colliery. Watterson, E.K., Burston, J.M., Stevens, H. and Messiter, D.J., 2011, The hydraulic and morphological response of a large coastal lake to rising sea levels. Worley Parsons. pp 1-14. Winkler MA, Cherry H and Downey PO (eds) 2008, *Bitou bush management manual. Current management and control options for bitou bush Chrysanthemoides monilifera* ssp. *rotundata) in Australia,* Department of Environment and Climate Change (NSW), Sydney.

19 Definitions

BMP Biodiversity Management Plan

CCC Central Coast Council

DC Delta Coal

DP&E Department of Planning & Environment

DPIE Department of Planning, Industry and Environment

DPI Department of Primary Industries

EA Environmental Assessment

EMS Environmental Management System

EPA NSW Environment Protection Authority

EPL Environmental Protection License

EP&A Act *Environmental Planning and Assessment Act 1979*

LMCC Lake Macquarie City Council

MC Mannering Colliery

MOP Mine Operations Plan

MP 10_161 Project Approval for CVC Domains 1 & 2 Continuation Project, referred to in Schedule 3, Condition 25 of SSD-5465

MSDS Material Safety Data Sheet

NSW New South Wales

OEH NSW Office of Environment and Heritage

POEO Act *Protection of the Environment Operations Act 1997*

RFS NSW Rural Fire Service

ROM Run of mine

Secretary Secretary of the Department, or nominee

VPPS Vales Point Power Station

WoNS Weed of National Significance

Appendix 1: Consultation

Appendix 2: Development Consent Summary

Chain Valley Colliery Development Consent SSD-5465 Summary

Relevant sections of Development Consent SSD-5465 detail the requirements of the BMP and are reproduced in Table A1 below along with identification of where the requirements are addressed in this document.

Table A1: Requirements from Chain Valley Colliery Development Consent (SSD-5465)

Condition No.	Requirements	Relevant section of this document
	Schedule 2 Administrative Conditions	
18	***Updating and Staging Strategies, Plans or Programs*** *The Applicant must regularly review the strategies, plans and programs required under this consent and ensure that these documents are updated to incorporate measures to improve the environmental performance of the development and reflect current best practice in the mining industry. To facilitate these updates, the Applicant may at any time submit revised strategies, plans or programs for the approval of the Secretary. With the agreement of the Secretary, the Applicant may also submit any strategy, plan or program required by this consent on a staged basis.* *With the agreement of the Secretary, the Applicant must prepare a revision or stage of any strategy, plan or program required under this consent without undertaking consultation with all parties nominated under the applicable condition in this approval.* *Notes:* • *While any strategy, plan or program may be submitted on a staged basis, the Applicant must ensure that the existing operations on site are covered by suitable strategies, plans or programs at all times.* • *If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage to which the strategy, plan or program applies, the relationship of this stage to any future stages, and the trigger for updating the strategy, plan or program.*	**Section 10.1**
	Schedule 3 Specific Environmental Conditions	
	BIODIVERSITY ***Rehabilitation Objectives***	

<table>
<tr><th>Condition No.</th><th>Requirements</th><th>Relevant section of this document</th></tr>
<tr><td>19</td><td>The Applicant shall implement a Biodiversity Enhancement Strategy as described in the EIS and summarised in Table 6, in consultation with OEH, and to the satisfaction of the Secretary.
Table 6: Summary of the Biodiversity Enhancement Strategy
<table>
<tr><th>Area</th><th>Offset Type</th><th>Minimum Size/Amount</th></tr>
<tr><td>Biodiversity Enhancement Area</td><td>Enhancement and restoration measures, including weed and rubbish removal, return of natural hydrological regime and regeneration with native endemic species.</td><td>3 ha (in total) of Swamp Sclerophyll Floodplain Forest and Swamp Oak Floodplain Forest endangered ecological communities within the surface facilities sites</td></tr>
</table>
Note: To identify the Biodiversity Enhancement Area referred to in Table 6 see the applicable figures in Appendix 7.</td><td>Section 6</td></tr>
<tr><td></td><td>The Applicant shall implement its preferred option of the three options set out in new dot point 1 of the Terrestrial Ecology section of its Statement of Commitments by 1 December 2016, following consultation with OEH and to the satisfaction of the Secretary.</td><td>See below</td></tr>
<tr><td></td><td>Biodiversity Management Plan</td><td></td></tr>
<tr><td>20</td><td>The Applicant shall prepare a Biodiversity Management Plan for the surface facilities sites, for all areas that are not, or will not, be subject to condition 7 of schedule 4, to the satisfaction of the Secretary. This plan must:</td><td></td></tr>
<tr><td></td><td>(a) be prepared by a suitably qualified person approved by the Secretary; in consultation with OEH, and submitted to the Secretary within 6 months of the date of this consent;</td><td>Section 1.5</td></tr>
<tr><td></td><td>(b) establish baseline data for the existing habitat in the Biodiversity Enhancement Area and elsewhere on the site;</td><td>Section 6</td></tr>
<tr><td></td><td>(c) describe the short, medium, and long term measures that would be implemented to:</td><td></td></tr>
<tr><td></td><td>• manage the impacts of clearing vegetation;</td><td>Section 5</td></tr>
<tr><td></td><td>• manage the remnant vegetation and habitat in the Biodiversity Enhancement Area and elsewhere on the site; and</td><td>Section 6, 10</td></tr>
<tr><td></td><td>• implement the Biodiversity Enhancement Strategy, including detailed performance and completion criteria;</td><td>Section 6</td></tr>
<tr><td></td><td>(d) include a program to monitor and report on the effectiveness of these measures, and progress against the detailed performance and completion criteria;</td><td>Section 11</td></tr>
<tr><td></td><td>(e) identify the potential risks to the successful implementation of the Biodiversity Enhancement Strategy, and the contingency measures that would be implemented to mitigate these risks; and</td><td>Section 6</td></tr>
<tr><td></td><td>(f) include details of who would be responsible for monitoring, reviewing, and implementing the plan.</td><td>Section 17</td></tr>
<tr><td></td><td>The Applicant shall implement the approved management plan as approved from time to time by the Secretary.</td><td>Noted</td></tr>
<tr><td>20A</td><td>Within 3 months of the approval of MOD 2, the Applicant shall revise the Biodiversity Management Plan to incorporate the measures required to implement its commitments described in new dot point 2 of the Terrestrial Ecology section of its Statement of Commitments, and submit it to the Secretary for approval.</td><td>This document</td></tr>
<tr><td></td><td>BUSHFIRE MANAGEMENT</td><td></td></tr>
<tr><td>24</td><td>The Applicant shall:</td><td></td></tr>
</table>

Condition No.	Requirements	Relevant section of this document
	(a) ensure that the development is suitably equipped to respond to any fires on site; and	**Section 9**
	(b) assist the Rural Fire Service and emergency services as much as possible if there is a fire in the vicinity of the Surface facilities sites.	**Section 9**
	STATEMENT OF COMMITMENTS	
	Terrestrial Ecology	
	In addition to the management and mitigation measures undertaken at the Colliery for terrestrial ecology as described in the BMP, the following commitments specific to the Proposal will be undertaken. Some commitments are already undertaken under the BMP. LakeCoal will:	
	• *investigate one of the following options in consultation with OEH to offset the biodiversity impacts arising from the proposed modification:* ○ *provide $10,000 of funding, which is equivalent to the biodiversity being lost (i.e. 5 credits x $2,000 per credit) to existing environmental programs at the site which benefits the Swamp Sclerophyll EEC; or* ○ *consult with OEH to identify a suitable conservation program and provide $10,000 of funding; or* ○ *purchase and retire 5 credits on the Biobanking register.*	**Financial contribution by LakeCoal in 2016**
	• *update* the BMP to include the following: ○ *the completion of predisturbance surveys in the survey area for Blackeyed Susan, Leafless Tongue Orchid and Variable Midge Orchid during their flowering periods (July to December, November to February and September to October, respectively);* ○ *pre-disturbance surveys by an ecologist to determine the important components of vegetation communities and fauna habitats that should be preferentially retained in the APZs;* ○ *installation of delineation fencing around threatened flora populations (if found) to ensure their protection during development and maintenance of the APZs;* ○ *condition monitoring for threatened flora populations (if found);* ○ *retention of hollow-bearing trees in the APZs, where possible, with details to be included in a hollow tree register;* ○ *installation of nest boxes (or salvaged hollows) within the APZs under the supervision of a suitably qualified ecologist or wildlife carer to replace hollows where hollow-bearing trees cannot be retained;* ○ *measures for APZ maintenance that include weed control;* ○ *clearing of hollow-bearing trees (if required) under the supervision of a suitably qualified ecologist;* ○ *any injured fauna would be taken to the nearest veterinary hospital for treatment before release; and* ○ *relocation of suitable hollow-bearing felled trees adjacent to the APZs to create additional fauna habitat;*	**Section 5, 7 and 9**
	• *undertake the design of the dam embankment and spillway works in consultation with an ecologist to minimise potential impacts on the Swamp Oak Floodplain Forest EEC;*	**Dam works completed 2017**
	• *ensure pre-clearing surveys are undertaken by an ecologist to minimise the potential impact to fauna and significant vegetation prior to clearing works being undertaken within the embankment and spillway area;*	**As above and Section 5**

Condition No.	Requirements	Relevant section of this document
	• *clearly delineate the clearing footprint and cordon off surrounding vegetation as a 'no go' zone during works to the dam embankment and spillway;*	**As above and Section 5**
	• *minimise disturbance areas where possible by ensuring all stockpiling of materials, parking of machinery etc, is undertaken in previously cleared areas;*	**As above and Section 5**
	• *ensure that, wherever possible, dead standing timber and fallen timber will be avoided by any clearing works, or if required to be removed, be relocated into suitable habitat areas nearby;*	**As above and Section 5**
	• *ensure all equipment used for the earthworks associated with the dam embankment and spillway will be cleaned of excess soil potentially containing pathogens and weed seeds prior to entering the Site;*	**As above and Section 5**
	• *install sediment fencing surrounding the proposed earthwork areas, in accordance with a site- specific erosion and sediment control plan for the works;*	**As above and Section 5**
	• *ensure that in the event that sedimentation dam water is released from Dam 10 prior to the works being undertaken, it will be undertaken in a controlled manner over a number of days to ensure that the release does not result in significant erosion and sedimentation to the Swamp Oak Floodplain Forest;*	**As above and Section 5**
	• *continue the management and monitoring of flora and fauna in accordance with the BMP for the life of the mine, including:* - *the condition and composition of the Swamp Oak Floodplain Forest area;* - *the condition of vegetation adjacent to the ventilation shaft and fans;* - *the location and distribution of weed infestations; and* - *the abundance and distribution of feral animal use.*	**Section 7, 8, 11**
	• *noxious weeds will be removed and continually controlled from the pit top area, allowing for natural regeneration of vegetation;*	**Section 7**
	• *weed invasion will be monitored as part of the Colliery's BMP; and*	**Section 11**
	• *the condition of the EEC areas will be monitored through the Colliery's BMP.*	**Section 11**

Appendix 7 Benthic Communities Management Plan

Delta coal	Doc Owner: **Environmental Compliance Coordinator** Doc No:

CHAIN VALLEY COLLIERY

Benthic Communities Management Plan

ENVIRONMENTAL MANAGEMENT PLAN

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1 Introduction

1.1 Purpose and Scope

The purpose of this Benthic Communities Management Plan (BCMP) is to:

- outline details of the benthic communities monitoring data collected;
- outline existing and predicted subsidence levels;
- outline the methodology to be used to identify depth changes at monitoring locations;
- identify benthic community monitoring locations;
- identify reporting requirements;
- detail benthic community management measures;
- identify the requirements for incident or exceedances reporting and reviews of the document; and
- identify persons responsible for implementation of requirements.

The overall aim of this management plan is to promote a high level of environmental performance through the minimisation of impacts.

A formal Environmental Management System (EMS) has been developed as a systematic and structured approach to managing environmental issues at the operation. This has been developed in general accordance with the requirements of the international standard ISO 14001.

This BCMP is an element of the Chain Valley Colliery (CVC) Environmental Management System (EMS).

1.2 Background

Chain Valley Colliery (CVC) is an underground coal mine located on the southern side of Lake Macquarie approximately 60 km south of Newcastle and 80 km north of Sydney (see Figure 1). The pit-top is located approximately 1 km south-east of the township of Mannering park at the southern extent of Lake Macquarie, as shown on Figure 1.

Mining is currently undertaken at CVC, with the coal being transported underground to Mannering Colliery (MC) where the coal is crushed and screened and sent directly to Vales Point Power Station (VPPS).

In August 1960, J&A Brown and Abermain Seaham Collieries Ltd commenced clearing the present site with drift and shaft sinking starting a few months later. Production of coal from the Wallarah Seam, commenced with the first delivery to the adjacent Delta Electricity's Vales Point Power Station (VPPS) in April 1963. As of 1 April 2019, Great Southern Energy Pty Ltd (trading as Delta Coal (DC)) own and operate the two underground coal mines, CVC and MC.

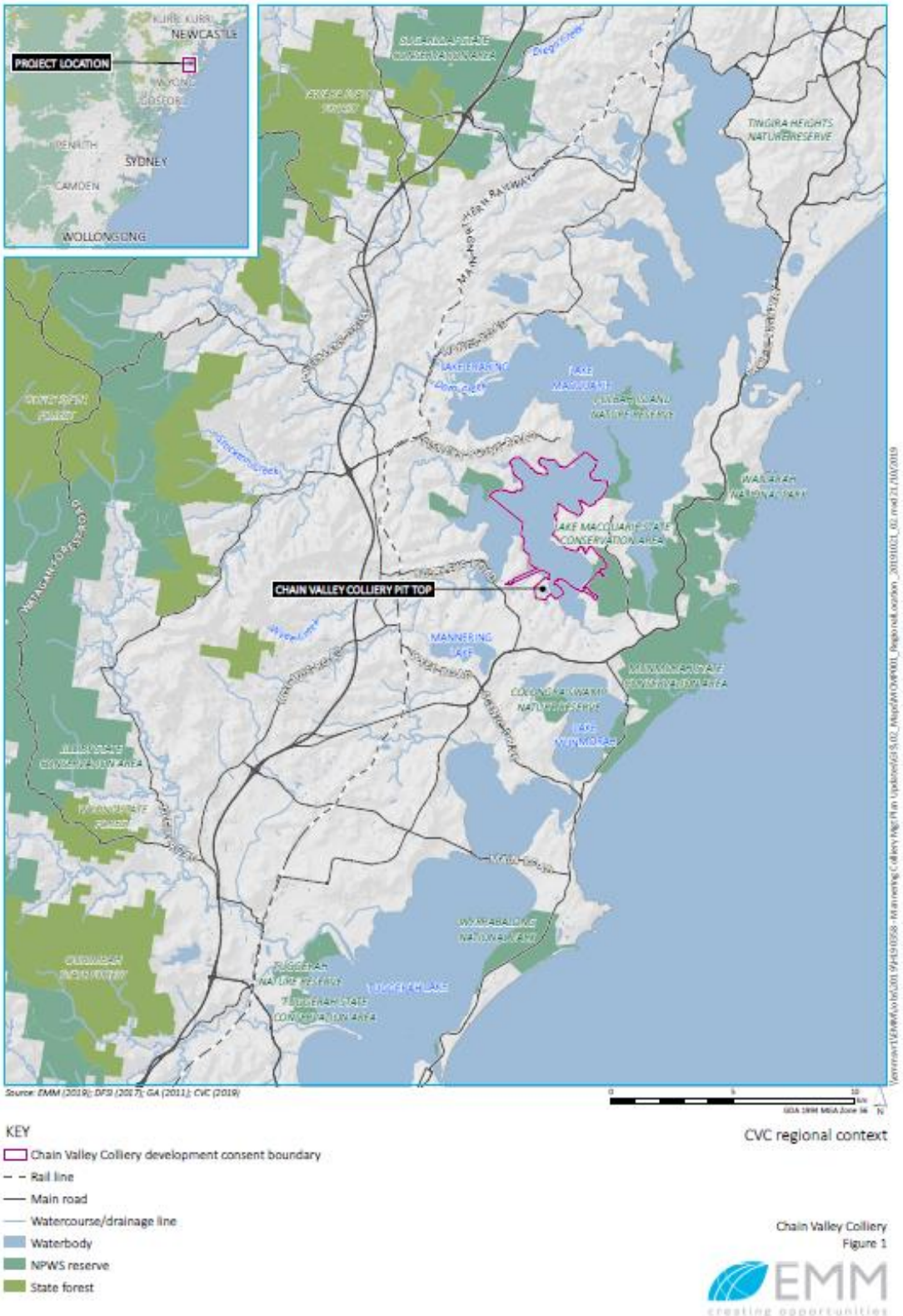


Figure 1 Regional context

1.3 Consultation

The original BCMP was developed in consultation with the OEH, DPI Fisheries and LMCC. These agencies were contacted on the 28 March 2012, and at this time a face-to-face meeting was offered to discuss the development of the methodologies and management plan. However, all stakeholders requested information be provided for comment due to resource constraints. As a result, each stakeholder was provided a summary of the survey methods for comment on the 11 April 2012. A response was received from LMCC on the 23 May 2012 regarding mitigation measures and these comments were addressed in the BCMP. No comments were received from OEH or DPI Fisheries.

Copies of the draft BCMP (Revision 1) were distributed to the OEH, LMCC and DPI Fisheries on the 13th March 2014 with comments requested back by the 1st April 2014. As of 7th April 2014 only one response from the OEH had been received, dated the 21st March 2014. The OEH noted that while they encourage the development of such plans, they do not approve or endorse these documents and accordingly no comments were provided.

The previous version of the BCMP was sent to OEH, DPI Fisheries and LMCC on 4 November 2016 for review and comment. All three agencies provided comments on the revised Plan. LMCC and DPI Fisheries confirmed that the document was acceptable in its revised form. OEH noted that while they encourage the development of such plans, they do not approve or endorse these documents and accordingly no comments were provided on the content of the plan.

Further reviews to the BCMP were conducted in March 2019, November 2019 and May 2020.

A copy of the BCMP review which includes an update for miniwall S5 and Northern Mining Pillar extraction and SSD 5465 Modification 3 was provided to the stakeholders listed in the below table on 4 December 2020.

A summary of the comments received during this round of review, and amendments subsequently made to the document prior to finalisation are detailed in **Table 1**. Evidence of consultation is provided in **Appendix 1**. This plan was approved by DPIE on the 6 April 2021 as part of the Miniwall S5 and Northern Pillar Area extraction plan.

Table 1: Consultation Summary

Stakeholder	Comments	Response/Action
NSW DPIE-Resource Assessments	• Request for information (RFI) provided on 5 March 2020. See attached DPIE RFI letter and attachment (Appendix 1). Extraction Plan approval which includes approval of the Benthic Communities Management Plan (Appendix 1).	• Tracked changed document provided on planning portal for updated consent references and mining panel numbering
NSW DPIE-BCD	• No comments received	• Nil Required
Lake Macquarie City Council	• Comments received from LMCC on the Benthic Communities Management Plan via tracked changes in a word document. Two main points in this consultation were; • identifying tests of significance (using ANOSIM) for changes in benthic communities as a result of subsidence vs other environmental variables. • clarification on when exactly a 'significant' change will be determined to have been caused by subsidence, as opposed to being attributed to other things (like water temp, turbidity, DO, etc). •	• Section 5.2 updated. EMM Consulting marine ecologist provided additional comments on statistical analysis and significance of change. •

Stakeholder	Comments	Response/Action
DPI Fisheries	• No comments or objections	• Nil required

2 Statutory Requirements

2.1 Key Legislation, Policy and Guidelines

Both State and Commonwealth environmental legislation applies to DC's operation and activities. A number of legislative requirements, government policies and guidelines are applicable. Key items relevant to this management plan are:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Protection of the Environment Operations Act 1997* (POEO Act);
- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Mining Act 1992*;
- *National Parks and Wildlife Act 1974*;
- *Biodiversity Conservation Act 2016*;
- Department of Primary Industries (2013), *Policy and guidelines for fish habitat conservation and management*; and
- ANZECC 2000, Australian *and New Zealand Guidelines for Fresh and Marine Water Quality*.

Delta lands are within the LMCC and Central Coast Council local government areas (LGAs).

2.2 Development Consent SSD-5465 Requirements

This BCMP has also been completed to satisfy the requirement of Condition 7(h), Schedule 4 of Development Consent SSD-5465 (Modification 3), which states:

"The Applicant shall prepare an Extraction Plan for all second workings on site, to the satisfaction of the Secretary. Each Extraction Plan must:

(h) include a Benthic Communities Management Plan, which has been prepared in consultation with BCD, LMCC and DPI Fisheries, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on benthic communities, and which includes:

- surveys of the lake bed to enable contours to be produced and changes in depth following subsidence to be accurately measured;
- benthic species surveys within the area subject to second workings, as well as control sites outside the area subject to second workings (at similar depths) to establish baseline data on species number and composition within the communities;
- a program of ongoing seasonal monitoring of benthic species in both control and impact sites;
- development of a model to predict likely impact of increased depth and associated subsidence impacts and effects, including but not limited to light reduction and sediment disturbance, on benthic species number and benthic communities' composition, incorporating the monitoring and survey data collected; and
- updating the model every 2 years using the most recent monitoring and survey data.

The relevant requirements from Table 6 within Condition 2, Schedule 4 of SSD-5465 (Modification 3), including the relevant notes, are recreated in **Table 2**.

Table 2: Subsidence Impact Performance Measures

Biodiversity	
Benthic Communities	Minor environmental consequences, including minor changes to species composition and/or distribution

Notes:

- *The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) for each of these performance measures in the various management plans that are required under this consent (see Condition 7 below).*
- *Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Planning Secretary will be the final arbiter.*
- *The requirements of this condition only apply to the impacts and consequences of mining operations, construction or demolition undertaken following the date of approval of this consent.*

Benthic related requirements of SSD-5465, including specific requirements that are to be addressed in this plan, and where they are addressed, are detailed in **Appendix 2**.

3 Benthic Communities Management

3.1 Baseline Data

Both species diversity and abundance are recorded as part of the six-monthly seasonal (autumn and spring) benthic communities monitoring, which commenced in 2012.

The mud basin off Summerland Point, in Chain Valley Bay and Bardens Bay, was found to be inhabited by 21 species of organisms greater than 1mm in size. Polychaete worms and bivalve molluscs were the most frequently encountered animals.

Bottom sediment in the study area was composed of a small fraction of black sand and shell fragments of various sizes. Most of the sediment was fine black or grey mud.

The sampling results of the benthos undertaken at six-monthly intervals between February 2012 and September 2019 revealed the following:

- the similar suite of organisms dominated each of the 22 sample stations. These were polychaete worms and bivalves;
- stations were distinguished by the relative abundance of the dominant species.
- water depth was not the key parameter in determining the species composition at a station; and
- physical variables such as salinity (conductivity), dissolved oxygen concentration and turbidity of the bottom water, measured only on the day the benthos was sampled, had little influence on the species composition of the benthos over the period sampled.

The results collated to date appear to support the notion that increasing the water depth by the predicted levels of subsidence has, to date, had no discernible effect on the composition and abundance of organisms making up the benthos of the mud basin.

3.2 Bathymetric Surveys

Bathymetric data from the NSW Office of Environment and Heritage (OEH) was obtained in draft format during 2012. DC was granted a license to use this OEH data for the purposes of monitoring changes in the bed of Lake Macquarie, and acknowledges the OEH's data which has enabled the subsidence comparison to be undertaken based on this 2010 data and data subsequently obtained in 2012 by Delta Coal. OEH notes that the data was obtained via use of differential GPS and a 200 kHz echosounder, which is noted to provide a general data accuracy of 0.1 m.

DC commissioned Astute Surveying in March 2012 to undertake a bathymetric survey over the areas of current and proposed workings. The primary purpose of this survey was to obtain accurate baseline data for future subsidence assessments and to enable comparison with the draft OEH data from 2010. Importantly, the 2012 survey provided accurate details of the lake depth within the proposed mining areas, which would enable future surveys to use as baseline data to monitor the future subsidence levels as a result of mining activities. Prior to 2018, bathymetric surveys were conducted annually.

Following an exceedance of the subsidence predictions over CVC's MW7-12 mining area in 2017, DC has committed to undertaking future bathymetric surveys at six monthly intervals to further understand the behavior of subsidence over the active mining areas. The latest bathymetric survey was undertaken in August 2020 (**Figure 2**).

The surveys have shown that subsidence from the miniwall mining can be monitored with a useful level of accuracy and the surveys will be continued bi-annually to cover future mining areas and areas where mining has been completed.

3.3 Subsidence Predictions and Modelling

Subsidence predictions and modelling is undertaken by specialist geotechnical engineers for each extraction plan. The subsidence predictions and modelling assist the site technical services personnel in the mine design and planning process. The mine design and planning process is fundamental to controlling mine subsidence to consented limits.

4 Benthic Communities Monitoring Program

Based on contour mapping of Lake Macquarie and Delta Coal hydrographic surveys, it was identified that the mining operations are largely proposed to occur beneath areas of the Lake at water depths between 4-6 m which represent the general lake depths where subsidence is proposed and under which mining activities have been, will be or are proposed to occur. Accordingly, the monitoring program was designed to sample benthic invertebrate communities from these depths and to provide ongoing monitoring of the potential effects of subsidence. The methodology and monitoring details are presented in the following sections.

4.1 Sampling Locations

In order to analyse the community assemblages and determine potential impacts of subsidence over time, sampling was, and will continue to be undertaken across two depth intervals from numerous site locations within three site types. The site types consist of:

- Impacted (site prefix “IM”): Sites which are currently, or were historically impacted upon by subsidence;
- Reference (site prefix “R”): Sites which are not currently impacted by subsidence but fall within the proposed future mining footprint. Following undermining, Reference sites are designated as Impacted sites; and
- Control (site prefix “C”): Sites which will not be impacted upon by subsidence.

The sampling locations are identified in **Table 3** and **Figure 3**.

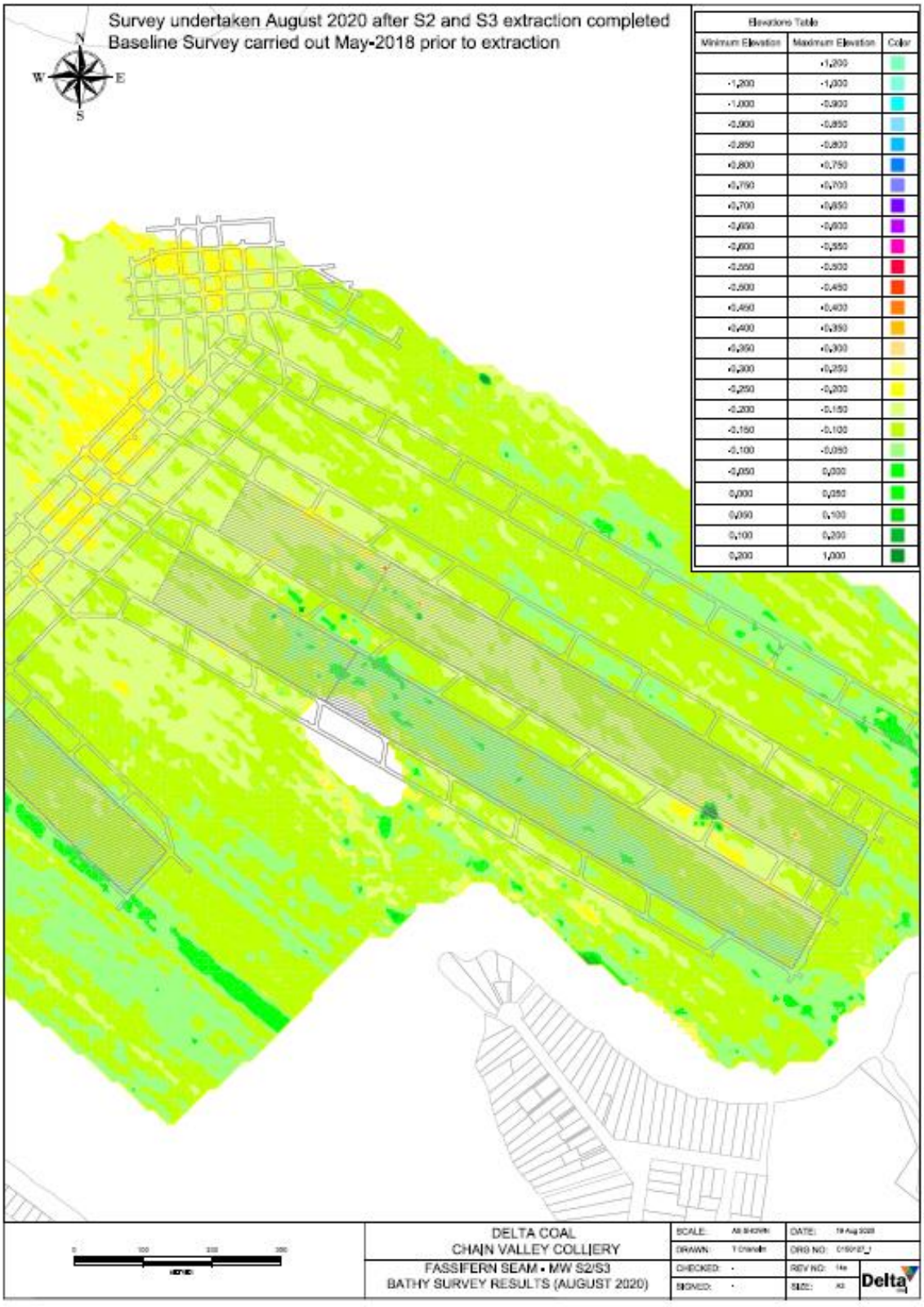


Figure 2 Latest Bathymetric Survey of extracted Miniwalls S2 and S3

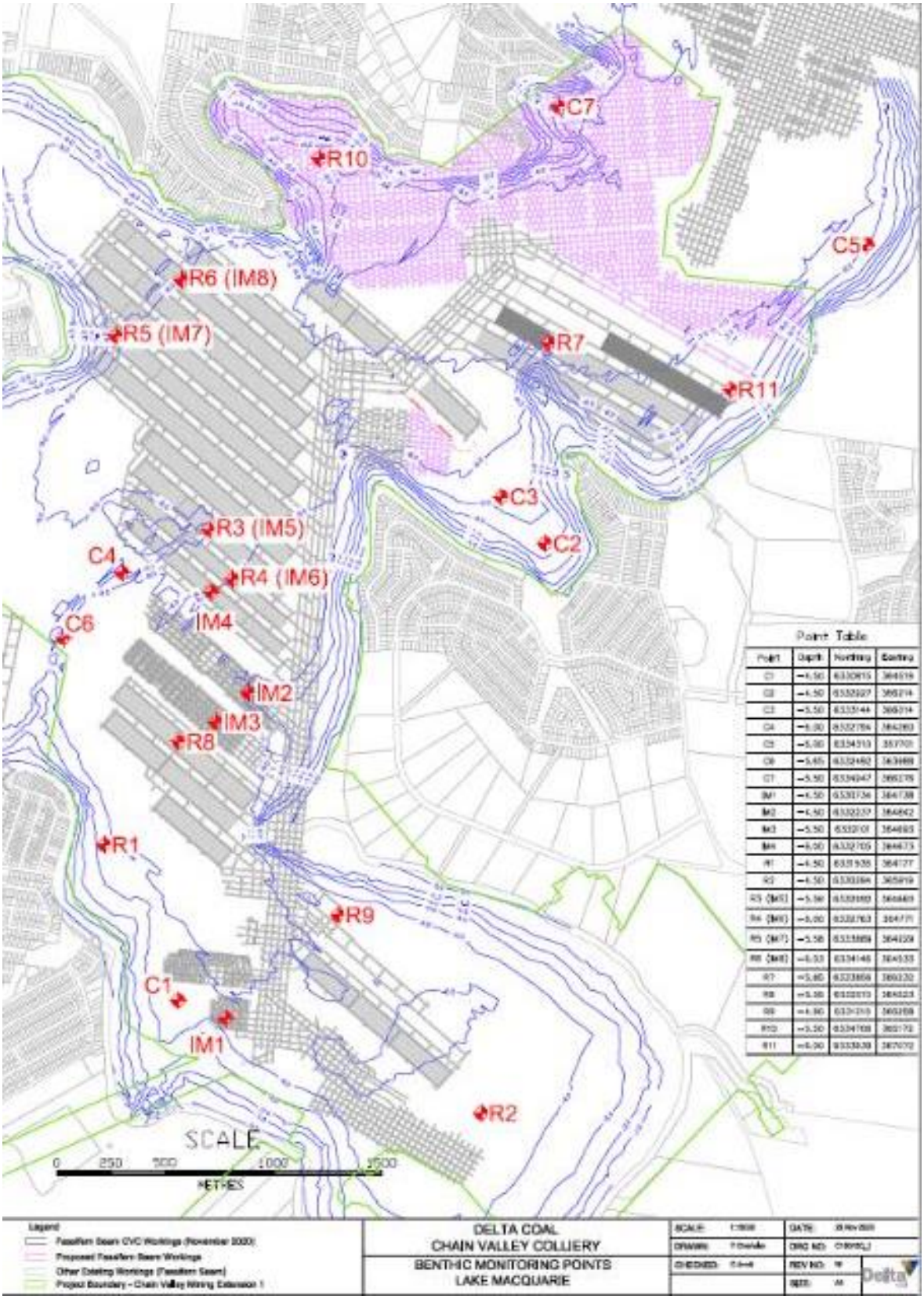


Figure 3 Benthic Sampling locations

Table 3: Benthic Community Sampling Locations

Site Name	Sample Depth (m)	Easting	Northing
C1	-4.5	364519	6330815
C2	-4.5	366214	6332927
C3	-5.5	366014	6333144
C4	-6.0	364260	6332794
C5	-6.0	367701	6334310
C6	-5.5	363988	6332492
C7	-5.5	366276	6334947
R1	-4.5	364177	6331535
R7	-6.0	366232	6333856
R9	-4.5	365258	6331210
R10	-5.5	365172	6334706
R11	-6.0	367072	6333639
IM1	-4.5	364738	6330734
IM2	-4.5	364842	6332237
IM3	-5.5	364693	6332101
IM4	-6.0	364673	6332705
IM5 (previously R3)	-6.0	364771	6332763
IM6 (previously R4)	-5.5	364660	6332992
IM7 (previously R5)	-5.5	364229	6333889
IM8 (previously R6)	-6.0	364533	6334146
IM9 (Previously R8)	-5.5	364523	6332010
IM10 (Previously R2)	-4.5	365919	6330294

4.2 Sampling Methods

Each of the sites will be surveyed for biotic (benthic invertebrates) and environmental (water quality, benthic sediment) variables. The surveys will be undertaken during spring and autumn.

4.2.1 Water Quality

General physico-chemical water quality variables will be measured at the sites during sampling. The water quality parameters will be measured at 0.5m below the surface and 0.5 m above the lakebed. The variables measured will include temperature (oC), pH, turbidity (NTU), conductivity (µS/cm), dissolved oxygen (mg/L and % saturation) and oxygen reduction potential (ORP) or photosynthetically active radiation (PAR).

4.2.2 Benthic Sediment

Sediment samples will be collected to a depth of 20 cm at each of the sites using 250 mL jars. The jars will be labelled and transported to the laboratory for analysis via settlement method.

4.2.3 Benthic Invertebrates

At each site, five replicate samples of benthic sediment will be collected by a diver using 200x200x100 mm sieve boxes with 1 mm mesh.

The samples will be sieved to remove sediment particles less than 1 mm in diameter. The residual material will then be transferred to a labelled 250 mL plastic jar and preserved with formaldehyde. Large fragments of shell will be removed from the sample at this time to ensure that the sample volume did not exceed 250 mL and the samples are retained for later inspection at the laboratory.

4.3 Laboratory Analysis

4.3.1 Benthic Sediment

The 250 mL sample of the entire sediment from each site will be transferred into a 500 mL clear glass measuring cylinder and the volume made up to 500 mL with seawater. The cylinder is then to be stoppered and shaken vigorously to suspend the sediment in the seawater. The sample will then be allowed to settle and the volumes of each fraction (shell and coarse sand, fine sand, mud and fine silt) calculated and recorded. Results are then determined relative to the initial volume of sediment collected in the 250 mL jar.

4.3.2 Benthic Invertebrate Identification

The contents of each jar are run through a 1mm mesh sieve and washed free of formalin and any remaining mud.

The washed material is then placed into two enamel dishes and portions of each sample placed in a 100 mm diameter petri dish for examination under a stereoscopic binocular microscope to detect and recover small organisms. Organisms and parts of organisms are removed, counted, identified and the results entered a spreadsheet. The benthic invertebrates are identified to genera and species where possible. This process is repeated until the debris of the entire sample had been examined. The results for each site are then entered an excel spreadsheet for summary and analysis. All shell remaining in the sample is kept for later examination.

4.4 Data Analysis

The biotic and environmental data will be analysed using a variety of univariate and multivariate analysis (**Table 4**). The statistical methods used to analyse the data were determined based on earlier monitoring data to provide the most statistically robust assessment of comparison between impacted and reference and control sites and environmental data. It must be noted that control and reference sites are the same until undermined.

Table 4: Data Analysis

Variable Type	Analysis	Description
Environmental: Water quality	ANZECC/ARMCANZ Guidelines (ANZECC Guidelines)	Trigger values for slightly – moderately disturbed ecosystems: Estuaries.
Biotic and Environmental	Univariate	Descriptive graphical statistics. Analysis of Variance and Similarity (2 way nested)
Biotic and Environmental	Multivariate	A square-foot transformation was performed on the data and Bray-Curtis Similarity matrices created. Cluster analysis was then performed for each site and dendrogram plots produced.

	Multidimensional Scaling Ordination	The analysis represents the sites as points in space so the relative distances between samples show similarities in community structure. Samples that are placed closer together are more similar than samples further apart.
	BIOENV	The analysis matches environmental variables against biotic data which have been measured at the same sites. This analysis enables analysis of the extent to which the physio-chemical data is related to the observed biological patterns. Correlations were performed for each site between the biotic and environmental factors using the BIOENV function in PRIMER5.

4.5 Monitoring Frequency

The baseline sampling program methods outlined in **Section 3** will form the basis for a seasonal monitoring program that will be undertaken during spring and autumn each year to survey biotic (benthic invertebrates) and environmental variables (water quality and sediment). The program has been designed to enable analysis and reporting of the data to monitor the impacts of subsidence and effects, including but not limited to light reduction and sediment disturbance, on benthic species number and benthic communities' composition and distribution.

In addition to the above, annual lakebed bathymetric surveys will be undertaken prior to each autumn survey. The annual bathymetric surveys will enable any change to the lake floor to be identified and addressed during the data analysis process.

4.6 Program Refinements

The survey methods will be reviewed every two years of seasonal sampling to refine the sampling program if required. Prior to each seasonal sampling event the sites will be reviewed against the mine plans to ensure that any reference sites that have become impacted upon by mining are reclassified as impact sites, and replacement reference sites are identified and sampled. This will result in additional reference sites being added to the program during the monitoring period.

5 Modelling to Monitor Potential Impacts

5.1 Model Background

Maximum subsidence for the proposed future mining activities is predicted to be 1230 mm, or 780 mm where no overlying workings exist. The analysis undertaken on the baseline data provides an initial assessment of biotic and environmental variables associated with the study area and forms the basis of the formation of the predictive modelling (JSA 2012). The results will be reported in biannual monitoring reports and the Annual Review.

The aim of the predictive modelling is to compare the condition of the baseline benthic community assemblages prior to mining to the benthic community assemblages after mining has occurred, to ensure that only minor environmental consequences occur due to mining activities. The effects of subsidence are required to result in only minor changes to species composition and/or distribution. As the environmental variables which affect benthic communities are complex, in order to determine whether community dynamics at reference sites are related to subsidence, seasonal biotic survey data will be analysed against environmental data and between impacted types. The analysis and modelling will be undertaken to determine whether:

- Overall community dynamics are related to seasonal and environmental variables and/or subsidence impacts;
- Abundance and diversity changes to community composition at reference sites that have been undermined are related to seasonal and environmental variables or subsidence impacts; and
- Changes identified in reference sites that have been undermined are considered minor.

5.2 Analysis

For the model to identify whether the environmental consequences of subsidence are considered minor (and therefore whether mitigation measures will be required) a series of statistical analysis will be undertaken and reported seasonally and annually. Based on the expected timing of subsidence impacts, the analysis will model scenarios to determine:

- Changes in undermined reference sites with the baseline conditions at the same sites; and
- Similarity of impacted sites to control and reference sites at similar depths.

The modelling will be based on Multi-dimensional Scaling (MDS) Ordination, two-way ANOVAs (analysis of variation) and ANOSIM (analysis of similarity) techniques to identify any links in benthic community structure between sites at the same depth profiles. The modelling will be based on the existing benthic community structure, actual subsidence levels (determined from annual bathymetric surveys), predicted levels of increased subsidence and collection of seasonal data.

Figure 2 identifies the reference sites applicable to the project. The communities at the reference sites will be compared against control and reference sites at a similar depth profile. The determination of the level of impact of subsidence, once other environmental variables have been discounted by the model will be based on ANOVA/ANOSIM techniques.

Where ANOVA/ANOSIM results indicate that undermined reference site communities are changing at a rate of ANOVA/ANOSIM test of significance <5% then the impacts will be moderate or major mitigation measures to manage impacts will be required. The use of 5% (the p significance level of 0.05) is a standard statistical method of determining level of significance, another is p= 0.01. Because the data set used in the initial analysis

represents a single sampling event the use of the conservative 5% significance rule has been applied to determine minor impacts (other methods such as ranking and scaling were applied to the data but did not provide adequate measurable results). The 5% significance will be applied to seasonal data and revisited regarding suitability based on data outcomes.

The options for mitigation measures to manage subsidence on the lake floor are largely limited to changes to mine design. If impacts are determined to be moderate or major, mine planning will be required to modify mine plans.

The benthic community results of surveys and annual monitoring undertaken have identified that while communities at some sites were defined by dominant species, the abundance and diversity of the communities did not identify clear links to location or impact type. Rather the analysis identified that natural environmental fluctuations in water quality, benthic substrate composition and natural depth intervals were influencing the communities (JSA 2013).

The results of sampling between February 2012 and September 2017 appear to support the notion that increasing the water depth by the predicted subsidence will have no discernible effect on the composition and abundance of organisms making up the benthos of the mud basin (Laxton & Laxton, 2017). This is supported by the statistical modelling of results which is undertaken every 3 years.

In January 2018 Delta Coal engaged JSA environmental to undertake the 3 yearly statistical modelling of the sites Benthos data set. Detailed ANOSIM analysis of the benthic community data between un-impacted and impacted sites between 2012 and 2017 identified a significance p value of 24.1%. This value indicates that there had been no significant differences between the un-impacted and impacted sites over the last 5 years.

EMM Consulting undertook statistical modelling of the Benthic communities monitoring data between January 2020 and April 2020 and presented the following conclusions, the results of statistical analysis of CVC's benthic monitoring data indicate that no exceedance of the BCMP subsidence impact performance measure of "minor environmental consequences, including minor changes to species composition and/or distribution" has occurred. Consequently, CVC is not required to implement any additional investigations of benthic communities within the project study area at this time and should continue the routine monitoring of benthic assemblages.

If the assessment of results from future analysis indicate that impacts are outside the defined trigger level Delta Coal will investigate the cause of incident and implement corrective actions where required as outlined in **Section 8**.

6 Reporting

6.1 Regular Reporting

In accordance with Schedule 6, Condition 8, the Applicant shall provide regular reporting on the environmental performance of the development on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of the development consent.

The benthic community monitoring results will be reviewed as survey reports are received to confirm compliance with the conditions specified in the Subsidence Impact Performance Measures.

6.2 Annual Review

In accordance with Schedule 6, Condition 4, the Applicant shall review the environmental performance of the development to the satisfaction of the Secretary, by the end of March each year, or other timing as may be agreed by the Secretary.

The Annual Review will also include a summary of monitoring results during the past year, discussion with reference to the impact assessment criteria, and any relevant details related to comparisons between actual results and predictions in the Environmental Impact Statement. The Annual Review will be forwarded to the relevant authorities including DPIE, and EPA. The Annual Review will also be forwarded to members of the Community Consultative Committee and local Councils (Central Coast and Lake Macquarie). It will also be placed on the company's website along with a summary of environmental monitoring results.

6.3 Incident or Non-Compliance Reporting

If monitoring reveals that, as a result of mining activities, the criterion have been exceeded, then DC will investigate the cause of the non-compliance. As detailed in Schedule 6, Condition 7 of SSD-5465, DPIE and other relevant agencies will be immediately notified by email (DPIE - compliance@planning.nsw.gov.au) of an incident. Within seven days of becoming aware of a non-compliance, DC must notify the Department of the non-compliance. A written report will be provided to the DPIE within 7 days of the date of the incident or being made aware of the incident (such as receiving monitoring data).

The report will:

- describe the date, time, location and nature of the observation;
- identify the development (development application number and name), applicable non-compliance schedule and condition;
- describe non-compliance and reasons for non-compliance;
- identify the cause (or likely cause) of the damage;
- describe what action has been taken to date; and
- describe the proposed measures to address the impacts and prevent further such occurrences.

DC will implement the recommendations of the investigation in order to address any potential future incidents. Additional details of the incident reporting process are provided in the Environmental Management Strategy (EMS).

Any incidents or complaints will be recorded and fully investigated to find root causes and corrective actions implemented where necessary.

7 Stakeholder Management, Response and Training

7.1 Complaint Protocol

DC has a 24-hour telephone hotline (1800 115 277) through which members of the public can lodge complaints, concerns, or to raise issues associated with the operation. This service aims to promptly and effectively address community concerns and environmental matters.

All complaints are recorded and responded to and if, for some reason, no action is taken then the reason why is recorded. The information recorded in the complaint register includes:

- date and time the complaint was lodged;
- personal details provided by the complainant;
- nature of the complaint;
- action taken or, if no action was taken, the reason why; and
- follow up contact with the complainant.

1.1 Independent Review

As detailed in Condition 2, Schedule 5 of SSD-5465, an Independent Review can be requested by a landowner who "*considers the development to be exceeding the relevant criteria in Schedule 3".*

If the Planning Secretary is satisfied that an independent review is warranted, then within 2 months of the Planning Secretary's decision the Applicant must:

(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Planning Secretary, to:
- *consult with the landowner to determine his/her concerns;*
- *conduct monitoring to determine whether the development is complying with the relevant criteria in Schedule 3; and*
- *if the development is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and*

(b) give the Planning Secretary and landowner a copy of the independent review.

1.2 Dispute Resolution

If any disputes are not adequately addressed by the complaints handling process then they will be handled by the Environmental Compliance Coordinator. If the response of CVC is not considered to satisfactorily address the concern of the complainant, a meeting may be convened with the complainant, Mine Manager together with the Environmental Compliance Coordinator to determine any further options to reduce potential impacts.

Any actions agreed from the meeting will be implemented by CVC. After implementation of the proposed actions the complainant will be contacted and advice sought as to the satisfaction or otherwise with the measures taken.

If no agreed outcome is determined or the complainant is still not satisfied by the action taken, then an Independent Review may be requested by the complainant. If determined to be warranted by the Secretary,

an independent review will be undertaken in accordance with the process identified in Schedule 5 of SSD-5465.

7.2 Training, Awareness and Competence

Training is an essential component of the implementation phase of this BCMP. The Environmental Compliance Coordinator will ensure that training and awareness processes are implemented to manage, identify and minimise potential impacts of CVC and to ensure personnel are aware of their roles and responsibilities in terms of benthic management.

Generally training at CVC consists of induction training for new starters and contractors along with environmental awareness training at two-year intervals and ongoing “toolbox” training for all permanent employees as required.

The Environmental Compliance Coordinator is the contact point for any person that does not understand this document or their specific requirements, and will provide guidance and training to any person that requires additional training regarding this BCMP.

8 Audit and Review

8.1 Review and Improvement

This document shall be reviewed, and if necessary revised, within 3 months of the following:

- the submission of an Annual Review;
- the submission of an incident report;
- the submission of an independent environmental audit; and
- following any modification to the development consent.

As outlined in **Section 6.2**, the Annual Review will include a review of the seasonal monitoring program and mine plans to ensure that any reference sites that have been impacted by mining reclassified as impacted impact sites, and replacement reference sites identified and sampled. Survey methods will be reviewed every two years to refine the sampling program if required. Improvements identified during reviews or audits will be incorporated into the BCMP.

8.2 Auditing

Internal and external audits of this document will be carried out as described below. Internal and external audits shall be objective and if possible be conducted by a person or organisation independent of the document being audited.

Audits shall be carried out by personnel who have the necessary qualifications and experience to make an objective assessment of the issues. The extent of the audit, although pre-determined, may be extended if a potentially serious deviation from this document is detected.

Any audit non-conformances and/or improvement opportunities will have corrective and preventative actions implemented to avoid recurrence, these actions will be loaded into the site Incident Database to ensure the actions are assigned to the relevant people and completed.

External audits will be conducted utilising external specialists and will consider this document and related documents. External auditors shall be determined based on skills and experience and upon what is to be accomplished.

An Independent Environmental Audit (IEA) was undertaken during June 2019. In accordance with SSD-5465 Schedule 6, Condition 9, IEA's will be scheduled for every three years thereafter (unless the Secretary directs otherwise) by an audit team whose appointment has been endorsed by the Secretary.

9 Records and Document Control

9.1 Records

Generally, the Environmental Compliance Coordinator will maintain all Environmental Management System records which are not of a confidential nature. Records that will be maintained include:

- monitoring data;
- environmental inspections and auditing results;
- environmental incident reports;
- the complaints register; and
- licences and permits.

All records will be stored so that they are legible, readily retrievable and protected against damage, deterioration and loss. Records will be maintained for a minimum of 4 years or as otherwise required under any legislation, licence, lease, permit or approval.

9.2 Document Control

This document and all others associated with the Environmental Management System shall be maintained in a document control system which is in compliance with the site Document Control Standard which is available to all site personnel. Any proposed change to this document will be via the Environmental Compliance Coordinator or Approvals Coordinator.

A copy of this document is available on the DC website. Document revision details are provided in **Table 5**.

Table 5: Document Revision Details

Version	Date	Details of Revision	Company	Reviewed by/ Authorised by
1	May 2012	Version 1 Final	LakeCoal	Unknown
2	07/04/2014	Version 2 Final	LakeCoal	Chris Ellis
3	10/02/2017	Version 3 Final	LakeCoal	Wade Covey
4	14/05/2018	LakeCoal updated document to reflect the development consent requirements and to include monitoring locations for proposed mining areas that are referred to in Extraction Plan	LakeCoal	Wade Covey Adrian Moodie
5	17/06/2019	Updated for Miniwalls S2/S3	Delta Coal	Chris Armit
6	10/03/2020 12/05/2020	Updated document to reflect current S4 workings and consultation with stakeholders	EMM Consulting / Delta Coal	Katie Weekes Chris Armit

Version	Date	Details of Revision	Company	Reviewed by/ Authorised by
		Updated document to reflect consultation with DPIE and 2020 statistics report		
7	04/12/20 18/01/21 19/03/2021 6/04/2021	Updated document for S5 and NMA pillar extraction areas and SSD5465 Modification 3 Updated for consultation Plan approval from DPIE	Delta Coal	Chris Armit

10 Roles and Responsibilities

All employees and contractors at CVC are responsible for environmental management. However, various positions in the organisation have roles, responsibilities and authorities for managing environmental aspects, action plans, programs and controls.

Roles and responsibilities specific to completing the requirements of this plan are identified in **Table 6**.

Table 6: Benthic Communities Management Plan Roles and Responsibilities

Role	Responsibilities
Manager of Mining Engineering (Mine Manager)	• Ensure that adequate financial and personnel resources are made available for the implementation of the BCMP • Maintain overall responsibility for environmental compliance with Mining Lease, EPL, development consent and other mining approvals as they pertain to the management of benthic communities • Ensure that appropriate mining engineering and geotechnical engineering designs are undertaken to protect subsidence barriers and maintain compliance within subsidence limits • Ensure that adequate training is provided to staff to minimise impacts to benthic communities

Role	Responsibilities
Environmental Compliance Coordinator or delegate	• Co-ordinate benthic community monitoring • Review benthic community monitoring results on a seasonal and annual basis • Develop management actions in consultation with regulatory agencies as/if required from the monitoring results • Compile the Annual Review (including a summary of the benthic community monitoring) • Respond to any potential or actual non-compliance and report these as required to regulatory bodies and other stakeholders • Undertake reviews of this document • Undertake or coordinate the required audits of this document • Notify relevant agencies if there are any exceedances in impact thresholds • Ensure complaint handling and response is undertaken, including determination of sources and potential remedial action to avoid recurrence
Mine Surveyor	• Ensure mine layout and workings are set out as approved, taking into consideration protection barriers and subsidence predictions
All employees and contractors	• Comply with the requirements of this BCMP • Immediately notify Environmental Compliance Coordinator of possible incident

11 References

Documents referenced in the preparation of the BCMP are detailed in **Table 7**.

Table 7: References

Reference	Title
Australian Standards	AS/NZS ISO 14001:2004, *Environmental management systems – Requirements with guidance for use* AS/NZS ISO 14004:2004, *Environmental management systems – General guidelines on principles, systems and support techniques* ANZECC 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*
Government Department	Department of Primary Industries (2013), *Policy and guidelines for fish habitat conservation and management* SSD-5465 Development Consent SSD-5465 (Modification 2), 16 December 2015 NSW EPA Environment Protection Licence: EPL 1770, 2 April 2019
Delta Coal documents	EMS Environmental Management Strategy.
External documents	JSA Environmental 2013, *Chain Valley Colliery Mining Extension 1 Project Marine Ecology Assessment,* Lake Coal JSA Environmental 2015*, Chain Valley Colliery Modification 2 Marine Ecology Assessment,* Lake Coal JSA Environmental 2018*, Chain Valley Colliery Benthos Statistical Analysis,* Lake Coal EMM Consulting 2020, Chain Valley Colliery Benthic Community Monitoring - Statistical Analysis Laxton 2020, *Benthic Communities Survey of Chain Valley Bay, Summerland Point and Crangan Bay, Lake Macquarie*, NSW Laxton and Laxton 2019, *Benthic Communities Survey of Chain Valley Bay, Summerland Point and Crangan Bay, Lake Macquarie*, NSW Laxton and Laxton 2018, *Benthic Communities Survey of Chain Valley Bay, Summerland Point and Crangan Bay, Lake Macquarie*, NSW Laxton and Laxton 2017, *Benthic Communities Survey of Chain Valley Bay, Summerland Point and Crangan Bay, Lake Macquarie*, NSW Laxton and Laxton 2016*, Lake Macquarie Benthos Survey Results No.10 September 2016.* J.H. & E.S. Laxton - Environmental Consultants P/L. Report for Lake Coal Pty Ltd Chain Valley Colliery Laxton and Laxton 2015, *Benthic Communities Survey of Chain Valley Bay, Summerland Point and Crangan Bay, Lake Macquarie*, NSW Laxton and Laxton 2014, *Benthic Communities Survey of Chain Valley Bay, Summerland Point and Crangan Bay, Lake Macquarie*, NSW

Reference	Title
	Laxton & Laxton, 2013, *Lake Macquarie Benthos Survey Results of Sampling No. 4.* September 2013. Laxton and Laxton 2012, *Benthic Communities Survey of Chain Valley Bay, Summerland Point and Crangan Bay, Lake Macquarie*, NSW O'Connor S et al 2007, Stone Construction on Rankin Island, Kimberley, Western Australia, Australian Archaeology, Number 64, PP: 15-22

12 Definitions

CVC Delta Coal - Chain Valley Colliery

DA Development approval

DC Delta Coal

DP&E Department of Planning & Environment (former)

DPIE Department of Planning, Industry and Environment

DPI Fisheries Department of Primary Industries – Fisheries NSW

DTIRIS Department of Trade, Investment, Regional Infrastructure and Services

EMS Environment Management System

EPA NSW Environment Protection Authority

EPL Environmental Protection License

EP&A Act *Environmental Planning and Assessment Act 1979*

LMCC Lake Macquarie City Council

POEO Act *Protection of the Environment Operations Act 1997*

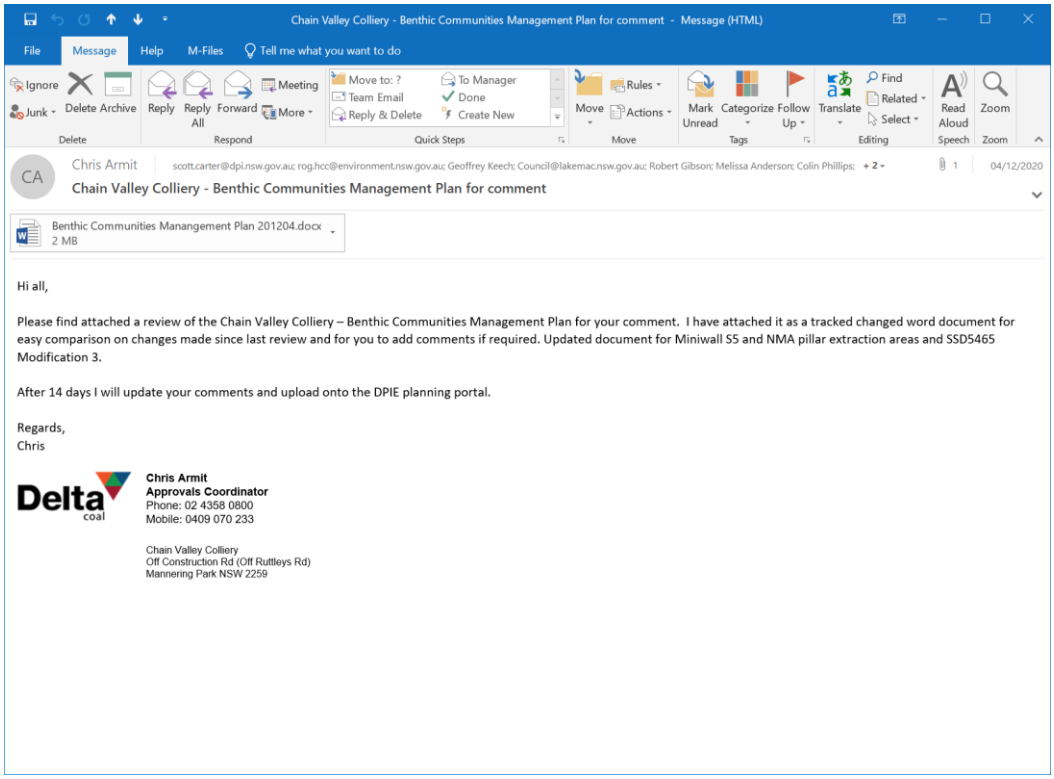
OEH Office of Environment and Heritage

ROM Run-of-mine

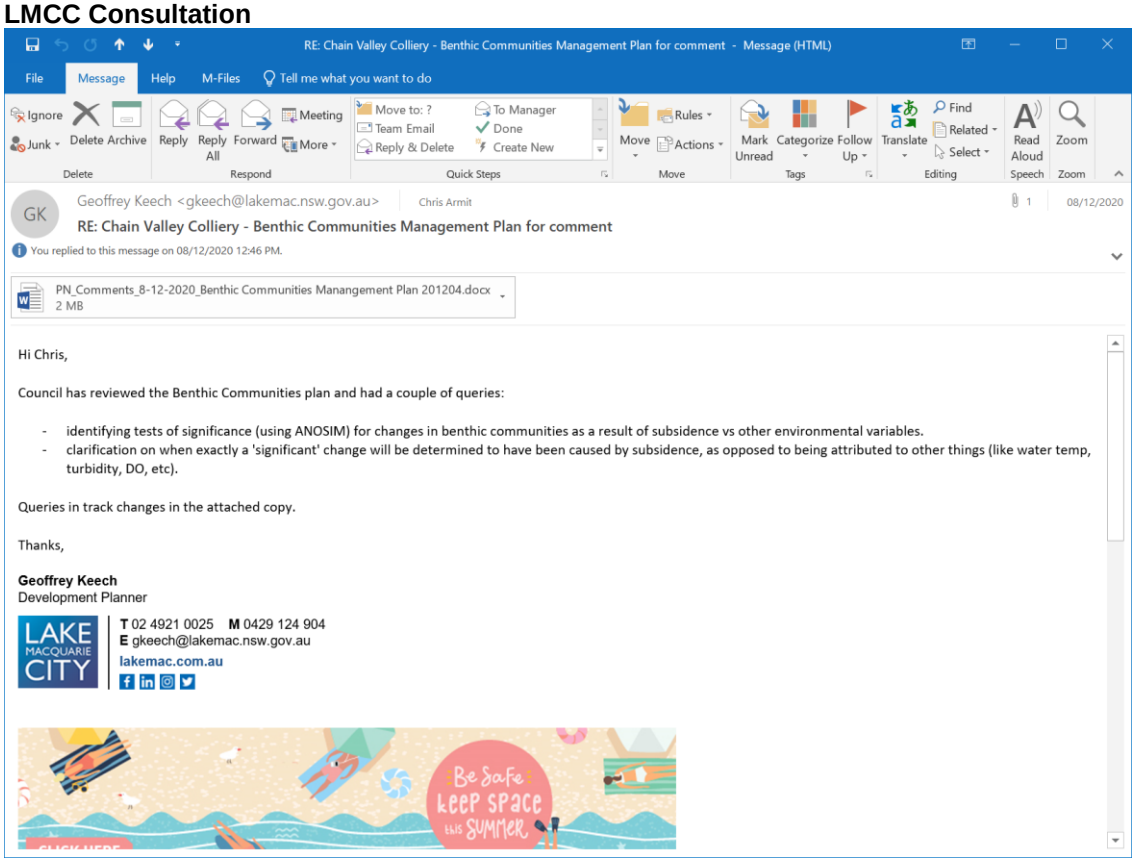
Secretary
Secretary of the Department of Planning and Environment, or nominee

SSD-5465
Development Consent SSD-5465 (for the Chain Valley Colliery Mining Extension 1 Project)

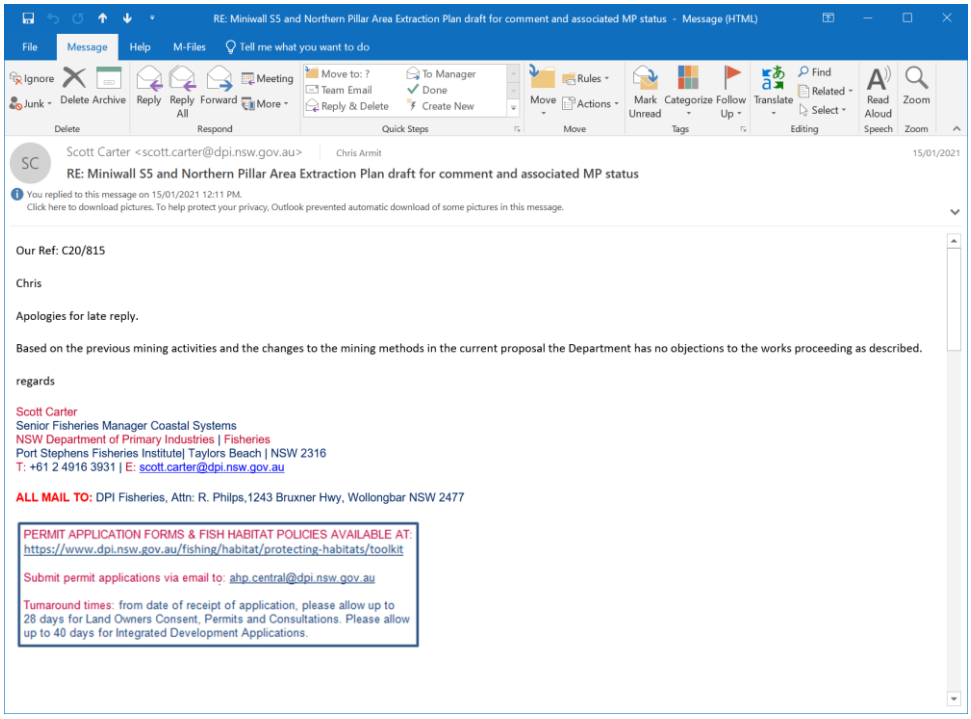
Appendix 1: Consultation



LMCC Consultation



DPI Fisheries Consultation



RE: Miniwall S5 and Northern Pillar Area Extraction Plan draft for comment and associated MP status - Message (HTML)

File Message Help M-Files Tell me what you want to do

Ignore Junk Delete Archive Reply Reply All Forward Meeting More Move to: ? To Manager Team Email Done Reply & Delete Create New Rules Actions Move Mark Unread Categorize Follow Up Translate Find Related Select Read Aloud Zoom

Delete Respond Quick Steps Move Tags Editing Speech Zoom

SC Scott Carter <scott.carter@dpi.nsw.gov.au> Chris Armit 15/01/2021

RE: Miniwall S5 and Northern Pillar Area Extraction Plan draft for comment and associated MP status

You replied to this message on 15/01/2021 12:11 PM.
Click here to download pictures. To help protect your privacy, Outlook prevented automatic download of some pictures in this message.

Our Ref: C20/815

Chris

Apologies for late reply.

Based on the previous mining activities and the changes to the mining methods in the current proposal the Department has no objections to the works proceeding as described.

regards

Scott Carter
Senior Fisheries Manager Coastal Systems
NSW Department of Primary Industries | Fisheries
Port Stephens Fisheries Institute| Taylors Beach | NSW 2316
T: +61 2 4916 3931 | E: scott.carter@dpi.nsw.gov.au

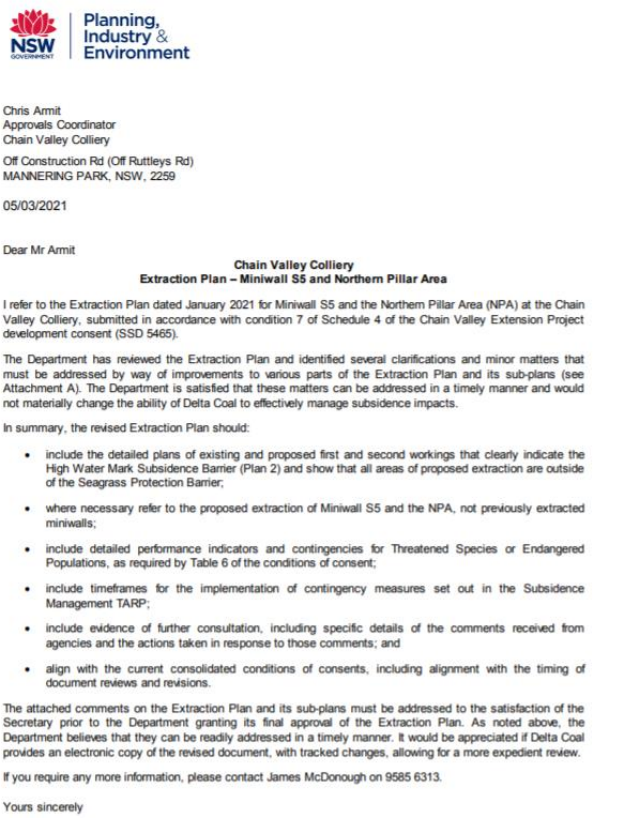
ALL MAIL TO: DPI Fisheries, Attn: R. Philps,1243 Bruxner Hwy, Wollongbar NSW 2477

PERMIT APPLICATION FORMS & FISH HABITAT POLICIES AVAILABLE AT:
https://www.dpi.nsw.gov.au/fishing/habitat/protecting-habitats/toolkit

Submit permit applications via email to: ahp.central@dpi.nsw.gov.au

Turnaround times: from date of receipt of application, please allow up to 28 days for Land Owners Consent, Permits and Consultations. Please allow up to 40 days for Integrated Development Applications.

DPIE Consultation - Request for Information Letter



NSW GOVERNMENT Planning, Industry & Environment

Chris Armit
Approvals Coordinator
Chain Valley Colliery

Off Construction Rd (Off Ruttleys Rd)
MANNERING PARK, NSW, 2259

05/03/2021

Dear Mr Armit

Chain Valley Colliery
Extraction Plan – Miniwall S5 and Northern Pillar Area

I refer to the Extraction Plan dated January 2021 for Miniwall S5 and the Northern Pillar Area (NPA) at the Chain Valley Colliery, submitted in accordance with condition 7 of Schedule 4 of the Chain Valley Extension Project development consent (SSD 5465).

The Department has reviewed the Extraction Plan and identified several clarifications and minor matters that must be addressed by way of improvements to various parts of the Extraction Plan and its sub-plans (see Attachment A). The Department is satisfied that these matters can be addressed in a timely manner and would not materially change the ability of Delta Coal to effectively manage subsidence impacts.

In summary, the revised Extraction Plan should:

- include the detailed plans of existing and proposed first and second workings that clearly indicate the High Water Mark Subsidence Barrier (Plan 2) and show that all areas of proposed extraction are outside of the Seagrass Protection Barrier;
- where necessary refer to the proposed extraction of Miniwall S5 and the NPA, not previously extracted miniwalls;
- include detailed performance indicators and contingencies for Threatened Species or Endangered Populations, as required by Table 6 of the conditions of consent;
- include timeframes for the implementation of contingency measures set out in the Subsidence Management TARP;
- include evidence of further consultation, including specific details of the comments received from agencies and the actions taken in response to those comments; and
- align with the current consolidated conditions of consents, including alignment with the timing of document reviews and revisions.

The attached comments on the Extraction Plan and its sub-plans must be addressed to the satisfaction of the Secretary prior to the Department granting its final approval of the Extraction Plan. As noted above, the Department believes that they can be readily addressed in a timely manner. It would be appreciated if Delta Coal provides an electronic copy of the revised document, with tracked changes, allowing for a more expedient review.

If you require any more information, please contact James McDonough on 9585 6313.

Yours sincerely

DPIE Request for Information Letter - Response Summary Table

DPIE Review	Response
include the detailed plans of existing and proposed first and second workings that clearly indicate the High Water Mark Subsidence Barrier (Plan 2) and show that all areas of proposed extraction are outside of the Seagrass Protection Barrier	Plan 2 updated to include clear indication of the High Water Subsidence Barrier. All secondary workings extraction areas are located outside of Seagrass Protection Barrier.
where necessary refer to the proposed extraction of Miniwall S5 and the NPA, not previously extracted miniwalls	Document updated for legacy miniwall naming (see tracked changes)
include detailed performance indicators and contingencies for Threatened Species or Endangered Populations, as required by Table 6 of the conditions of consent	Subsidence Management TARP updated to include Threatened Species or Endangered Populations
include timeframes for the implementation of contingency measures set out in the Subsidence Management TARP	Incident and non-compliance reporting timeframes included. Timeframes of contingency measures implementation added to the Subsidence Management TARP
include evidence of further consultation, including specific details of the comments received from agencies and the actions taken in response to those comments	See updates in section 2.5 Table 1 and Appendix 1 which includes specific stakeholder comment details and communications.
align with the current consolidated conditions of consents, including alignment with the timing of document reviews and revisions	Consent references updated to changes in SSD5465 Modification 3 numbering and conditions.
It would be appreciated if Delta Coal provides an electronic copy of the revised document, with tracked changes, allowing for a more expedient review	A Microsoft Word document has been provided with tracked changes included at the start of the document change process. Plan 2 amendment and Subsidence Management TARP were not able to be tracked changed as they were drafted in software without the tracked changes option.

Planning, Industry & Environment

Chris Armit
Approvals Coordinator
Chain Valley Colliery
Delta Coal Pty Ltd
Off Construction Road (Off Rutleys Road)
Mannering Park NSW 2259

06/04/2021

Dear Mr Armit

Chain Valley Colliery (SSD 5465)
Miniwall S5 and NPA Extraction Plan

I refer to the Miniwall S5 and NPA Extraction Plan which was submitted on 18 January 2021 in accordance with Condition 7 of Schedule 4 of the consent for Chain Valley Colliery (SSD 5465).

The Department has carefully reviewed the document and is satisfied that it addresses the requirements of the conditions of consent for Extraction Plans (see Attachment A).

Accordingly, the Planning Secretary has approved the Miniwall S5 and NPA Extraction Plan (Revision 1.2, dated 10 March 2021). Please ensure that the approved plan is placed on the project website at your earliest convenience.

If you wish to discuss the matter further, please contact James McDonough on 9585 6313.

Yours sincerely

Lauren Evans
A/Director
Resource Assessments (Coal & Quarries)
As nominee of the Planning Secretary

Planning, Industry & Environment

ATTACHMENT A

Consideration of Approval of Miniwall S5 and NPA Extraction Plan

1. As required by condition 7 of Schedule 4 of the consent for Chain Valley Colliery (SSD 5465), the Extraction Plan (EP) for proposed Miniwall S5 and the Northern Pillar Area (NPA) consists of an overarching document that describes the proposed mining operations, supported by a specialist subsidence assessment, and a series of specialist management plans (MPs) including a:
   - Public Safety MP;
   - Built Features MP;
   - Groundwater MP;
   - Rehabilitation MP;
   - Benthic Communities MP;
   - Seagrass MP;
   - Subsidence Monitoring MP; and
   - Subsidence Management Trigger Action Response Plan (TARP).

   The EP was submitted by Delta Coal. The EP was prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Secretary. Many of these MPs are little changed from when they were reviewed in March 2020 as part of the EP for Miniwall S4, which was approved in June 2020.

Appendix 2: Development Consent Summary

Chain Valley Colliery Development Consent SSD-5465 Summary

This BCMP has been prepared in accordance to Schedule 4, Condition 7(h) of SSD-5465, which states the requirements of the BCMP and what it must address. **Table A2** outlines the requirements of the BCMP and where this document addresses these requirements.

Table A2: Requirements from Chain Valley Colliery Development consent SSD-5465

<table>
<tr><th>Condition No.</th><th>Requirement</th><th>Relevant section of this document</th></tr>
<tr><td></td><td>Schedule 2 Administrative Conditions</td><td></td></tr>
<tr><td>23</td><td>•
Staging, combining and updating strategies, Plan or Programs
With the approval of the Planning Secretary, the Applicant may: (a) prepare and submit any strategy, plan or program required by this consent on a staged basis (if a clear description is provided as to the specific stage and scope of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program); (b) combine any strategy, plan or program required by this consent (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined); (c) update any strategy, plan or program required by this consent (to ensure the strategies, plans and programs required under this consent are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the development); and (d) combine any strategy, plan or program required by this consent with any similar strategy, plan or program required by an adjoining mining consent or approval, in common ownership or management.</td><td>Section 8</td></tr>
<tr><td></td><td>Schedule 3 Specific Environmental Conditions</td><td></td></tr>
<tr><td>2</td><td>Performance Measures- Natural Environment

The Applicant shall ensure that the development does not cause any exceedance of the performance measures in Table 6 to the satisfaction of the Planning Secretary.

Table 6: Subsidence Impact Performance Measures
<table>
<tr><td colspan="2">Biodiversity</td></tr>
<tr><td>Threatened species or endangered populations</td><td>Negligible environmental consequences</td></tr>
</table></td><td>This document</td></tr>
</table>

	Seagrass beds	*Negligible environmental consequences including:* • *Negligible change in the size and distribution of seagrass beds;* • *Negligible change in the functioning of seagrass beds; and* • *Negligible change to the composition or distribution of seagrass species within seagrass beds.*
	Benthic communities	*Minor environmental consequences, including minor changes to species composition and/or distribution*
	Mine workings	
	First workings under an approved Extraction Plan beneath any feature where performance measures in this table require negligible environmental consequences	*To remain long-term stable and non-subsiding.*
	Second workings	*To be carried out only in accordance with an approved Extraction Plan.*
	Notes: • *The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) for each of these performance measures in the various management plans that are required under this consent (see Condition 7 below).* • *Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Planning Secretary will be the final arbiter.* *The requirements of this condition only apply to the impacts and consequences of mining operations, construction or demolition undertaken following the date of approval of this consent*	
3	***Offsets*** *If the Applicant exceeds the performance measures in Table 6 and the Planning Secretary determines that: (a) it is not reasonable or feasible to remediate the impact or environmental consequence; or (b) the remediation measures implemented by the Applicant have failed to satisfactorily remediate the impact or environmental consequence; then the Applicant must provide a suitable offset to compensate for the impact or environmental consequence to the satisfaction of the Planning Secretary. Note: Any offset required under this condition must be proportionate with the significance of the impact or environmental consequence.*	**Section 4**
7	***Extraction Plan*** ***(h)*** *include a Benthic Communities Management Plan, which has been prepared in consultation with BCD, LMCC, and DPI Fisheries, which provides for the management of the potential impacts and/or*	**This document**

	environmental consequences of the proposed second workings on benthic communities, and which includes: • *surveys of the lakebed to enable contours to be produced and changes in depth following subsidence to be accurately measured;* • *benthic species surveys within the area subject to second workings, as well as control sites outside the area subject to second workings (at similar depths) to establish baseline data on species number and composition within the communities;* • *a program of ongoing seasonal monitoring of benthic species in both control and impact sites;* • *development of a model to predict likely impact of increased depth and associated subsidence impacts and effects, including but not limited to light reduction and sediment disturbance, on benthic species number and benthic communities' composition, incorporating the monitoring and survey data collected; and* • *updating the model every 2 years using the most recent monitoring and survey data.* *The Applicant must implement the approved management plan as approved from time to time by the Planning Secretary.* *Notes:* • *To identify the underground mining areas approved under this consent referred to in this condition, see Appendix 3.* • *This condition does not limit secondary extraction under a Subsidence Management Plan approved as at the date of this consent.* *The Applicant must implement the Extraction Plan as approved by the Planning Secretary.*	
8	*The Applicant must ensure that the management plans required under conditions 7(g)-(j) above include: (a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this consent; and (b) a detailed description of the measures that would be implemented to remediate predicted impacts*	**Section 4 and 6**

Appendix 8 Seagrass Management Plan

Delta coal	Doc Owner: **Approvals Coordinator** Doc No:

CHAIN VALLEY COLLIERY

Seagrass Management Plan

ENVIRONMENTAL MANAGEMENT PLAN

Reviewed	Chris Armit - Delta Coal
Authorised by:	Chris Armit - Approvals Coordinator
Date:	6 April 2021

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1 Introduction

1.1 Purpose

The purpose of this Seagrass Management Plan is to:

- outline details of the seagrass monitoring data collected;
- outline subsidence prediction methodology;
- outline the methodology to be used to identify depth changes at monitoring locations;
- identify seagrass monitoring locations;
- identify reporting requirements;
- detail seagrass management measures;
- identify the requirements for incident or exceedances reporting and reviews of the document; and
- identify persons responsible for implementation of requirements.

The overall aim of this management plan is to promote a high level of environmental performance through the minimisation of impacts.

A formal Environmental Management System (EMS) has been developed as a systematic and structured approach to managing environmental issues at the operation. This has been developed in general accordance with the requirements of the international standard ISO 14001.

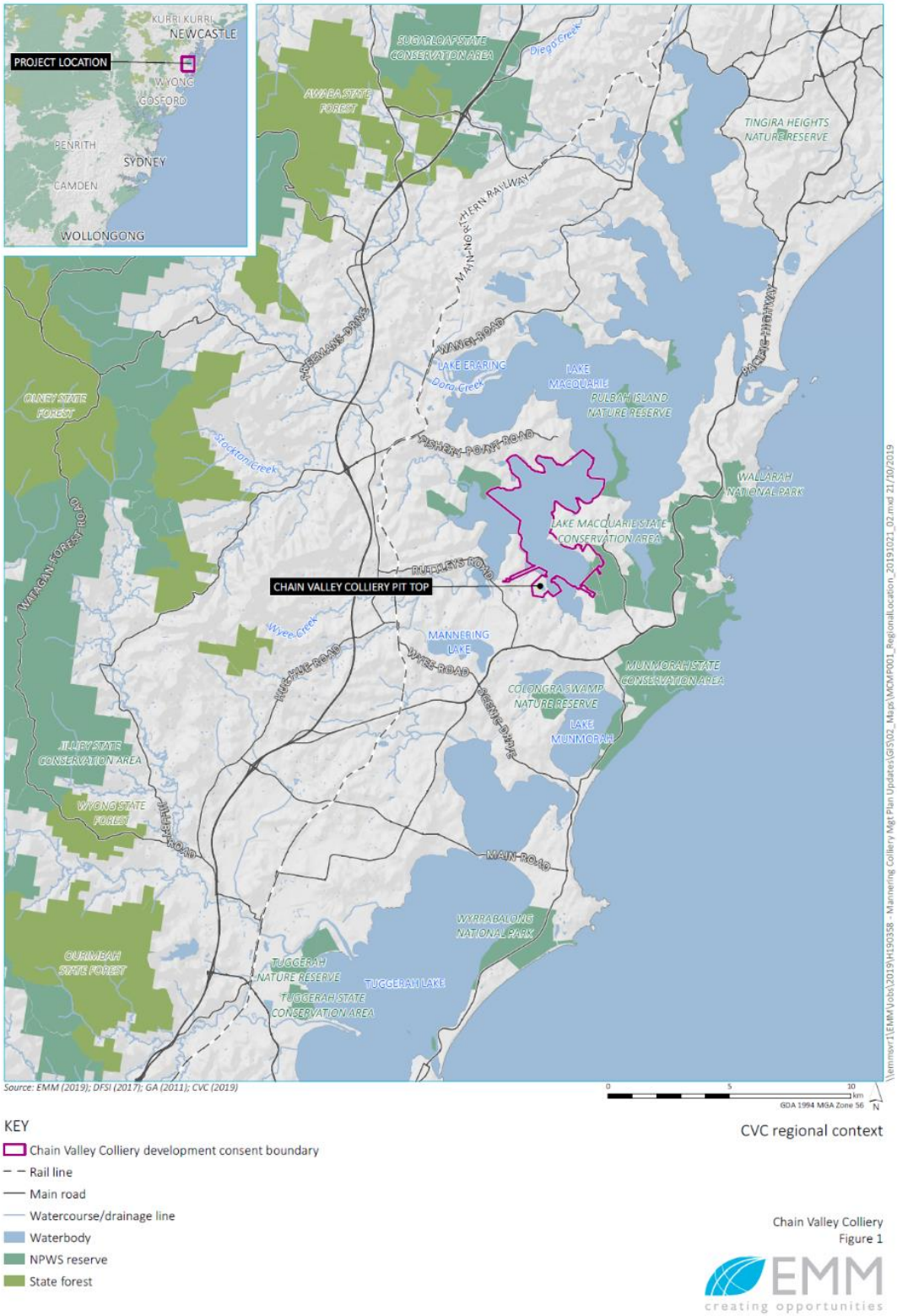
This Seagrass Management Plan is an element of the Delta Coal (DC) Environmental Management System (EMS).

1.2 Background

Chain Valley Colliery (CVC) is an underground coal mine located on the southern side of Lake Macquarie approximately 60 km south of Newcastle and 80 km north of Sydney (see Figure 1). The pit-top is located approximately 1 km south-east of the township of Mannering park at the southern extent of Lake Macquarie, as shown on Figure 1.

Mining is currently undertaken at CVC, with the coal being transported underground to Mannering Colliery (MC) where the coal is crushed and screened and sent directly to Vales Point Power Station (VPPS).

CVC has been operating since the early 1960s. As of 1 April 2019, Great Southern Energy Pty Ltd (trading as Delta Coal (DC)) own and operate the two underground coal mines, CVC and MC.


PROJECT LOCATION
KURRI KURRI
NEWCASTLE
WYONG
GOSFORD
PENRITH
SYDNEY
CAMDEN
WOLLONGONG
SUGARLOAF STATE CONSERVATION AREA
AWABA STATE FOREST
Diega Creek
TINGIRA HEIGHTS NATURE RESERVE
MAIN NORTHERN RAILWAY
WANGI ROAD
LAKE ERARING
Dora Creek
LAKE MACQUARIE
PULBAH ISLAND NATURE RESERVE
PACIFIC HIGHWAY
ASHTONS DRIVE
CHINEY STATE FOREST
Stockton Creek
FISHERY POINT ROAD
WALLARAH NATIONAL PARK
LAKE MACQUARIE STATE CONSERVATION AREA
WATAGAN FOREST ROAD
RUSSELLS ROAD
CHAIN VALLEY COLLIERY PIT TOP
Wyee Creek
MANNERING LAKE
MUNMORAH STATE CONSERVATION AREA
WYEE ROAD
COLONGRA SWAMP NATURE RESERVE
SCENIC DRIVE
LAKE MUNMORAH
TUGGERAH STATE CONSERVATION AREA
WYONG STATE FOREST
PACIFIC HIGHWAY
MAIN ROAD
WYRRABALONG NATIONAL PARK
OURIMBAH STATE FOREST
TUGGERAH NATURE RESERVE
TUGGERAH LAKE
\\emmsvr1\EMMJobs\2019\H190358 - Mannering Colliery Mgt Plan Updates\GIS\02_Maps\MCMP001_RegionalLocation_20191021_02.mxd 21/10/2019
Source: EMM (2019); DFSI (2017); GA (2011); CVC (2019)
0 5 10 km
GDA 1994 MGA Zone 56
N
KEY
Chain Valley Colliery development consent boundary
Rail line
Main road
Watercourse/drainage line
Waterbody
NPWS reserve
State forest
CVC regional context
Chain Valley Colliery
Figure 1
EMM
creating opportunities

1.3 Consultation

The original version of this Seagrass Management Plan was provided to OEH, LMCC and DPI Fisheries for comment. Both LMCC and DPI Fisheries reviewed the Seagrass Management Plan, with comments from DPI Fisheries provided on the 28th June 2013. At that time DPI Fisheries had no objection to the plan being implemented as written. Comments from Lake Macquarie City Council were received on the 19th July 2013, which were addressed and incorporated into the document, this final version was then sent back to Council who confirmed on the 19th August 2013 that the changes had addressed their comments. The changes made previously to address Council's comments remain in the current version.

Revision 2 of the draft Seagrass Management Plan was provided to OEH, DPI Fisheries and LMCC on the 12th March 2014, with comments on the draft plan requested back by the 1st April 2014. The only response received was from OEH, dated the 21st March 2014. The OEH noted that while they encourage the development of such plans, they do not approve or endorse these documents and accordingly no comments were provided.

Revision 3 of the Seagrass Management Plan was sent to OEH, DPI Fisheries and LMCC on 4 November 2016 for review and comment. All three agencies provided comments on the revised Plan. LMCC and DPI Fisheries confirmed that the document was acceptable in its revised form while OEH noted that while they encourage the development of such plans, they do not approve or endorse these documents and accordingly no comments were provided on the content of the Plan.

Revision 4 of the Seagrass Management Plan was provided to OEH, DPI Fisheries and LMCC on 26 February 2018 with the Extraction Plan application for Chain Valley Colliery's Northern Mining Area (NMA).

Revision 5 of the Seagrass Management Plan was sent to OEH, DPI Fisheries and LMCC in May 2019. On the 5 June 2019 DPI Fisheries responded that the Seagrass Management Plan was adequate. On 5 June 2019 OEH noted that they do not approve or endorse these documents and accordingly no comments were provided on the content of the Plan.

Revision 8 of the Seagrass Management Plan was sent to DPI-Fisheries, OEH, DPIE and LMCC on 27 November 2020.

A summary of the comments received, and amendments subsequently made to the document prior to finalisation are detailed in **Table 1**. Evidence of consultation is provided in **Appendix 1**. This plan was approved by DPIE on the 6 April 2021 as part of the Miniwall S5 and Northern Pillar Area extraction plan.

Table 1: Consultation Summary

Stakeholder	Comments	Response/Action
DPI- Fisheries	• Based on the previous mining activities and the changes to the mining methods in the current proposal the Department (i.e Fisheries) has no objections to the works proceeding as described.	• Nil required
NSW DPIE-BCD	• No comments	• Nil required
Resource Regulator	• No comments	• Nil required
DPIE-Resource Assessments	• Request for information (RFI) provided on 5 March 2020. See attached DPIE RFI letter and attachment (Appendix 1). Extraction Plan approval which includes approval of the Seagrass Management Plan (Appendix 1).	• Section 2.3 updated • Tracked changed document provided on planning portal for updated consent references and mining panel numbering

Stakeholder	Comments	Response/Action
LMCC	• Comments received from LMCC on the Seagrass Management Plan via tracked changes in a word document. Two main points in this consultation were; • A couple of typographical errors • Missing figure numbers and • Alternative options for remediation of seagrass where that may be required	• Seagrass Management Plan updated for typographical errors and missing figure numbers and included alternative seagrass remediation option
Combined CVC and MC Community Consultative Committee	• No comments	• Nil required

2 Statutory Requirements

2.1 Key Legislation, Policy and Guidelines

Both State and Commonwealth environmental legislation applies to DC's operation and activities. A number of legislative requirements, government policies and guidelines are applicable. Key items relevant to this management plan are:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Protection of the Environment Operations Act 1997* (POEO Act);
- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Mining Act 1992*;
- *National Parks and Wildlife Act 1974*;
- *Biodiversity Conservation Act 2016*; and
- Department of Primary Industries (2013), *Policy and guidelines for fish habitat conservation and management*.

Delta lands are within the LMCC and Central Coast Council local government areas (LGAs).

2.2 Development Consent SSD-5465 (as modified)

This management plan has also been completed to satisfy the requirements of Development Consent SSD–5465 (Modification 3), Schedule 4, Condition 7(i) and Schedule 4, Table 8, which states:

"7. The Applicant must prepare an Extraction Plan for all second workings on site, to the satisfaction of the Planning Secretary. Each Extraction Plan must:

(i) include a Seagrass Management Plan, which has been prepared in consultation with BCD, LMCC, and DPI Fisheries, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on seagrass beds, and which includes:

- a program of ongoing monitoring of seagrasses in both control and impact sites; and
- a program to predict and manage subsidence impacts and environmental consequences to seagrass beds to ensure the performance measures in Table 8 are met."

In addition to the above, Condition 2 within Schedule 4 of SSD-5465 (Modification 3) also requires that:

"The Applicant must ensure that the development does not cause any exceedance of the performance measures in Table 6 to the satisfaction of the Planning Secretary."

The relevant seagrass requirements from Table 8 within Schedule 4 of the Development Consent, including the relevant notes, are recreated in **Table 2**.

Table 2: Subsidence Impact Performance Measures - Natural and Heritage Features

Biodiversity	
Seagrass beds	Negligible environmental consequences including: • *negligible* change in the size and distribution of seagrass beds; • *negligible* change in the functioning of seagrass beds; and • *negligible* change to the composition or distribution of seagrass species within seagrass beds.

Notes:

- *The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) for each of these performance measures in the various management plans that are required under this consent (see Condition 7 below).*
- *Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Secretary will be the final arbiter.*
- *The requirements of this condition only apply to the impacts and consequences of mining operations, construction or demolition undertaken following the date of approval of this consent.*

Seagrass related requirements of SSD-5465, including specific requirements that are to be addressed in this plan, and where they are addressed, are detailed in **Appendix 2**.

3 Background

3.1 Operations

CVC is an underground coal mine with current coal mining methods including development of roadways in the coal seam known as first workings and secondary workings.

Lake Macquarie is the largest saline lake in New South Wales. It lies on the central coast between Sydney and Newcastle within the local government areas of Wyong and Lake Macquarie. Lake Macquarie has a catchment of 700 km^2 and a water surface area of 125 km^2 (Bell & Edwards, 1980). The lake has a permanent entrance to coastal waters at Swansea and has an average depth of around 6 m (Laxton, 2005).

The catchment of Lake Macquarie is largely rural with large areas of bush land and grazing land. The shoreline of Lake Macquarie is heavily urbanised, especially the eastern, western and northern shorelines. The region has a relatively long history of coal mining and power generation, with mining occurring since the late 1800s and the first power station at Lake Macquarie commencing operations in 1958.

CVC is situated on the southern shores of Lake Macquarie near Mannering Park, NSW. The mine has been operating since 1962. Mining is currently undertaken using bord and pillar and miniwall methods with first workings to support the development in advance of each Miniwall or pillar extraction panel. All secondary extraction is currently occurring in the Fassifern Seam, in line with Development Consent SSD–5465. The general layout of the CVC Extension Project in respect to Lake Macquarie is shown on **Figure 2**.

3.2 Seagrass Communities

Lake Macquarie contains approximately 10% of the total area of seagrass beds in NSW (DPI 2007). The following four species of seagrass occur in Lake Macquarie:

- eelgrass (*Zostera capricorni*);
- paddle weed (*Halophila ovalis*);
- *Ruppia sp.*; and
- strapweed (*Posidonia Australia*), which is listed as an endangered species under the *Fisheries Management Act, 1994*.

Seagrass distribution within estuaries is naturally influenced by light penetration, depth, salinity, nutrient status, bed stability, wave energy, estuary type, and the evolutionary stage of the estuary. Light is a major limiting factor for the growth of seagrasses and the effects of shading either by artificial structures or increased turbidity associated with sediment re-suspension are common light reducing factors in estuaries (BioAnalysis, 2008).

Seagrass communities in Lake Macquarie appear to have declined since 1953, though there was a general increase in the cover of seagrass in Lake Macquarie between 2000 and 2004 due to a change in light penetration following a period of lower freshwater inputs (King and Barclay 1986; Wellington 2000; Gray and Wellington 2004).

Annual surveys of seagrass communities at Summerland Point, Chain Valley and Crangan Bay (i.e. within and adjacent to the current mining areas) have been undertaken by J.H. & E.S. Laxton - Environmental Consultants Pty Ltd (Laxton Environmental Consultants) on behalf of Delta Coal (and previously LakeCoal) since 2008. Additional survey locations in Bardens Bay were added to the survey program in 2014. Two species of seagrass are present in these areas, namely, eelgrass and paddle weed.

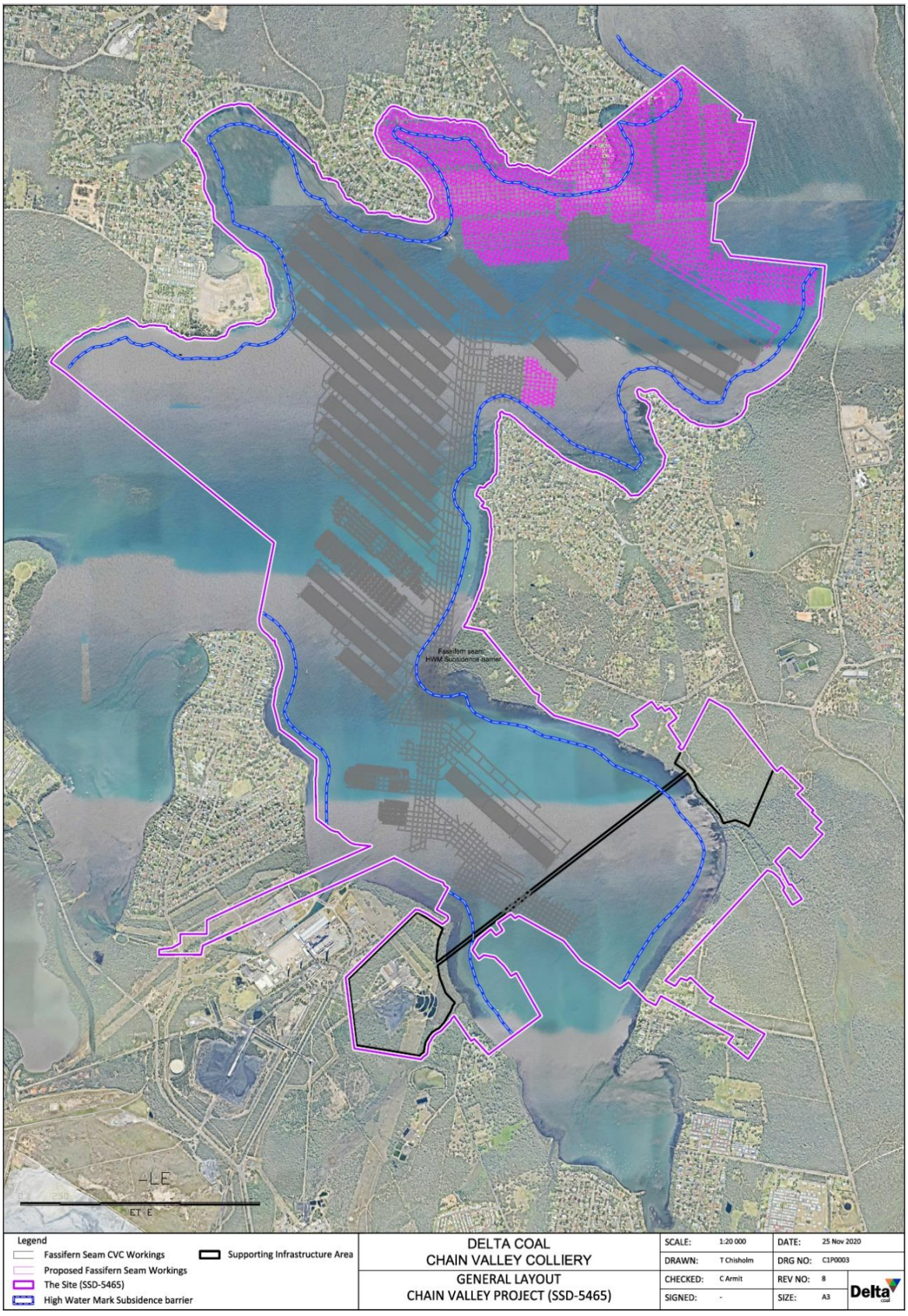


Figure 2: General Layout of the Chain Valley Northern Mining Domain

The 2020 survey report *Seagrass Survey of Chain Valley Bay, Summerland Point, Bardens Bay and Crangan Bay, Lake Macquarie, NSW (Results for 2008 to 2020)* (Laxton Environmental Consultants, May 2020) reported seagrass cover along the transects ranged from 75.9% to 100% of the substratum in 2020. Since 2011 seagrass cover has generally increased progressively. This annual increase in seagrass cover is most likely attributable to the cessation of commercial fishing in Lake Macquarie which was known to impact on the seagrass beds through land-based netting practices.

In 2020 there were no changes in seabed height across transects greater than 0.15 m (0.15 m trigger level) compared with the datum from previous years.

Several studies have been conducted on the seagrass beds in Chain Valley Bay and Summerland Point that are relevant to this Seagrass Management Plan.

In 2007, LakeCoal engaged Laxton Environmental Consultants to identify environmental factors including seagrasses, benthic fauna and bathymetry. The study area was the area east of Mannering Park where it was found that the seagrass beds were composed of *Zostera capricorni* (eelgrass) only.

It was concluded that seagrasses in Chain Valley Bay commenced along the lake edge and appeared to have a depth limit of less than 2 m. Any mining beneath the beds could lead to subsidence which would cause a decline of seagrasses along the outer edge of the seagrass beds. It was also concluded that the distribution and density of seagrass beds in Chain Valley Bay could change due to events unrelated to underground coal mining.

In July 2008, the seagrass survey was conducted to the west of Summerland Point (see **Figure 1**), from Frying Pan Point to Sandy Beach Reserve, Summerland Point, Lake Macquarie. The 2008 seagrass survey provided the baseline data for seagrass distribution, density and condition to which annual surveys are compared. It was determined that seagrass densities in Chain Valley Bay and Crangan Bay ranged from 17.74 to 99.32% of the substratum in the -0.19 to -2.34 A.H.D zone around the shore.

Two forms of the seagrass *Zostera capricorni* were present; short leaved and long leaved forms. In Lake Macquarie, the distinction between these two forms of *Zostera capricorni* appeared to be arbitrary. In 2010 a second species of seagrass, *Halophila ovalis* (paddle weed), was discovered for the first time at transect E6 in Chain Valley Bay.

Subsequent annual seagrass surveys discovered large and unexplained changes in seagrass cover which were unrelated to underground coal mining, as no mining had impacted seagrass beds since commencement of monitoring. The precise reasons for these longer term changes in seagrass distribution are not always obvious but may be related to changes in water transparency, salinity, nutrient concentrations and the proliferation of epiphytic algae. Migration of sediment may also change the distribution of seagrasses over time. It is also thought that the cessation of commercial fishing in Lake Macquarie has positively contributed to the regrowth of seagrass beds.

Seagrass is a vital component of Lake Macquarie's marine ecosystem. It captures the sun's energy and converts it into organic matter that may be utilised by the whole food chain. Destruction of seagrass beds could lead to a reduction in available organic matter for marine flora and faunal species. Seagrass also improves water quality as it decreases sediment within the water column and takes in many nutrients and heavy metals entering the waterway. Hence, a reduction in seagrass population may also result in decreased water quality.

3.3 Seagrass Mapping

Surveys have shown that the short leaved and long leaved forms of *Zostera capricorni* present adjacent to the proposed mining operations commence along the lake edge and terminate when water depths approached 2 m.

Further mapping undertaken as part of the Chain Valley Mining Extension 1 Project in 2011/2012, enabled the maximum depths and locations of seagrass to be considered in the mine design. This resulted in the generation of a broader seagrass protection barrier, extending to the proposed mining areas, which was then used to refine the mine design and ensure subsidence impacts to seagrass communities could be avoided.

This study found that the communities were dominated by *Zostera capricorni* and that in general, the areas were characterised by patchy individuals of *Zostera*. The seagrass beds were found to exist to a maximum depth of 1.9 m.

Further visual assessments and remapping of seagrass beds within the areas of Sugar Bay, Frying Pan Bay and Point Wolstoncroft was undertaken by LakeCoal, Laxton Environmental Consultants, and Daly Smith Surveyors in February 2018.

Details from these studies have been combined to produce the mapping of seagrass over the entirety of the historic, current and future mining areas, and enabled the seagrass protection barrier to be further defined. The current seagrass mapping is shown on **Figure 3**: Mapped Seagrass and Protection Barrier

3.4 Subsidence Predictions and Modelling

Subsidence predictions and modelling is undertaken by specialist geotechnical engineers for each extraction plan. The subsidence predictions and modelling assist the site technical services personnel in the mine design and planning process. The mine design and planning process is fundamental to controlling mine subsidence to consented limits.

The seagrass communities within the entirety of the proposed mining areas have been mapped and the majority of the seagrass beds appear to extend to depths around 2 – 2.5 m. As a result, if mining takes place beneath the seagrass beds, and subsidence takes place, it could be expected that the lower areas of the seagrass beds will potentially retreat with increased depth as a result of reduced light available for photosynthesis.

In light of Condition 7 (i) Schedule 4 and to ensure the performance measures in are met, an essential component of this Seagrass Management Plan is the seagrass protection barrier to ensure that any impacts associated with mining operations are negligible. This barrier is further described in **Section 4.2**.

4 Seagrass Management

4.1 Management Practices

No secondary extraction is being undertaken, nor is it planned to be undertaken beneath seagrass beds.

In addition, to achieve negligible impact on seagrass beds due to subsidence effects, a seagrass protection barrier has been established. This barrier is based on the seagrass mapping and the application of an "angle of draw" of 26.5^{o} from the seagrass area to the coal seam being mined, as depicted in **Figure 3**: Mapped Seagrass and Protection Barrier

Only first workings are to be undertaken within the seagrass protection barrier. In these areas, subsidence will be limited to less than 20 mm which is considered to be negligible.

The personnel responsible for the above management measures are detailed in **Section 8**.

4.2 Seagrass Protection Limits

As part of the protection of the lake foreshore, the Colliery holding mining leases require a protection barrier around the foreshore. This is known as the High-Water Mark (HWM) subsidence barrier and is shown on **Figure 4**. The barrier is approximately 130 m wide, but varies based on the depth of cover, and no secondary extraction occurs within this zone.

Although similar in some locations, the HWM subsidence barrier and the seagrass protection barrier are separate barriers, with the mine layout limited (among other factors) by either barrier at any specific location. The application of the HWM subsidence barrier and seagrass protection barrier is depicted on **Figure 3**.

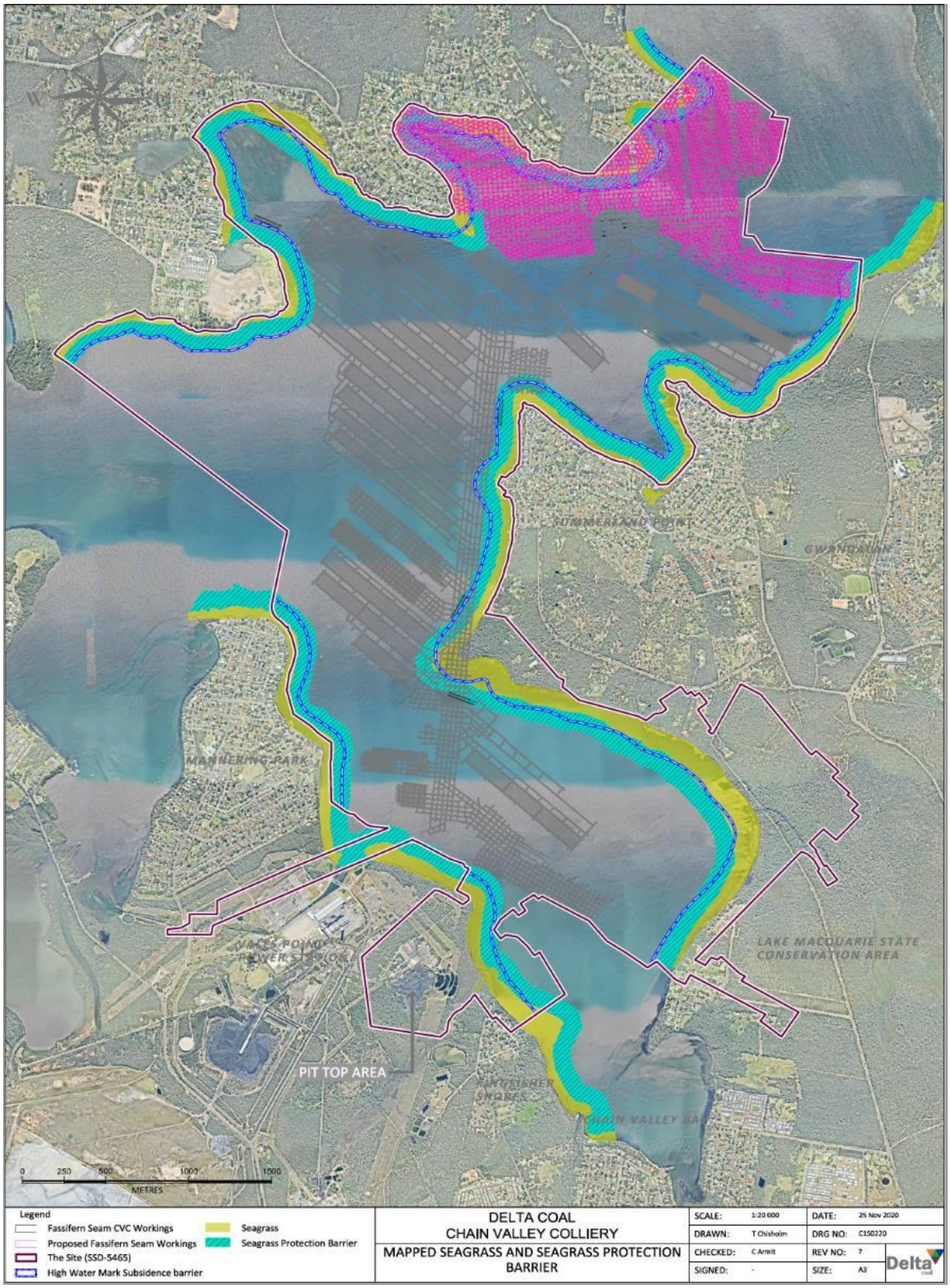


Figure 3: Mapped Seagrass and Protection Barrier

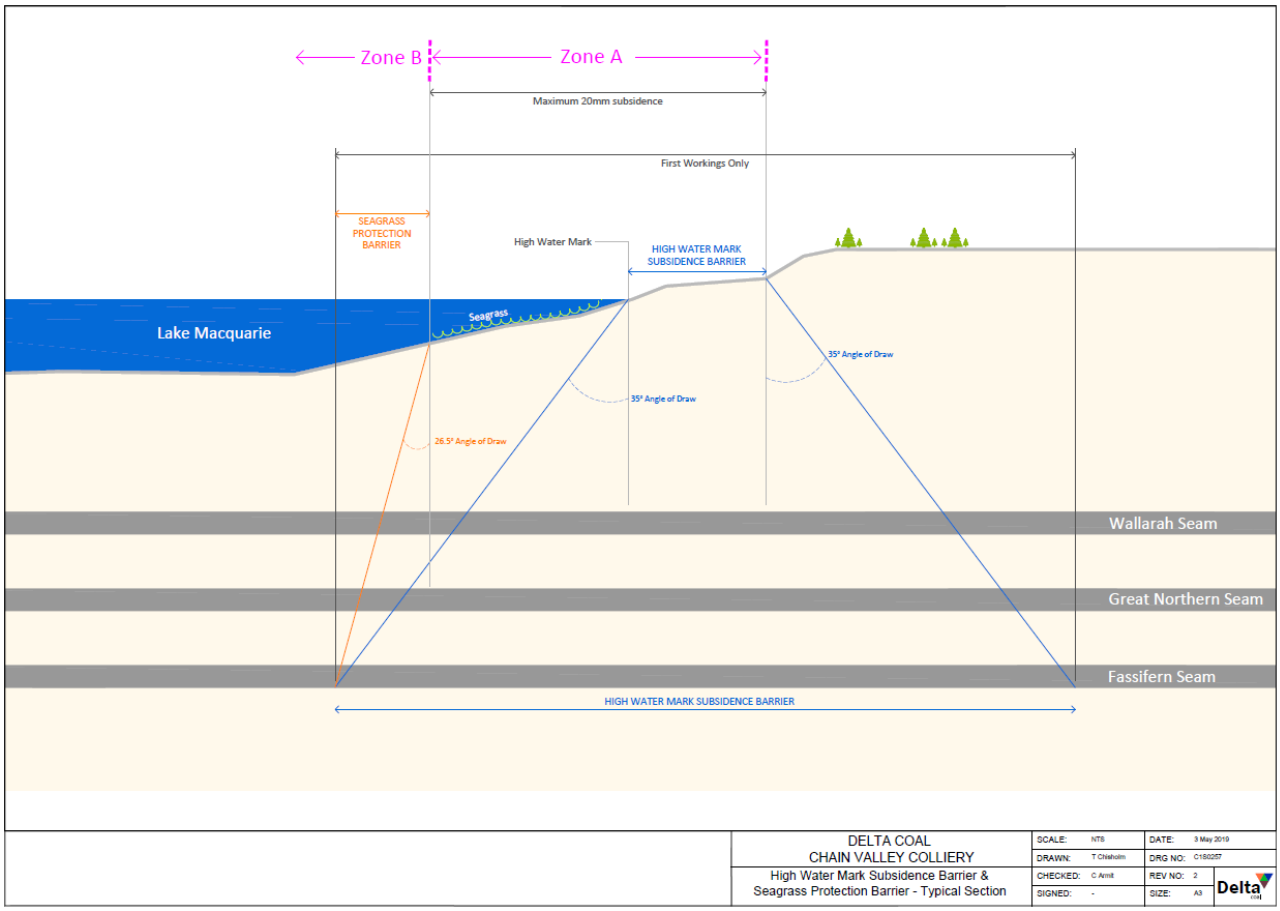


Figure 4: Protection Barrier Schematic cross section

Despite the above barriers, which are in place to protect the seagrass and foreshore areas, monitoring thresholds have been established based on observable change to seagrass beds or bed height. The following triggers have been set:

1. 20% decline in condition from the base year survey (i.e. earliest survey prior to mining occurring nearby); and
2. Mining induced subsidence of 150 mm or greater being recorded at one of the monitoring sites.

The DC Environmental Compliance Coordinator will notify DPI Fisheries, Lake Macquarie City Council and the Department of Planning, Industry and Environment if either of the above impact thresholds are exceeded. If deemed necessary by any of the parties, a meeting will be convened to discuss the results and determine any required future action.

It is noted that in prior years the 20% decline in baseline condition has been seen at a number of seagrass monitoring sites in the absence of any subsidence. As such, reaching the threshold may not in itself warrant the convening of a meeting or the requirement for further actions.

4.3 Seagrass Impact Mitigation

If, through the monitoring program, subsidence is found to occur in areas known to contain seagrass beds (as identified in **Figure 5**) and loss of seagrass habitat has been determined to have occurred as a direct result of subsidence, DC would commit to undertaking remediation strategies to replace an equal area of any loss of seagrass habitat that has occurred.

DC's approach to managing seagrass is aimed at protection. However, if an investigation were to identify that an exceedance or incident has occurred that was a direct result of the mining activities and associated subsidence, then DC would develop a remediation plan which would be submitted to DPI Fisheries, identifying the proposed remediation strategy. The strategy would identify proposed remediation measures which could include:

- Transplanting existing communities with additional fast growing locally occurring seagrass plants;
- Transplanting aquaria grown seedlings,
- Seeding, stapling, plugging and anchoring
- Regrading, topographical restoration; and/or
- Fertilising, to stimulate lateral ingrowth of seagrass communities.

The exact method of remediation would be determined based on the existing integrity of the seagrass beds, existing species and specific impacts that have occurred. The remediation strategy would be developed in consultation with DPI Fisheries and be "site specific" to ensure the most appropriate remediation methodology is implemented.

Should remediation on-site not be viable, mitigation could be undertaken at other sites within Lake Macquarie in consultation with DPI Fisheries and LMCC. Work would be completed to offset the impact arising as a result of mining activities.

5 Seagrass Monitoring

The purpose of this plan is to monitor and report on any changes in seagrass communities over time. The monitoring program also includes physical surveys to detect if there is any vertical movement that could attributable to mine subsidence and if identified, determine if subsidence has caused anything other than a negligible impact. To achieve this, the following will be undertaken:

- an annual survey of the study area with 50 seagrass transects using differential GPS survey methods. These differential GPS survey methods will establish the precise location and height of the lake bed at inner and outer ends of each transect and compare these values against those of previous years and the baseline survey;
- a survey to determine the maximum seaward extent of the seagrass beds and the maximum depth at which they occurred;
- photographic survey of seagrass distribution, density and condition along each transect to be recorded using a video camera enclosed within a waterproof housing and mounted on a floating platform;
- conduct annual seagrass surveys while mining operations have the potential to impact seagrass communities. Reports of annual surveys will be sent to the Department of Primary Industries – Fisheries and Lake Macquarie City Council.
- a summary of the annual seagrass survey will be included in the Annual Review;
- responding to any potential or actual non-compliances and reporting as required to regulatory bodies and other stakeholders; and
- all complaints will be recorded in the complaints register with actions taken also noted.

The detailed methods used to conduct the surveys to determine subsidence of the lake bed and the photographic surveys of seagrass distribution, density and conditions are described below. The same or similar methods should be used in future seagrass surveys to ensure consistency of results.

5.1.1 Seagrass Photography

A video camera fitted with a wide conversion lens and enclosed in an underwater housing is used to capture the video footage.

The camera in the underwater housing is mounted vertically in the centre of a 1 m long surfboard. This rig is towed alongside a workboat. Experimentation revealed that the best photographic results are obtained when the boat and photographic rig were poled very slowly along the transect line on windless days. Good quality photographs were obtained both in boat shadow and full sunlight although half shadow sequences could still be evaluated satisfactorily.

The water depth along most of the transect lines ranges from around 0.5 to 2 m (depending on the lake level). At the end of the transect line the water depth could be around 2 m. Transect lines are photographed from the outer end to the inner end. The beginning of each transect is marked by photographing a plate with the transect number printed in large type.

At the end of each day's photography, the hard drive of the video camera is downloaded, the film is paused at around 1m intervals along the transect line. Each still frame is examined and the following information is recorded on a data sheet:

1. The file name and number of the video segment being examined;
2. The transect number and date the video was taken;
3. The percentage areas occupied by the following organisms in each still or quadrat was determined:

(a) % area occupied by long leaved seagrass (*Zostera capricorni*);

(b) % area occupied by short leaved seagrass (*Zostera capricorni*);

(c) % area occupied by the small seagrass (*Halophila ovalis*);

(d) degree of fouling of the seagrass leaves by algae 1=no fouling, 2=light fouling, 3=heavy fouling;

(e) % area occupied by the large brown alga (*Sargassum* sp., *Hormosira banksii* or *Cystoseira trinodis*);

(f) % area occupied by filamentous and thallous algae (green or brown algae);

(g) Number of the large bivalve *Pinna bicolor;*

(h) % area of uncolonised (by macroscopic epibenthos) ground (bare ground).

At the end of the analysis of the photographs, the results are entered into a work sheet and mean values for each category of organism are calculated.

5.1.2 Surveying Methods

Surveyors have established base stations with their differential GPS equipment along the shore of Chain Valley Bay. A carbon fibre staff fitted with a 110mm diameter aluminium base plate (to prevent penetration into the sediment) is used to take the readings. Survey data (x, y & z coordinates) are recorded on a separate hand piece. Communication between the GPS receiver, the base stations and the hand piece is by coded radio signals.

The boat is maneuvered into position at the inshore end of each transect. The staff is placed on the lakebed and held vertically until the observation is made and recorded. The boat is then moved outwards from the shore where intermediate points along the transect were established and recorded. When the outer end of the transect is reached, the staff is placed alongside the concrete marker and the position and height of the lake bed was recorded.

The gps is downloaded and the following plots made:

- a map of the position of transects in Chain Valley Bay, Summerland Point and Bardens Bay;
- a table of the coordinates of inner and outer ends of each transect and the coordinates of the base stations are made; and
- elevations of the seabed at the inner and outer ends of each transect, relative to AHD, are established and tabulated.

The results from the seagrass monitoring, including determination of compliance with seagrass impact thresholds, is undertaken and reported back to DC in a formal report to be provided following the completion of each annual seagrass survey.

5.2 Monitoring Locations

Monitoring locations have been chosen based on the proposed mining activities that will be covered by the Seagrass Management Plan, over time, as this management plan is updated to reflect future mining locations, it is anticipated that additional monitoring transects will be incorporated and others removed from the monitoring regime as time progresses. More specifically, the monitoring locations proposed to be monitored are those that are adjacent to past, current and proposed mining activities that are within the review period of this management plan.

The monitoring locations are substantially derived from the original experimental and control transects selected by Laxton Environmental Consultants and JSA Environmental Pty Ltd who completed the Marine Ecology assessment that supported the Environmental Assessment for the Mining Extension 1 Project. An additional 15 transects were added to the seagrass monitoring program as part of the latest revision to this plan to obtain

baseline information within the areas of Frying Pan Bay, Sugar Bay and the Northern side of Point Wolstoncroft. Two additional Control Points (C5 and C6) were also added to the monitoring program in 2018.

The current monitoring locations are:

- Transects E1 to E16 Transects primarily in Chain Valley Bay and adjacent Summerland Point;
- Transects T1 to T8 Transects adjacent Summerland Point;
- Transects C1 to C6 Control stations in Crangan Bay and Frying Pan Bay;
- Transects A1 to A6 Transects primarily in Bardens Bay;
- Transect L1 Transect above potential future first workings in Chain Valley Bay;
- Transects S1 to S6 Transect adjacent Sugar Bay;
- Transects F1 to F7 Transects adjacent Frying Pan Bay and along Point Wolstoncroft.

Table 3 shows the GPS locations of the inner ends of the seagrass monitoring transects. Where available, reduced levels of the lakebed measured historically are presented. For sites that have not yet been surveyed by differential GPS, baseline depth levels will be obtained prior to any secondary extraction undertaken in the vicinity of the site. Transects in Crangan Bay were for control purposes only, i.e. no mining or subsidence impact potential, and accordingly no differential GPS depths/locations are required. Relocation of the control stations is done with hand-held GPS.

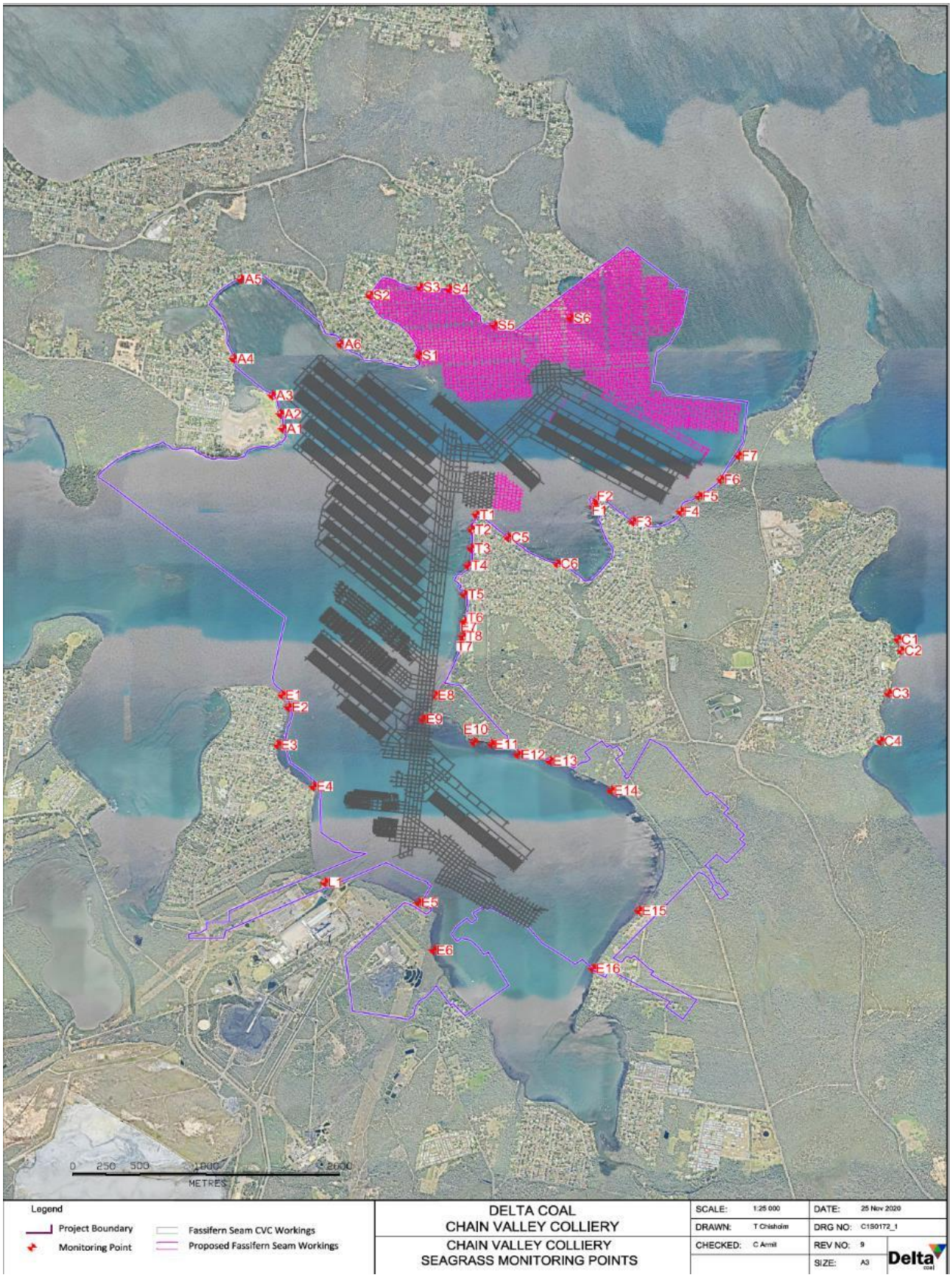


Figure 5: Locations of Seagrass Monitoring Transects

Table 3: Seagrass Monitoring Transect Coordinates

Site	Easting	Northing	Reduced Level (m) – inner transect	Reduced Level (m) – outer transect
E1	363986	6331797	-0.68	-1.00
E2	364035	6331701	-0.64	-1.78
E3	363953	6331405	-0.32	-2.34
E4	364220	6331078	-0.46	-1.69
E5	365006	6330164	-0.46	-1.68
E6	365118	6329788	-0.48	-1.21
E7	365351	6332350	-0.24	-1.68
E8	365128	6331796	-0.27	-0.99
E9	365040	6331608	-0.19	-1.07
E10	365423	6331427	-0.41	-1.74
E11	365554	6331410	-0.40	-1.09
E12	365750	6331329	-0.59	-1.50
E13	365991	6331278	-0.59	-1.44
E14	366447	6331047	-0.52	-1.34
E15	366657	6330098	-0.39	-1.22
E16	366310	6329644	-0.55	-1.08
T1	365440	6333217	-0.40	-1.15
T2	365403	6333101	-0.70	-1.31
T3	365400	6332952	-0.29	-1.01
T4	365377	6332817	-0.46	-1.12
T5	365350	6332590	-0.42	-1.38
T6	365348	6332380	-0.47	-1.61
T7	365321	6332207	-0.17	-1.64
T8	365337	6332262	-0.20	-1.14
C1	368596	6332235	N/A	N/A
C2	368619	6332147	N/A	N/A
C3	368524	6331811	N/A	N/A
C4	368467	6331435	N/A	N/A
C5	365676	6333038	N/A	N/A
C6	366045	6332831	N/A	N/A
A1	363991	6333894	-0.51	-1.19
A2	363974	6334009	-0.39	-0.81
A3	363912	6334156	-0.33	-1.44
A4	363621	6334445	-0.16	-0.72
A5	363678	6335072	-0.30	-0.96
A6	364423	6334560	-0.14	-0.68
L1	364306	6330322	-1.12	-1.63
S1	365009	6334470	-0.64	-1.78
S2	364642	6334943	-0.28	-1.59
S3	365017	6335008	-0.11	-1.87
S4	365235	6334992	-0.11	-1.73
S5	365575	6334709	-0.69	-1.39
S6	366144	6334765	-0.1	-0.92
F1	366321	6333281	-0.25	-1.31
F2	366342	6333330	-0.24	-1.98
F3	366611	6333163	-0.11	-1.88
F4	366968	6333242	-0.11	-2.45
F5	367106	6333361	-0.33	-2.46
F6	367271	6333493	-0.3	-2.81
F7	367402	6333682	-0.48	-1.4

6 Reporting

6.1 Regular reporting

In accordance with Schedule 6, Condition 13(a), DC shall provide regular reporting on the environmental performance of the development on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of the development consent.

The seagrass monitoring results will be reviewed on an annual basis as survey reports are received to confirm compliance with the conditions specified in the *Subsidence Impact Performance Measures - Natural and Heritage Features* found in Table 2 and the criteria outlined in **Section 4.2**.

6.2 Annual review

In accordance with Schedule 6, Condition 8, the proponent must review the environmental performance of the development to the satisfaction of the Planning Secretary, by the end of March each year, or other timing as may be agreed by the Secretary.

The Annual Review will be forwarded to the relevant authorities including DPIE, EPA, members of the Community Consultative Committee and local Councils (Central Coast Council and Lake Macquarie) and will also be placed on the Delta Coal website along with a summary of environmental monitoring results.

6.3 Incident or Non-Compliance Reporting

If seagrass monitoring reveals that, as a result of mining activities, the criterion outlined in **Section 4.2** have been exceeded, then DC will investigate the cause of the non-compliance. As detailed in Schedule 6, Condition 7 of SSD-5465, DPIE and other relevant agencieswill be immediately notified by email (DPIE - compliance@planning.nsw.gov.au) of an incident. Within seven days of becoming aware of a non-compliance, DC must notify the Department of the non-compliance...

A written report will be provided to the DPIE within 7 days of the date of the incident or being made aware of the incident (such as receiving monitoring data).

The report will:

- describe the date, time, location and nature of the observation;
- identify the development (development application number and name), applicable non-compliance schedule and condition;describe non-compliance and reasons for non-compliance;
- identify the cause (or likely cause) of the damage;
- describe what action has been taken to date; and
- describe the proposed measures to address the impacts and prevent further such occurrences.

DC will implement the recommendations of the investigation in order to address any potential future incidents. Additional details of the incident reporting process are provided in the Environmental Management Strategy (EMS).

Any incidents or complaints will be recorded and fully investigated to find root causes and corrective actions implemented where necessary.

7 Stakeholder Management, Response and Training

7.1 Complaint Protocol

DC has a 24-hour telephone hotline (1800 115 277) through which members of the public can lodge complaints, concerns, or to raise issues associated with the operation. This service aims to promptly and effectively address community concerns and environmental matters. All complaints are recorded and responded to. The information recorded in the complaint register includes:

- date and time the complaint was lodged;
- personal details provided by the complainant;
- nature of the complaint;
- action taken or if no action was taken, the reason why; and
- follow up contact with the complainant.

7.2 Independent Review

As detailed in Condition 2, Schedule 5 of SSD-5465, an Independent Review can be requested by a landowner who "*considers the development to be exceeding the relevant criteria in Schedule 3".*

If the Secretary is satisfied that an independent review is warranted, then within 2 months of the Secretary's decision the Applicant shall:

(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to:
- *consult with the landowner to determine his/her concerns;*
- *conduct monitoring to determine whether the development is complying with the relevant criteria in Schedule 3; and*
- *if the development is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and*

(b) give the Secretary and landowner a copy of the independent review

7.3 Dispute Resolution

If any disputes are not adequately addressed by the complaints handling process then they will be handled by the Environmental Compliance Coordinator. If the response of CVC is not considered to satisfactorily address the concern of the complainant, a meeting may be convened with the complainant, Mine Manager together with the Environmental Compliance Coordinator to determine any further options to reduce potential impacts.

Any actions agreed from the meeting will be implemented by CVC. After implementation of the proposed actions the complainant will be contacted and advice sought as to the satisfaction or otherwise with the measures taken.

If no agreed outcome is determined or the complainant is still not satisfied by the action taken, then an Independent Review may be requested by the complainant. If determined to be warranted by the Secretary, an independent review will be undertaken in accordance with the process identified in Schedule 5 of SSD-5465.

7.4 Training, Awareness and Competence

Training is an essential component of the implementation phase of this Seagrass Management Plan. Any person or position that has a role or responsibility under this document will be provided with a copy of the document and be advised verbally regarding their requirements by the Environmental Compliance Coordinator.

As the document owner, the Environmental Compliance Coordinator is the contact point for any person that does not understand this document or their specific requirements and will provide guidance and training to any person that requires additional training regarding this management plan.

8 Audit and Review

8.1 Review and improvement

In accordance with Schedule 6, Condition 5 of SSD-5465, this management plan shall be reviewed, and if necessary revised, within 3 months of the following:

- the submission of an Annual Review;
- the submission of an incident report;
- the submission of an independent environmental audit; and
- following any modification to the project approval.

8.2 Audits

Internal and external audits of this document will be carried out as described below. Internal and external audits shall be objective and if possible be conducted by a person or organisation independent of the document being audited.

Audits shall be carried out by personnel who have the necessary qualifications and experience to make an objective assessment of the issues. The extent of the audit, although pre-determined, may be extended if a potentially serious deviation from this document is detected.

Any audit non-conformances and/or improvement opportunities will have corrective and preventative actions implemented to avoid recurrence, these actions will be loaded into the site Incident Database to ensure the actions are assigned to the relevant people and completed.

External audits will be conducted utilising external specialists and will consider this document and related documents. External auditors shall be determined based on skills and experience and upon what is to be accomplished.

An Independent Environmental Audit (IEA) was undertaken during June 2019. In accordance with SSD-5465 Schedule 6, Condition 9, IEA's will be scheduled for every three years thereafter (unless the Secretary directs otherwise) by an audit team whose appointment has been endorsed by the Secretary.

9 Records and Document Control

9.1 Records

Generally, the Environmental Compliance Coordinator will maintain all Environmental Management System records, which are not of a confidential nature. Records that are maintained include:

- monitoring data and equipment calibration;
- environmental inspections and auditing results;
- environmental incident reports;
- complaint register; and
- licenses and permits.

All records will be stored so that they are legible, readily retrievable and protected against damage, deterioration and loss. Records will be maintained for a minimum of 4 years or as otherwise required under any legislation, licence, lease, permit or approval.

9.2 Document Control

This document and all others associated with the Environmental Management System (EMS) shall be maintained in a document control system which is in compliance with the site Document Control Standard which is available to all site personnel. Any proposed change to this document will be via the Environmental Compliance Coordinator. Details on document revisions are provided in **Table 4**.

Table 4: Document Revision Details

Version	Date	Details of Revision	Company	Reviewed by/ Authorised by
1	16/08/2013	Final	LakeCoal	Chris Ellis
2	09/04/2014	Final	LakeCoal	Chris Ellis
3	4/11/2016	Final	LakeCoal	Wade Covey
5	17/06/2019	Update to Delta Coal format and include proposed S2/S3 secondary workings	Delta Coal	Wade Covey Chris Armit Dave McLean
6	10/03/2020	Update to include proposed S4 secondary workings / 2020 Seagrass report	EMM Consulting	Katie Weekes Chris Armit
7	12/5/2020	Update to include DPIE comments	DeltaCoal	Chris Armit

Version	Date	Details of Revision	Company	Reviewed by/ Authorised by
8	27/11/2020 18/01/2021 19/03/2021 6/04/2021	Mine workings update and Modification 3 and MWS5 and Northern Pillar Area Extraction Plan Update for consultation Plan approval from DPIE	Delta Coal	Chris Armit

10 Roles and Responsibilities

Roles and responsibilities specific to completing the requirements of the Seagrass Management Plan are identified in **Table 5**.

Table 5: Seagrass Management Roles and Responsibilities

Role	Responsibilities
Mine Manager	• Ensure that adequate financial and personnel resources are made available for the implementation of the Seagrass Management Plan. • Ensure mine layout and workings are as approved, taking into consideration the seagrass barriers
Environmental Compliance Coordinator or delegate	• Co-ordinate seagrass monitoring, through the use of differential GPS surveying and photographic monitoring of seagrass beds. • Develop management actions in consultation with regulatory agencies as/if required from the monitoring results. • Review seagrass monitoring results on an annual basis. • Send Annual Seagrass Monitoring reports to DPI Fisheries, DPIE-BCD and DPIE-Compliance • Compile the Annual Review (including a summary of the annual seagrass survey). • Respond to any potential or actual non-compliance and report these as required to regulatory bodies and other stakeholders. • Undertake reviews of this document as per **Section 9** • Undertake or coordinate the required audits of this document, in accordance with **Section 9**. • Notify the DPI Fisheries, Department of Industry – Resources and Energy and Department of Planning and Environment if there are any exceedances in impact thresholds outlined in **Section 4.2** • Ensure complaint handling and response is undertaken, including determination of sources and potential remedial action to avoid recurrence.
Mine Surveyor	• Ensure mine layout and workings are as approved, taking into consideration the seagrass barriers

11 References & Associated Documents

Documents referenced in the preparation of the Seagrass Management Plan are detailed in **Table 6.**

Table 6: References and Associated Documents

Reference type	Document
Australian Standards	AS/NZS ISO 14001:2004 *Environmental management systems – Requirements with guidance for use* AS/NZS ISO 14004:2004 *Environmental management systems – General guidelines on principles, systems and support techniques*
Legislation and regulations	NSW DPI (2007) *PrimeFacts 629 - Seagrasses*. NSW EPA, EPL 1770 *Environment Protection License 1770* SSD–5465 Development Consent SSD-5465 (Modification 3) dated June 2020 for the Mining Extension 1 Project POEO Act 1997 Protection of the Environment Operations Act, 1997
Delta Coal documents	EMS Environmental Management Strategy.
External documents	Bell, F.C. and Edwards, A.R. (1980) *An Environmental Inventory of Estuaries and Coastal Lagoons in New South Wales*. Total Environment Centre. BioAnalysis (2008) *Assessment of seagrasses associated with proposal to expand the Lake Macquarie yacht club in Belmont Bay*. EMM (June 2015) *Chain Valley Colliery Modification 2 Statement of Environmental Effects*, prepared by EMGA Mitchell McLennan (EMM) dated 29 June 2015. Laxton, J.H. (2005) *Water Quality of Lake Macquarie*. J.H. & E.S. Laxton – Environmental Consultants P/L. Unpublished Report. Laxton, E. and Laxton, J.H. (August 2007) *Aquatic Biology of Chain Valley Bay Lake Macquarie, NSW*. J.H. & E.S. Laxton – Environmental Consultants P/L. Unpublished report prepared for Chain Valley Colliery Laxton, J.H. and Laxton, E. (July 2008) *Seagrass Survey of Chain Valley Bay Lake Macquarie, NSW*. J.H. & E.S. Laxton – Environmental Consultants P/L. Unpublished report prepared for Chain Valley Colliery. Laxton, J.H. and Laxton, E. (2009). *Peabody Energy – Chain Valley Colliery. Aquatic Biology of Domain No. 2 off Summerland Point, Lake Macquarie, NSW.* Emma and John H. Laxton. July 2009 Laxton, J.H. and Laxton, E. (2011). *Seagrass Survey of Chain Valley Bay, Summerland Point and Crangan Bay, Lake Macquarie, NSW* (Results from 2008, 2010 and 2011) J.H. & E.S. Laxton – Environmental Consultants

	P/L. Unpublished report prepared for Chain Valley Colliery. Laxton, J.H. and Laxton, E. (2012). *Seagrass Survey of Chain Valley Bay, Summerland Point and Crangan Bay, Lake Macquarie, NSW* (Results from 2008, 2010, 2011 and 2012) J.H. & E.S. Laxton – Environmental Consultants P/L. Unpublished report prepared for Chain Valley Colliery. Laxton, J.H. and Laxton, E. (2013). *Seagrass Survey of Chain Valley Bay, Summerland Point and Crangan Bay, Lake Macquarie, NSW*. (Results for 2008, 2010, 2011, 2012 and 2013). J.H. & E.S. Laxton – Environmental Consultants P/L. Unpublished report prepared for Chain Valley Colliery. Laxton, J.H. and Laxton, E.S. (2014) *Seagrass Survey of Chain Valley Bay, Summerland Point and Crangan Bay, Lake Macquarie, NSW* (Results for 2008 to 2014). J.H. & E.S. Laxton – Environmental Consultants P/L. Unpublished report prepared for Chain Valley Colliery. Laxton, J.H. and Laxton, E.S. (2015) *Seagrass Survey of Chain Valley Bay, Summerland Point and Crangan Bay, Lake Macquarie, NSW* (Results for 2008 to 2015). J.H. & E.S. Laxton – Environmental Consultants P/L. Unpublished report prepared for Chain Valley Colliery. Laxton, J.H. and Laxton, E.S. (2016) *Seagrass Survey of Chain Valley Bay, Summerland Point, Bardens Bay and Crangan Bay, Lake Macquarie, NSW* (Results for 2008 to 2016). J.H. & E.S. Laxton – Environmental Consultants P/L. Unpublished report prepared for Chain Valley Colliery. Laxton, J.H. and Laxton, E.S. (2017) *Seagrass Survey of Chain Valley Bay, Summerland Point, Bardens Bay and Crangan Bay, Lake Macquarie, NSW* (Results for 2008 to 2017). J.H. & E.S. Laxton – Environmental Consultants P/L. Unpublished report prepared for Chain Valley Colliery. Laxton, J.H. and Laxton, E.S. (2018) *Seagrass Survey of Chain Valley Bay, Summerland Point, Bardens Bay and Crangan Bay, Lake Macquarie, NSW* (Results for 2008 to 2018). J.H. & E.S. Laxton – Environmental Consultants P/L. Unpublished report prepared for Chain Valley Colliery. Laxton, J.H. and Laxton, E.S. (2019) *Seagrass Survey of Chain Valley Bay, Summerland Point, Bardens Bay and Crangan Bay, Lake Macquarie, NSW* (Results for 2008 to 2019). J.H. & E.S. Laxton – Environmental Consultants P/L. Unpublished report prepared for Chain Valley Colliery. Laxton, E.S. (2020) *Seagrass Survey of Chain Valley Bay, Summerland Point, Bardens Bay and Crangan Bay, Lake Macquarie, NSW* (Results for 2008 to 2020). J.H. & E.S. Laxton – Environmental Consultants P/L. Unpublished report prepared for Chain Valley Colliery.

12 Definitions

BCD Biodiversity and Conservation Division within the Department (formerly OEH – Office of Environment and Heritage)

CVC Delta Coal - Chain Valley Colliery

DC Delta Coal

DP&E Department of Planning & Environment (former)

DPIE Department of Planning, Industry and Environment

DPI Fisheries Department of Primary Industries NSW Department of Primary Industries – Fisheries

EMS Environmental Management System

EPA NSW Environment Protection Authority

EPL Environment Protection License

EP&A Act *Environmental Planning and Assessment Act 1979*

HWM High Water Mark

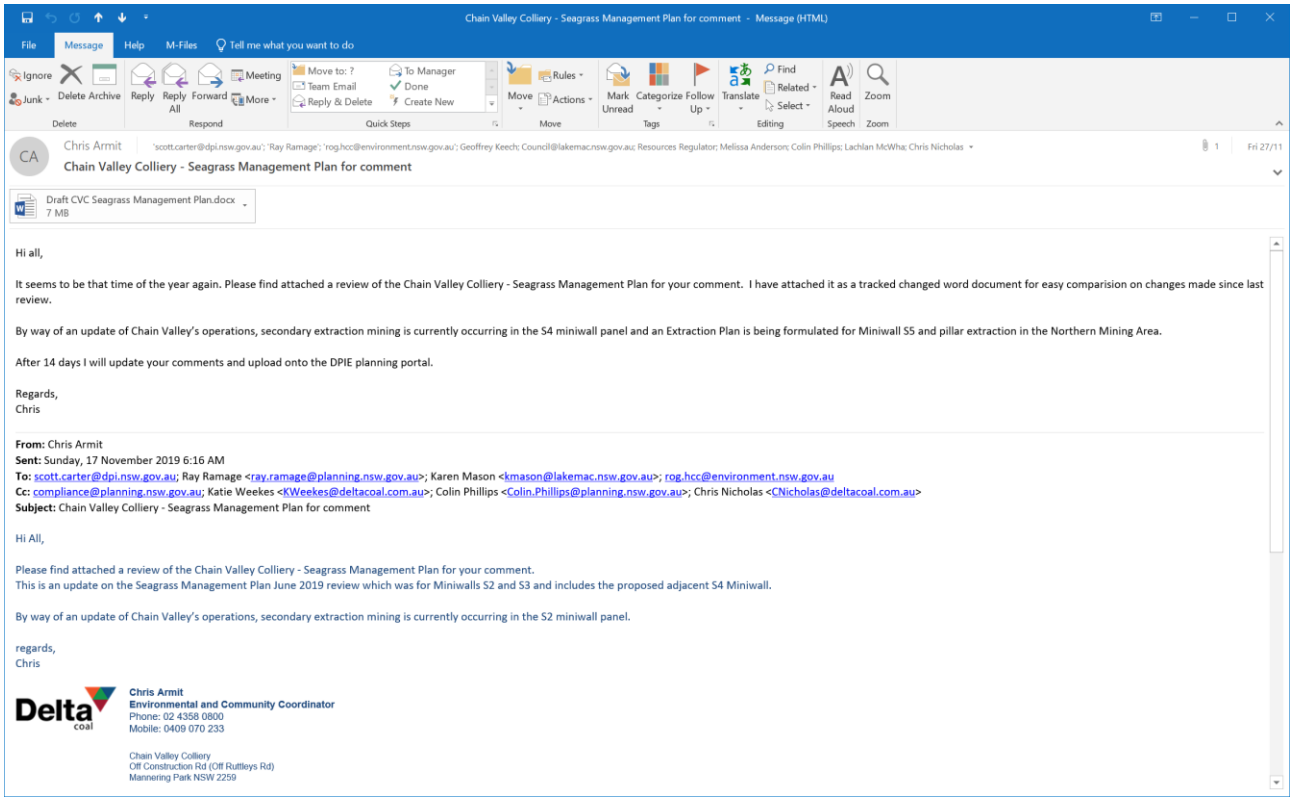
LMCC Lake Macquarie City Council

POEO Act *Protection of the Environment Operations Act 1997*

Planning Secretary Planning Secretary under the EP&A Act, or nominee

SSD-5465 Development Consent SSD-5465 (for the Chain Valley Colliery Mining Extension 1 Project)

Appendix 1: Consultation



Chain Valley Colliery - Seagrass Management Plan for comment - Message (HTML)

File | Message | Help | M-Files | Tell me what you want to do

Chris Armit

Chain Valley Colliery - Seagrass Management Plan for comment

Draft CVC Seagrass Management Plan.docx
7 MB

Hi all,

It seems to be that time of the year again. Please find attached a review of the Chain Valley Colliery - Seagrass Management Plan for your comment. I have attached it as a tracked changed word document for easy comparision on changes made since last review.

By way of an update of Chain Valley's operations, secondary extraction mining is currently occurring in the S4 miniwall panel and an Extraction Plan is being formulated for Miniwall S5 and pillar extraction in the Northern Mining Area.

After 14 days I will update your comments and upload onto the DPIE planning portal.

Regards,
Chris

From: Chris Armit
Sent: Sunday, 17 November 2019 6:16 AM
To: scott.carter@dpi.nsw.gov.au; Ray Ramage <ray.ramage@planning.nsw.gov.au>; Karen Mason <kmason@lakemac.nsw.gov.au>; rog.hcc@environment.nsw.gov.au
Cc: compliance@planning.nsw.gov.au; Katie Weekes <KWeekes@deltacoal.com.au>; Colin Phillips <Colin.Phillips@planning.nsw.gov.au>; Chris Nicholas <CNicholas@deltacoal.com.au>
Subject: Chain Valley Colliery - Seagrass Management Plan for comment

Hi All,

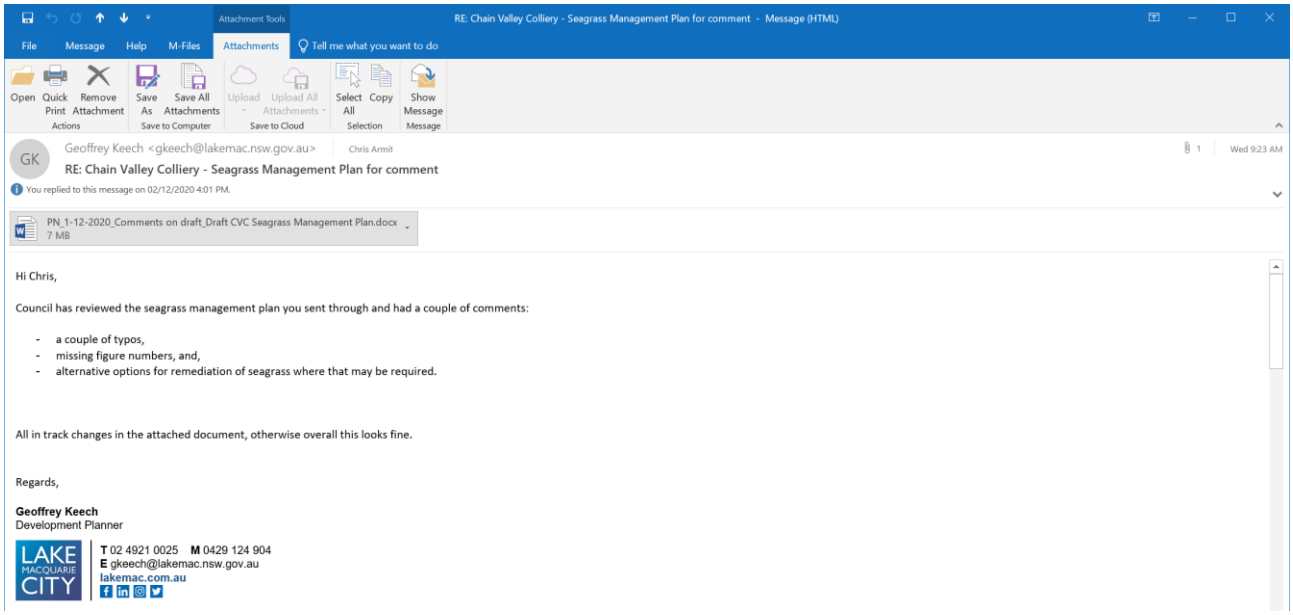
Please find attached a review of the Chain Valley Colliery - Seagrass Management Plan for your comment.
This is an update on the Seagrass Management Plan June 2019 review which was for Miniwalls S2 and S3 and includes the proposed adjacent S4 Miniwall.

By way of an update of Chain Valley's operations, secondary extraction mining is currently occurring in the S2 miniwall panel.

regards,
Chris

Delta coal
Chris Armit
Environmental and Community Coordinator
Phone: 02 4358 0800
Mobile: 0409 070 233

Chain Valley Colliery
Off Construction Rd (Off Ruttleys Rd)
Mannering Park NSW 2259



RE: Chain Valley Colliery - Seagrass Management Plan for comment - Message (HTML)

Attachment Tools

File | Message | Help | M-Files | Attachments | Tell me what you want to do

Geoffrey Keech <gkeech@lakemac.nsw.gov.au>

RE: Chain Valley Colliery - Seagrass Management Plan for comment

You replied to this message on 02/12/2020 4:01 PM.

PN_1-12-2020_Comments on draft_Draft CVC Seagrass Management Plan.docx
7 MB

Hi Chris,

Council has reviewed the seagrass management plan you sent through and had a couple of comments:

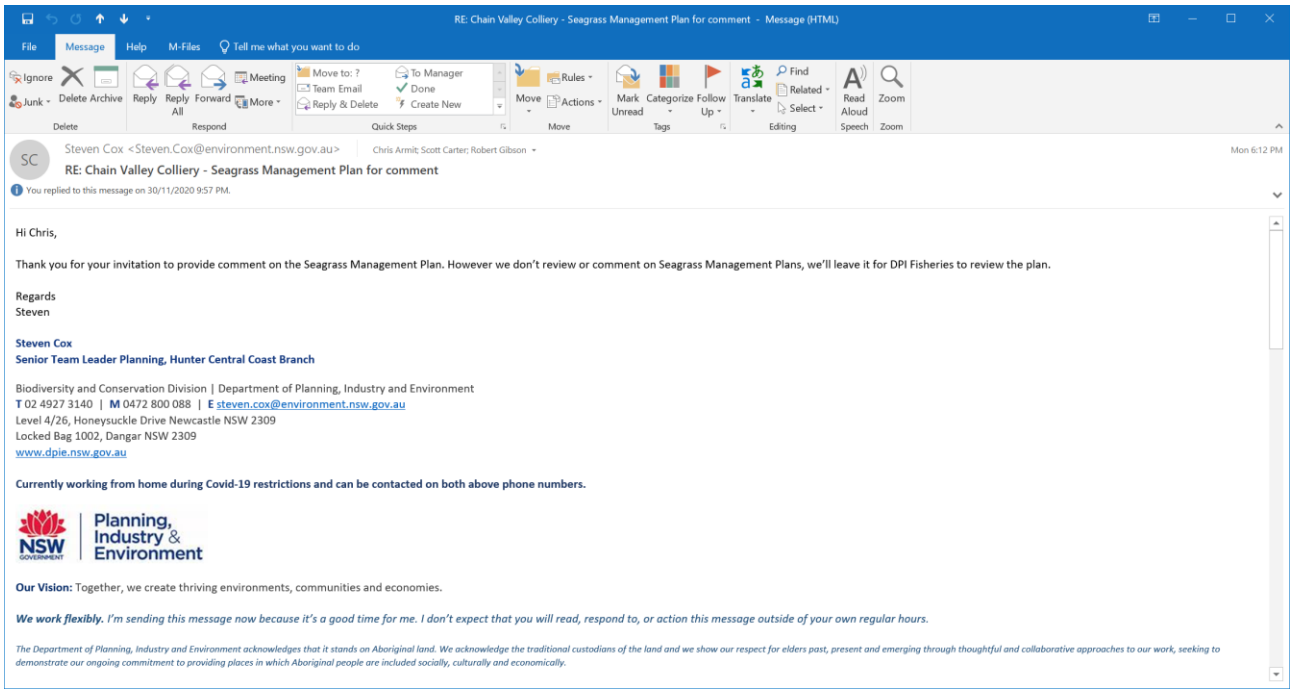
- a couple of typos,
- missing figure numbers, and,
- alternative options for remediation of seagrass where that may be required.

All in track changes in the attached document, otherwise overall this looks fine.

Regards,

Geoffrey Keech
Development Planner

LAKE MACQUARIE CITY
T 02 4921 0025 **M** 0429 124 904
E gkeech@lakemac.nsw.gov.au
lakemac.com.au



RE: Chain Valley Colliery - Seagrass Management Plan for comment - Message (HTML)

File | Message | Help | M-Files | Tell me what you want to do

Ignore | Junk | Delete | Archive | Reply | Reply All | Forward | Meeting | More | Move to: ? | Team Email | Reply & Delete | To Manager | Done | Create New | Move | Rules | Actions | Mark Unread | Categorize | Follow Up | Translate | Find | Related | Select | Read Aloud | Zoom

Steven Cox <Steven.Cox@environment.nsw.gov.au> | Chris Armit; Scott Carter; Robert Gibson | Mon 6:12 PM

RE: Chain Valley Colliery - Seagrass Management Plan for comment

You replied to this message on 30/11/2020 9:57 PM.

Hi Chris,

Thank you for your invitation to provide comment on the Seagrass Management Plan. However we don't review or comment on Seagrass Management Plans, we'll leave it for DPI Fisheries to review the plan.

Regards
Steven

Steven Cox
Senior Team Leader Planning, Hunter Central Coast Branch

Biodiversity and Conservation Division | Department of Planning, Industry and Environment
T 02 4927 3140 | **M** 0472 800 088 | **E** steven.cox@environment.nsw.gov.au
Level 4/26, Honeysuckle Drive Newcastle NSW 2309
Locked Bag 1002, Dangar NSW 2309
www.dpie.nsw.gov.au

Currently working from home during Covid-19 restrictions and can be contacted on both above phone numbers.

NSW GOVERNMENT | Planning, Industry & Environment

Our Vision: Together, we create thriving environments, communities and economies.

We work flexibly. *I'm sending this message now because it's a good time for me. I don't expect that you will read, respond to, or action this message outside of your own regular hours.*

The Department of Planning, Industry and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

DPIE Consultation

NSW GOVERNMENT | Planning, Industry & Environment

Chris Armit
Approvals Coordinator
Chain Valley Colliery

Off Construction Rd (Off Ruttleys Rd)
MANNERING PARK, NSW, 2259

05/03/2021

Dear Mr Armit

Chain Valley Colliery
Extraction Plan – Miniwall S5 and Northern Pillar Area

I refer to the Extraction Plan dated January 2021 for Miniwall S5 and the Northern Pillar Area (NPA) at the Chain Valley Colliery, submitted in accordance with condition 7 of Schedule 4 of the Chain Valley Extension Project development consent (SSD 5465).

The Department has reviewed the Extraction Plan and identified several clarifications and minor matters that must be addressed by way of improvements to various parts of the Extraction Plan and its sub-plans (see Attachment A). The Department is satisfied that these matters can be addressed in a timely manner and would not materially change the ability of Delta Coal to effectively manage subsidence impacts.

In summary, the revised Extraction Plan should:

- include the detailed plans of existing and proposed first and second workings that clearly indicate the High Water Mark Subsidence Barrier (Plan 2) and show that all areas of proposed extraction are outside of the Seagrass Protection Barrier;
- where necessary refer to the proposed extraction of Miniwall S5 and the NPA, not previously extracted miniwalls;
- include detailed performance indicators and contingencies for Threatened Species or Endangered Populations, as required by Table 6 of the conditions of consent;
- include timeframes for the implementation of contingency measures set out in the Subsidence Management TARP;
- include evidence of further consultation, including specific details of the comments received from agencies and the actions taken in response to those comments; and
- align with the current consolidated conditions of consents, including alignment with the timing of document reviews and revisions.

The attached comments on the Extraction Plan and its sub-plans must be addressed to the satisfaction of the Secretary prior to the Department granting its final approval of the Extraction Plan. As noted above, the Department believes that they can be readily addressed in a timely manner. It would be appreciated if Delta Coal provides an electronic copy of the revised document, with tracked changes, allowing for a more expedient review.

If you require any more information, please contact James McDonough on 9585 6313.

Yours sincerely

DPIE Request for Information Letter - Response Summary Table

DPIE Review	Response
include the detailed plans of existing and proposed first and second workings that clearly indicate the High Water Mark Subsidence Barrier (Plan 2) and show that all areas of proposed extraction are outside of the Seagrass Protection Barrier	Plan 2 updated to include clear indication of the High Water Subsidence Barrier. All secondary workings extraction areas are located outside of Seagrass Protection Barrier.
where necessary refer to the proposed extraction of Miniwall S5 and the NPA, not previously extracted miniwalls	Document updated for legacy miniwall naming (see tracked changes)
include detailed performance indicators and contingencies for Threatened Species or Endangered Populations, as required by Table 6 of the conditions of consent	Subsidence Management TARP updated to include Threatened Species or Endangered Populations
include timeframes for the implementation of contingency measures set out in the Subsidence Management TARP	Incident and non-compliance reporting timeframes included. Timeframes of contingency measures implementation added to the Subsidence Management TARP
include evidence of further consultation, including specific details of the comments received from agencies and the actions taken in response to those comments	See updates in section 2.5 Table 1 and Appendix 1 which includes specific stakeholder comment details and communications.
align with the current consolidated conditions of consents, including alignment with the timing of document reviews and revisions	Consent references updated to changes in SSD5465 Modification 3 numbering and conditions.
It would be appreciated if Delta Coal provides an electronic copy of the revised document, with tracked changes, allowing for a more expedient review	A Microsoft Word document has been provided with tracked changes included at the start of the document change process. Plan 2 amendment and Subsidence Management TARP were not able to be tracked changed as they were drafted in software without the tracked changes option.

Planning, Industry & Environment

Chris Armit
Approvals Coordinator
Chain Valley Colliery
Delta Coal Pty Ltd
Off Construction Road (Off Rutleys Road)
Mannering Park NSW 2259

06/04/2021

Dear Mr Armit

Chain Valley Colliery (SSD 5465)
Miniwall S5 and NPA Extraction Plan

I refer to the Miniwall S5 and NPA Extraction Plan which was submitted on 18 January 2021 in accordance with Condition 7 of Schedule 4 of the consent for Chain Valley Colliery (SSD 5465).

The Department has carefully reviewed the document and is satisfied that it addresses the requirements of the conditions of consent for Extraction Plans (see Attachment A).

Accordingly, the Planning Secretary has approved the Miniwall S5 and NPA Extraction Plan (Revision 1.2, dated 10 March 2021). Please ensure that the approved plan is placed on the project website at your earliest convenience.

If you wish to discuss the matter further, please contact James McDonough on 9585 6313.

Yours sincerely

Lauren Evans
A/Director
Resource Assessments (Coal & Quarries)
As nominee of the Planning Secretary

Planning, Industry & Environment

ATTACHMENT A

Consideration of Approval of Miniwall S5 and NPA Extraction Plan

1. As required by condition 7 of Schedule 4 of the consent for Chain Valley Colliery (SSD 5465), the Extraction Plan (EP) for proposed Miniwall S5 and the Northern Pillar Area (NPA) consists of an overarching document that describes the proposed mining operations, supported by a specialist subsidence assessment, and a series of specialist management plans (MPs) including a:
   - Public Safety MP;
   - Built Features MP;
   - Groundwater MP;
   - Rehabilitation MP;
   - Benthic Communities MP;
   - Seagrass MP;
   - Subsidence Monitoring MP; and
   - Subsidence Management Trigger Action Response Plan (TARP).

   The EP was submitted by Delta Coal. The EP was prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Secretary. Many of these MPs are little changed from when they were reviewed in March 2020 as part of the EP for Miniwall S4, which was approved in June 2020.

Appendix 2: Development consent summary

Chain Valley Colliery SSD-5465 Summary

Relevant sections of SSD-5465 detail the requirements of the SMP and are reproduced in **Table A2** below along with identification of where the requirements are addressed in this document.

Table A2: Requirements from Chain Valley Colliery Development Consent (SSD-5465)

Condition No.	Requirements	Relevant section of this document
Schedule 4 Environmental Conditions – Underground Mining		

<table>
<tr>
<td>2</td>
<td>
Performance Measures- Natural Environment

The Applicant must ensure that the development does not cause any exceedance of the performance measures in Table 6 to the satisfaction of the Planning Secretary.

Table 6: Subsidence Impact Performance Measures
<table>
<tr><td colspan="2">Biodiversity</td></tr>
<tr><td>Seagrass beds</td><td>Negligible environmental consequences including:
Negligible change in the size and distribution of seagrass beds;
Negligible change in the functioning of seagrass beds; and
Negligible change to the composition or distribution of seagrass species within seagrass beds.</td></tr>
</table>
Notes:
The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) for each of these performance measures in the various management plans that are required under this consent (see Condition 7 below).
Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Planning Secretary will be the final arbiter.
The requirements of this condition only apply to the impacts and consequences of mining operations, construction or demolition undertaken following the date of approval of this consent
</td>
<td>Section 1</td>
</tr>
<tr>
<td>3</td>
<td>Offsets

If the Applicant exceeds the performance measures in Table 6 and the Planning Secretary determines that: (a) it is not reasonable or feasible to remediate the impact or environmental consequence; or (b) the remediation measures implemented by the Applicant have failed to satisfactorily remediate the impact or environmental consequence; then the Applicant must provide a suitable offset to compensate for the impact or environmental consequence to the satisfaction of the Planning Secretary. Note: Any offset required under this condition must be proportionate with the significance of the impact or environmental consequence.</td>
<td>Section 4</td>
</tr>
<tr>
<td>7</td>
<td>Extraction Plan

(i) include a Seagrass Management Plan, which has been prepared in consultation with BCD, LMCC, and DPI Fisheries, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on seagrass beds, and which includes:
• a program of ongoing monitoring of seagrasses in both control and impact sites; and
• a program to predict and manage subsidence impacts and environmental consequences to seagrass beds to ensure the performance measures in Table 6 are met;

Notes:

• To identify the underground mining areas approved under this consent referred to in this condition, see Appendix 3.

• This condition does not limit secondary extraction under a Subsidence Management Plan approved as at the date of this consent.</td>
<td>This document</td>
</tr>
</table>

8	*The Applicant shall ensure that the management plans required under conditions 7(g)-(j) above include: (a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this consent; and (b) a detailed description of the measures that would be implemented to remediate predicted impacts*	**Section 4 and 6**

Appendix 9 Heritage Management Plan

Delta coal	Doc Owner: **Approvals Coordinator** Doc No:

DELTA COAL

Heritage Management Plan

Authors	Katie Weekes EMM Consulting
	Morgan Wilcox EMM Consulting
	Nena Lane-Kirwan EMM Consulting
	Chris Armit Delta Coal
Authorised by:	Chris Armit
	Approvals Coordinator
Date:	6 November 2020

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Acknowledgement

Delta Coal would like to acknowledge and pay respect to the traditional custodians of the area and their unique cultural heritage, spiritual beliefs and continuing relationship with the land and water.

We pay our respect to the Elders, past, present and emerging, and recognise their strength, resilience and rich contribution to society.

Delta Coal recognises the role of the registered Aboriginal parties in the management of the Aboriginal cultural heritage sites, landscape features and values of the area around Chain Valley Colliery and support their custodial and legislative rights and obligations to manage and participate in Caring for Country.

1 Introduction

1.1 Purpose

This Heritage Management Plan (HMP) outlines the requirements to be undertaken to ensure compliance with statutory requirements and applies to the surface operations at Chain Valley Colliery (CVC) and Mannering Colliery (MC), including pit top facilities and lands where additional infrastructure may be constructed.

This management plan addresses the requirements for Development Consent SSD-5465 (MOD3), Schedule 3, Conditions 21 and 21A (CVC) and Project Approval PA 06_0311 (MOD5), Schedule 3, Conditions 18 and 18A (MC). The conditions require the preparation of a HMP.

The purpose of this management plan is to:

- provide an overall framework for consultation related to heritage items;
- detail the regulatory requirements and commitments made in relation to management of Aboriginal and historic heritage at CVC and MC;
- identify measures to minimise impacts to heritage items;
- detail monitoring requirements for known heritage sites (if required);
- facilitate the effective management of heritage issues;
- outline the requirements and actions to be taken upon the discovery of heritage items;
- define specific responsibilities of all stakeholders and function as a management tool for all relevant operational personnel; and
- identify the requirements for review of the document and a procedure for continual improvement.

The overall aim of this management plan is to promote a high level of environmental performance through the minimisation of heritage impacts.

1.2 Background

CVC and MC are underground coal mines located adjacent to each other on the southern side of Lake Macquarie approximately 60 km south of Newcastle and 80 km north of Sydney (see **Figure 1**). The CVC pit-top is located approximately 1 km south-east of the township of Mannering Park at the southern extent of Lake Macquarie. The MC pit-top is located 3 km south of the township of Mannering Park.

1.2.1 Chain Valley Colliery

In August 1960, J&A Brown and Abermain Seaham Collieries Ltd commenced clearing the present site of CVC, with drift and shaft sinking starting a few months later. Production of coal from the Wallarah Seam commenced, with the first delivery to the adjacent Delta Electricity's Vales Point Power Station (VPPS) in April 1963.

LakeCoal was formed in 2001 to acquire BHP Billiton's 80% share in the Wallarah Coal Joint Venture (WCJV), the remaining 20% share was owned by Sojitz. In October 2006, Peabody Energy, a US listed company acquired LakeCoal Pty Limited.

In November 2009 LDO Coal Pty Limited purchased LakeCoal Pty Limited. LDO Coal is a consortium consisting of LD Operations, AMCI and private investors. In March 2011 the 20% share in the WCJV which Sojitz held was acquired by LDO Coal shareholders through the entity Fassi Coal Pty Ltd. The WCJV had operated the Wallarah, Moonee and Chain Valley underground coal mines and the Catherine Hill Bay Coal Preparation Plant, all located at the southern end of Lake Macquarie. At the time of LakeCoal's acquisition by LDO Coal, both the Wallarah and Moonee mines were closed.

1.2.2 Mannering Colliery

Development of MC (known as Wyee Mine) began in 1960 in conjunction with the construction of VPPS and was operated by Powercoal Pty. Ltd. Production commenced in 1961 with extensive mining (first workings and secondary extraction) having taken place in both the Great Northern and Fassifern seams. Coal operations temporarily ceased on 30 June 2002 when the operation was placed on care and maintenance.

Centennial Coal acquired control of Powercoal on 7 August 2002 and the Colliery remained on care and maintenance until reopening as Mannering Colliery. Production recommenced in December 2005, mining the Fassifern Seam to gain access to greater than 5 million tonnes of recoverable reserves beneath Lake Macquarie and surrounding lands.

MC was once again placed on care and maintenance in November 2012 and in 2013 the owners of MC and CVC entered into an agreement which enabled LakeCoal to operate the MC until 2022. LakeCoal became the operator of MC effective 17 October 2013. The underground link road between CVC and MC was completed in October 2017.

LakeCoal was placed into Voluntary Administration on 3 October 2018. The receivers continued operation of the mines in the period 3 October 2018 to 1 April 2019. As of 1 April 2019, Great Southern Energy Pty Ltd (trading as Delta Coal) own and operate the two underground coal mines, CVC and MC.

1.3 Operations

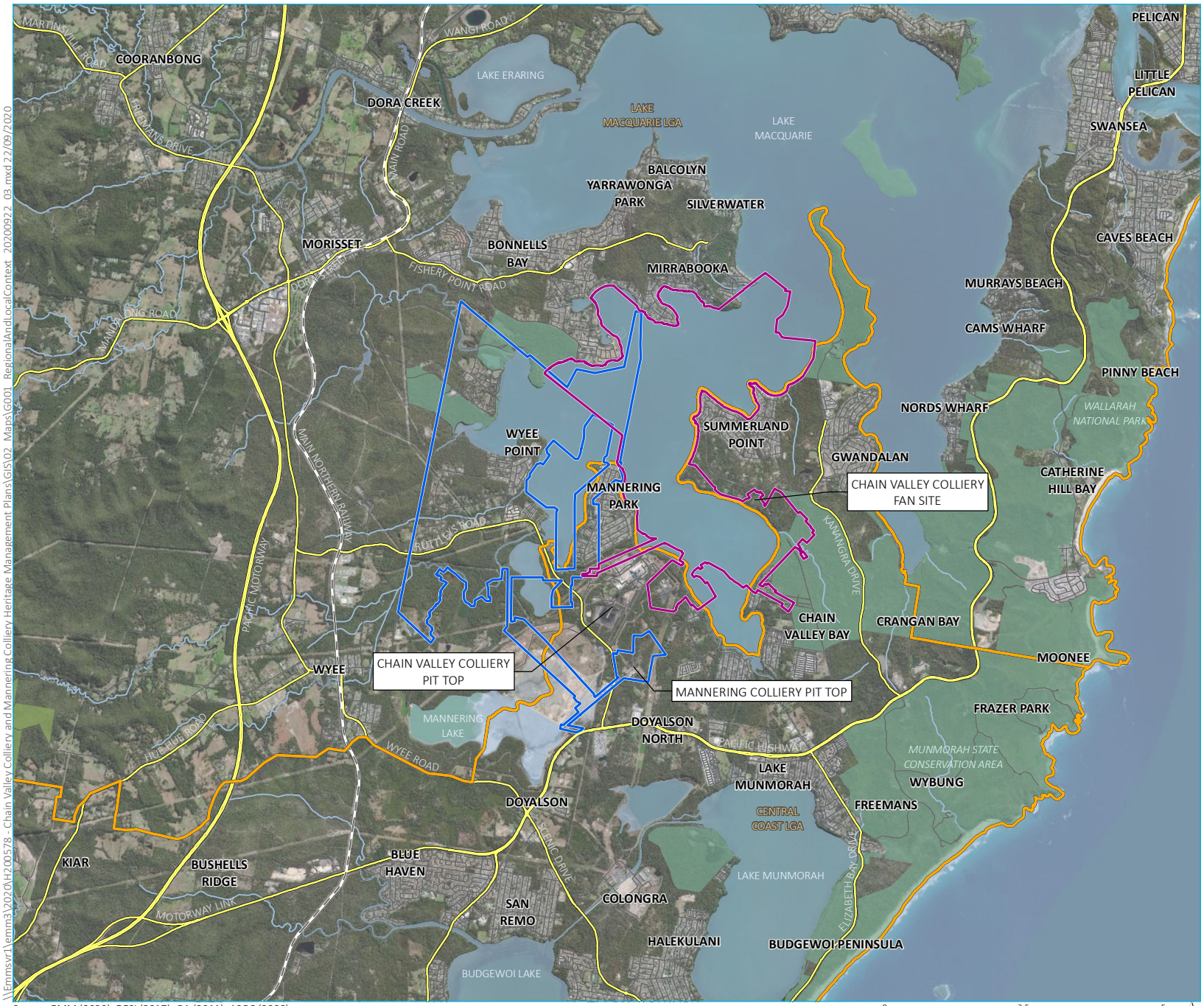
CVC is an underground coal mine which extracts coal through both first workings and miniwall extraction methods (second workings) as per the development approval SSD-5465 (as modified), with the latest modification (MOD 3) granted on 26 June 2020. Mining is currently undertaken at CVC, with the ROM coal being transported underground to MC where the coal is crushed and screened and sent to VPPS.

The surface infrastructure comprises limited facilities at the CVC 14 hectare pit top area adjacent to the VPPS, off Construction Road at Mannering Park, and another 0.3 hectare area at the ventilation facility situated at Summerland Point. Both the pit top and ventilation facilities have remained largely unchanged since their establishment.

As per the project approval PA 06_0311 all coal from MC is transported from CVC via the MC underground workings to the MC drift conveyor system to the surface, coal crushing facility and dedicated overland conveyor to VPPS for domestic energy generation.

On 26 June 2020 Delta Coal (DC) received approval for a modification (MOD 5) to PA 06_0311 to allow for:

- an increase in the rate of ROM coal handling at MC from 1.3 to 2.1 Mtpa;
- transport from MC to VPPS;
- an extension to the approved end date for mining operations to 31 December 2027; and
- the use of alternate bord and pillar mine designs.



\\Emmsvr1\emm3\2020\H200578 - Chain Valley Colliery and Mannering Colliery Heritage Management Plans\GIS\02 Maps\G001 RegionalAndLocalContext 20200922 03.mxd 22/09/2020

Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

Regional and local context

Delta coal

EMM creating opportunities

1.4 Statement of Significance

1.4.1 The Awabakal and Guringai Peoples

Following is a Statement of Significance by the Awabakal and Guringai Peoples for the CVC Revised Heritage Management Plan 2014. No changes to the Statement of Significance have been made and the statement has been reproduced with permission.

“Awabakal and Guringai is one of the 600 or more language groups or ‘nations’ that existed across Australia at the time of European contact and are part of the oldest and continuous living Culture in human history.

Our People were recorded in this area and acknowledged in the first records ever made of the Aboriginal People of the Lake Macquarie, Newcastle and Central Coast areas. Prominent people such as L.E.Threlkeld, Jonathon Warner and many others documented our People, Cultural Heritage and Language in detail going back to the very early 1800’s.

Our people believe that all Aboriginal sites and Traditional Culture that has existed for many thousands of years within our area are a tangible link to our Ancestors and our past. Surveys and assessments within the Chain Valley Colliery area has identified Aboriginal Cultural Heritage Sites (the tangible evidence of occupation) and (the intangible evidence) of landscape features of cultural value embedded within a landscape that provided physical and spiritual sustenance to the Awabakal and Guringai and those Aboriginal People they invited into their Country. The survival of these sites is significant to the continuation of collective knowledge and inspiration for our young people and coming generations of Awabakal and Guringai People. We acknowledge our Ancestors for passing on knowledge and also the legacy for us to continue what they put into place, to pass on our Cultural Heritage and to protect our sites for all those in the future.

The Awabakal and Guringai presence within the Chain Valley Colliery area extends from the present day back many thousands of years and is reflected in both tangible and intangible aspects of Aboriginal Culture and history. As Awabakal and Guringai People, we hold Cultural Knowledge that has been passed down from our Ancestors about our Traditional Country for thousands of years and a spiritual awareness, presence and connectedness of place that is what makes us one with the Land of our People. Therefore, the Awabakal and Guringai People have a continuing, contemporary history of trying to protect and preserve the Cultural Heritage within the surrounding areas.

We maintain concerns over Mining and Development licences being approved within the area and the adverse impacts this has on our Cultural Values and landscape features, and footprints of our Ancestors which are being impacted through cumulative and overlapping development, mining and unmonitored and unmanaged human recreational activities.

As indicated by the statements provided by the Traditional Owners, the mental, physical and spiritual wellbeing of the Awabakal and Guringai People and those Aboriginal Peoples that feel a connection to this landscape is also a contemporary phenomenon and not just ‘a thing of the past’.

The Project Area contains Registered Aboriginal Cultural Heritage sites identified as having Aboriginal Cultural value and are numerous within LakeCoal Project area. The sites and landscape features link contemporary Awabakal and Guringai People with generations of their Ancestors and are extremely important teaching places and places of spiritual renewal.

We, as the Traditional People of these areas since colonisation of our land, have had to endure many deprivation and degradation along with the subsequent loss of not just our People and land but many aspects of our Culture and Heritage. This has been brought about through the damage and neglect of many ventures both modern and historically that have taken place, the result being, significant loss of Cultural places and artefacts that for thousands of years have given substance and meaning to the lives of Awabakal and Guringai People.

We as Traditional Owners today have vowed to protect our Cultural Heritage and those significant places remaining, so we and our young people and those to come will not go the way of many other Aboriginal People and their Culture and Heritage to become just a name in history books of what was. It has been quite a struggle for our people, with our numbers reduced to a handful after the white fella arrived in Australia in 1788.

It would seem we were doomed to the fate of many other First Peoples that have disappeared from countries all around the world, but we are still here, we have survived and are proud to be called Awabakal and Guringa.

Although the impact of European invasion dramatically changed Aboriginal life in Australia, not to mention the lives of our own People forever, the recent history of the Lake Macquarie area is also characterised by the Cultural resilience of Aboriginal Peoples, for both those who have retained connection to Country and those that are reconnecting to Country. Recent history is also characterised by the movement of other Aboriginal Peoples into the Country of the Awabakal and Guringai and the development of their own more recent attachments to the area. Whilst a diversity of attachment and experience is recognised, it is also necessary to recognise that the landscape, vegetation and watercourses of the Chain Valley Colliery area forms a unique part of the Cultural Heritage and Cultural landscape of the Awabakal and Guringai People.

Aboriginal lore requires that the Aboriginal cultural landscape of the Chain Valley Colliery area (which includes Aboriginal heritage sites, landscape features of Cultural value, the plants, animals and water) is cared for so that it will survive for future generations of Aboriginal Peoples.

The custodial rights and obligations of Aboriginal people Caring for Country underpin the principles of this HMP. It is highlighted, however, that the Awabakal and Guringai People in no way support any impact to Aboriginal sites, landscape features of Aboriginal cultural value or any aspect of the natural environment of the Chain Valley Colliery Area. Aboriginal people inherit the right and obligation to Care for Country, and endorsing any form of harm is assessed as culturally and ethically inappropriate". (**© Awabakal & Guringai 2014)**

1.4.2 The Biraban Local Aboriginal Land Council

Following is a Statement of Significance by the Biraban Local Aboriginal Land Council for the combined Heritage Management Plan 2020. No changes to the Statement of Significance have been made and the statement has been reproduced with permission.

"Biraban Local Aboriginal Land Council aim to promote, protect and foster the best interests of all Aboriginal people within its boundary and its members. As part of Biraban Local Aboriginal Land Council's role, we provide ongoing protection and conservation to all tangible and intangible Aboriginal cultural and heritage sites and cultural landscapes throughout our boundary being across both Awabakal and Wonnarua countries.

For generations Aboriginal people have cared for country and continue to care for country, some of whom are descendants of the Awabakal and Wonnarua nations, others who were born and/or raised in these countries and have a strong continual connection to country, and are now too custodians of these lands. Aboriginal people have a strong unwavering spiritual and emotional connection to country and take great pride in continuing the efforts of our Elders and our Ancestors by caring for the land, the waters, the plants, the animals, the Dreaming and now and into the future the last remaining evidence of the traditional occupation of our country by our Aboriginal Ancestors.

The archaeological evidence is of significance to Aboriginal people and culture as too are the cultural landscapes, the flora, the fauna and the connections each one has to the other, the intangible values of a place contribute significantly to an areas significance, with special care and protection given to the traditional occupation sites, shell middens, scarred trees, stone and wooden artefacts, grinding grooves, ceremonial grounds and sites, burial grounds, dreaming sites and hunting and gathering grounds.

Aboriginal people are the primary determinants of their Aboriginal culture and heritage, they are the knowledge holders and the caretakers, they have a strong connection to country and have cared for country for thousands of years and will continue to care for country for thousands of years to come." (**© Biriban LALC 2020)**

1.5 Consultation

1.5.1 Chain Valley Colliery Heritage Management Plan

The original draft of the CVC Heritage Management Plan (HMP) was issued to the previously identified Aboriginal stakeholders for comment on 7 August 2012. Responses were received from:

- Darkinjung Local Aboriginal Land Council (DLALC);
- Bahtabah Local Aboriginal Land Council (BLALC);
- Awabakal Traditional Owners Aboriginal Corporation (ATOAC); and
- Awabakal Descendants Traditional Owners Aboriginal Corporation (ADTOAC).

These stakeholders identified the issues of accurate background information, inclusion of Aboriginal stakeholders in certain management measures and timing of review. At meetings with BLALC, ATOAC and ADTOAC at the CVC offices on 30 August 2012 the wording of the HMP was discussed in more detail and amendments were incorporated into the final version of the HMP which was subsequently approved on the 1 July 2013.

Version 2 of the management plan was based on the work completed for the heritage assessment of SSD-5465 and subsequent site inspection and workshop held in September 2013. At this site inspection representatives of the ADTOAC, ATOAC, Guringai Tribal Link Aboriginal Corporation and Awabakal Local Aboriginal Land Council were present for the fieldwork and, although unable to attend the fieldwork, an additional representative from the DLALC was able to attend the subsequent workshop.

A number of actions arose from the site inspection and workshop in September 2013 with all actions completed and incorporated into the HMP.

The third version of the CVC HMP addressed actions resulting from Modification 2 to Development Consent SSD-5465, specifically the recommendations of the Aboriginal Cultural Heritage Assessment (ACHA) prepared for Chain Valley Colliery Modification 2 Statement of Environmental Effects (EMM, June 2015).

The fourth version of the CVC HMP while based substantially on the previously approved LakeCoal HMP, was updated to reflect the recommendations and minor changes of the Independent Environmental Audit (IEA) conducted by SLR in June 2019.

The updates were administrative only and there were no changes to activities, impacts, the mine footprint or development consent requirements associated with CVC. This version included consultation with the Registered Aboriginal Parties, the Biodiversity and Conservation Division (BCD) and the Department of Planning, Industry and Environment (DPIE) and was approved by DPIE on 21 April 2020.

1.5.2 Mannering Colliery Aboriginal Cultural Heritage Management Plan

The original MC Aboriginal Cultural Heritage Management Plan (ACHMP) prepared by RPS in 2012 for Centennial Coal's Northern Holding, which included MC, was issued to the previously identified Aboriginal Stakeholders for comment. Following amendments, the ACHMP was approved on 26 November 2012.

In accordance with the review and auditing process outlined in Chapter 8, a draft of the updated ACHMP developed for MC was provided to the Aboriginal Stakeholders for comment on 16 August 2019. There were no responses received.

The updates were administrative only and there were no changes to activities, impacts, the mine footprint or development consent requirements associated with MC. This version included consultation with the Registered Aboriginal Parties, BCD and DPIE and was later approved by DPIE on 13 November 2019.

1.5.3 Mannering Colliery Historic Heritage Management Plan

The original MC Non-Indigenous Cultural Heritage Management Plan (NICHMP) was previously prepared by Centennial Coal in February 2013. The plan was approved by the (former) Department of Planning and Infrastructure (DPI) on 10 September 2013.

The second version of this NICHMP, while based substantially on the approved Centennial Coal management plan, was updated to reflect the recommendations and minor changes of the Independent Environmental Audit (IEA) conducted by SLR in June 2019.

The updates were administrative only and there were no changes to activities, impacts, the mine footprint or project approval requirements associated with MC. This version of NICHMP was provided to NSW Environment Protection authority (EPA) and DPIE and was approved on 13 November 2019.

1.5.4 Combined Delta Coal Heritage Management Plan

Registered Aboriginal Parties (RAPs) who have registered an interest to participate in the consultation process comprise the four groups consulted for the original HMP draft and six further Aboriginal organisations. The complete list of ten RAPs are:

- ATOAC;
- ADTOAC;
- BLALC;
- DLALC;
- Biriban Local Aboriginal Land Council;
- Daniella Chedzey;
- Cacatua Culture Consultants;
- Guringai Tribal Link;
- Wonn 1 Contracting; and
- Yula - Punaal Aboriginal Education and Healing Centre.

In accordance with the review and auditing process, a draft of this combined HMP, developed for CVC and MC was provided to the RAPs, DPIE, Heritage NSW (inclusive of Aboriginal Cultural Heritage Advisory Council and Heritage Council of NSW) for comment on 22 October 2020. This HMP was provided to DPIE on 6 November 2020 following the 14 day consultation period.

A summary of the comments received, and amendments subsequently made to the document prior to finalisation are detailed in **Table 1**. Evidence of consultation is provided in **Appendix 1**.

Table 1: Consultation Summary

Stakeholder	Comments	Response/Action
RAPs	• No comments provided	• NA
NSW DPIE	• TBC	• NA
Heritage NSW	• No comments provided	• NA

1.5.5 Ongoing community consultation and involvement

As part of the of the HMP, DC facilitates ongoing consultation and involvement of RAPs in the conversation and management of Aboriginal cultural heritage on CVC and MC sites. This is achieved by:

- providing relevant information about the cultural significance and values of the Aboriginal object(s) and/or place(s);
- providing for ongoing communication of information on mining operations and cultural heritage management and the Aboriginal community;
- providing advice on how to address community relationships; and
- commenting on future draft assessment reports and management plans before they are submitted to regulatory authorities.

1.5.6 Access to Aboriginal sites and stored Aboriginal objects

Local Aboriginal community access to Aboriginal sites and stored Aboriginal objects will be made available by DC subject to reasonable safety and security measures, such as availability of DC staff assistance. Any request to visit is to be made to the DC Environmental Compliance Coordinator.

2 Statutory Requirements

2.1 Key Legislation, Policy and Guidelines

This HMP has been prepared in accordance with the principles of the Australia ICOMOS Burra Charter, 2013 (Burra Charter). The Burra Charter provides guidance for the conservation and management of places of cultural significance and sets a standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance, including owners, managers and custodians.

Items of heritage significance in NSW are protected by a series of acts whose purpose it is to ensure that change is appropriately managed to ensure that significance is not lost. In NSW, the *Heritage Act 1977* and the *Environmental Planning and Assessment Act 1979* (EP&A Act) are the primary statutory controls protecting historical heritage and archaeology within NSW. Listing on statutory registers provides legal protection for heritage items.

2.2 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important heritage places as well as places that are owned by the Commonwealth, such as defence lands and postal facilities.

2.2.1 Native Title Act 1993

The Commonwealth Government enacted the *Native Title Act 1993* to formally recognise and protect native title rights in Australia following the decision of the High Court of Australia in Mabo & Ors v Queensland (No.2) (1992) 175 CLR 1 (“Mabo”.)

2.2.2 Aboriginal Land Rights Act 1983

The purpose of this legislation is to provide land rights for Aboriginal people within New South Wales and to establish Local Aboriginal Land Councils (LALCs). The land able to be claimed by Aboriginal Land Councils on behalf of Aboriginal people are certain Crown lands as detailed in s36 of the *Aboriginal Land Rights Act 1983*. Claims for land are by application to the Office of the Registrar, *Aboriginal Land Rights Act 1983*.

2.2.3 National Parks and Wildlife Act 1974

The primary state legislation relating to the protection of Aboriginal cultural heritage in NSW is Part 6 of the *National Parks and Wildlife Act 1974* (NPW Act).

The *National Parks and Wildlife Regulation 2009* (NPW Regulation) is subsidiary legislation made under its parent act, the NPW Act. The NPW Regulation provides codes of practice, documents and guidelines that relate to the NPW Act, including:

- *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010);
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010);
- *Aboriginal Consultation Requirements for Proponents 2010* (DECCW 2010); and
- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011).

2.2.4 Heritage Act 1977

Historical archaeological relics, buildings, structures, archaeological deposits and features are protected under the *Heritage Act 1977* (as amended 1999) and may be identified on the State Heritage Register (SHR) or by an active Interim Heritage Order.

I. Relics Provision

Relics are defined by the Heritage Act are *"any artefact, object or material evidence which relates to the settlement of that area that comprises New South Wales, not being Aboriginal settlement, and is of State or local significance."* Relics are protected under Section 139 of the Heritage Act. Where the potential for relics exists, the land in which it is found cannot be disturbed or excavated without an excavation permit.

II. State Heritage Register

The SHR is a list of places and objects of particular importance to the people of NSW. When a place is listed on the SHR or is affected by an interim heritage order, approval under Section 60 of the Heritage Act is required for any major work. The purpose of this requirement is to ensure that change to significant places is managed appropriately and does not detract from the heritage significance of the place.

III. Section 170 Register

State government agencies have responsibilities under Section 170 of the *Heritage Act* that requires them to identify, conserve and manage heritage assets owned, occupied or managed by that agency. Each agency is required to maintain a s170 register of all heritage assets and assess the significance of each asset.

2.2.5 Environment Planning and Assessment Act 1979 (EP&A Act)

The EP&A Act establishes the framework for cultural heritage values to be formally assessed in the planning and development consent process in NSW. The EP&A Act requires that environmental impacts are considered before land development; this includes impacts on cultural heritage items and places as well as archaeological sites and deposits.

The EP&A Act requires that local governments prepare planning instruments, such as Local Environment Plans (LEPs) and Development Control Plans (DCPs) to provide guidance on the level of environmental assessment. This includes identification of heritage items, as listed on the heritage schedules of an LEP.

The Act regulates a system of environmental planning and assessment for NSW. Land use planning requires that environmental impacts are considered, including the impact on cultural heritage and specifically Aboriginal heritage, assessment documents prepared to meet the requirements of the EP&A Act.

2.3 Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW

In 2010, the NSW Office of Environment and Heritage released the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW. This code of practice is designed to assist individuals and organisations to exercise due diligence, when carrying out activities that may harm Aboriginal objects and to determine whether they should apply for consent in the form of an Aboriginal Heritage Impact Permit (AHIP).

The *National Parks and Wildlife Act 1974* (NPW Act) provides that a person who exercises due diligence in determining that their actions will not harm Aboriginal objects has a defence against prosecution for the strict liability offence if they later unknowingly harm an object without an AHIP.

The code sets out the reasonable and practicable steps which individuals and organisations need to take in order to:

- identify whether or not Aboriginal objects are, or are likely to be present in an area;
- determine whether or not their activities are likely to harm Aboriginal objects (if present);
- determine whether an AHIP application is required; and
- Aboriginal Cultural Heritage Consultation Requirements for Proponents.

Also, in 2010, the NSW Office of Environment and Heritage released the Aboriginal Cultural Heritage Consultation Requirements for Proponents. The purpose of the consultation guidelines is to establish the requirements for consultation with the registered Aboriginal parties as part of the heritage assessment process to determine potential impacts of proposed activities on Aboriginal objects and places and to also inform decision making for any application for an AHIP. The aims of the consultation guidelines are to facilitate positive Aboriginal cultural outcomes by:

- *affording an opportunity for Aboriginal people who hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or place(s) in the area of the proposed project to be involved in consultation so that information about cultural significance can be provided to DECCW to inform decisions regarding applications for an AHIP; and*
- *providing Aboriginal people who hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or place(s) in the area of the proposed project with the opportunity to participate in decision making regarding the management of their cultural heritage by providing proponents information regarding cultural significance and inputting into management outcomes.*

2.4 Approvals

This plan has been prepared in accordance with CVC Schedule 3, Condition 21 of Development Consent SSD-5465, and MC Schedule 3, Condition 18 of Project Approval 06_0311, which states the requirements of the Heritage Management Plan (HMP) and what it must address. Cultural heritage related requirements of the approvals, including specific requirements that are to be addressed in this plan, and where they are addressed, are detailed in **Appendix 2**.

In accordance with Schedule 2, Conditions 2 and 2A, in addition to carrying out the works in accordance with the conditions of CVC Development Consent SSD-5465, DC will also carry out works generally in accordance with the Environmental Impact Statement (EIS), Statement of Environmental Effects (SEE) (Mod 1), SEE (Mod 2), SEE (Mod 3), Project Layout Plans, and Statement of Commitments.

In accordance with Schedule 2, Conditions 2, in addition to carrying out the works in accordance with the conditions of MC Project Approval 06_0331, DC will also carry out works generally in accordance with the Environmental Impact Statement (EIS), Statement of Environmental Effects (SEE) (Mod 1), SEE (Mod 2), SEE (Mod 3), SEE (Mod 4), SEE (Mod 5), Project Layout Plans, and Statement of Commitments.

3 Aboriginal Heritage Management

3.1 Background

The Awabakal is bordered generally by the Darkinjung to the south west, Wonnarua to the north west and by the Worimi to the north beyond Newcastle. The Awabakal language extended south to Brisbane Waters or even to Sydney Harbour North Head, if the Gringai (Kurringai) language is related to Awabakal (Shane Frost pers.comm. Aug 2012).

The Lake Macquarie area has been the focus of a number of surface investigations and a small number of excavations. In order to develop a predictive model of site location, distribution and type that occur in the vicinity of CVC and MC, previous archaeological work undertaken within the region was reviewed.

There have been numerous archaeological studies undertaken for the Lake Macquarie region, starting from the 1970s until the present (eg Haglund 1986; Navin Officer and Saunders 1996; Umwelt 2011; EMM 2012). These studies have largely been undertaken as part of commercial, linear infrastructure and mining developments.

Archaeological investigations have identified that Aboriginal subsistence was focused on the estuarine shell beds on the lake margins. There is a strong association with shell midden sites and the lake shore, whereas stone artefact sites are often mixed with midden sites but also distributed adjacent to watercourses in the hinterland of Lake Macquarie. Furthermore, studies have found that Aboriginal scarred or carved trees may be adjacent to water sources in areas of uncleared forest.

It was determined that there were no items of historic heritage significance within the existing or proposed disturbance or mining areas, although a number of items were located nearby. These are discussed further in Section 4. A number of Aboriginal heritage sites were identified within the CVC and MC site and areas of proposed mining, as discussed in further detail below.

3.2 Chain Valley Colliery Previous Assessments

3.2.1 Environmental Assessment (AECOM 2011)

For the EA (AECOM, 2011), a search of Office of Environment and Heritage (OEA) Aboriginal Heritage Information Management System (AHIMS) database was conducted on 30 September 2009 and revealed six registered Aboriginal sites within the area. In addition to this, as part of the EA process, consultation and field work was undertaken with Aboriginal stakeholders within the study area of the EA, which resulted in the identification of an additional five Aboriginal sites.

3.2.2 Environmental Impact Statement (EMM 2012)

An extensive search of the AHIMS register was also conducted during 2012 as part of the EIS for an area of 10 km by 10 km surrounding the CVC. The search revealed a total of 99 registered sites, the majority of which occurred along the Lake Macquarie foreshore. Middens accounted for 60% of the total sites registered, isolated finds accounted for 11% and scarred trees represented 10%. Subsequent fieldwork undertaken by EMM in conjunction with RAPs identified one new site (45-7-0339) and also redefined the extents of sites 45-7-0154 (at Fishery Point, Sunshine) and 45-7-0157 (at Casuarina Point, Sunshine).

Notwithstanding the high significance of Aboriginal sites and objects to Aboriginal people, Aboriginal stakeholders advise that all of the land is of significance to Aboriginal people.

In the 2014 HMP it was noted that the Awabakal and Guringai People had a Registered Native Title claim over the site and surrounding areas including the Lake Macquarie City Council and Wyong Shire Council Local Government Areas (LGAs) along with other LGAs. The Native Title claim was registered on 13 June 2013 and discontinued as at 30 June 2017.

In addition, there is a current claim by Johnson and Kendall Grange. The Native Title claim was registered on 27 April 2007 and is not yet determined.

3.2.3 ACHA (EMM, 2015)

In addition to the above assessments, an Aboriginal Cultural Heritage Assessment (ACHA) was completed as part of the Statement of Environmental Effects prepared for Chain Valley Colliery Modification 2 (EMM, June 2015). This report identified Aboriginal site 45-7-0157 would be subject to subsidence impacts at a negligible level as a result of the proposed modification, and recommended monitoring requirements. The assessment also recommended Aboriginal site 45-7-0154 be removed from the monitoring program as it will no longer be undermined.

3.2.4 Aboriginal due diligence assessments for subsidence monitoring (EMM, 2017 and 2019)

EMM was engaged in 2017 and 2019 to undertake Aboriginal due diligence assessments in relation to the installation of subsidence monitoring lines along Summerland Point/Chain Valley Bay foreshore (2017) and the Point Wollstonecraft Foreshore (2019). The assessments were a part of ongoing subsidence monitoring associated with mining operations. Although both assessments identified shell material associated with naturally occurring deposits, and cultural deposits at existing AHIMS site, no further sites were identified. No impacts to Aboriginal sites or objects were proposed by the subsidence monitoring activities.

3.2.5 Management Plan Reviews (EMM, 2020)

Methods used to identify potential Aboriginal cultural heritage sites and/or objects for inclusion in this revised HMP were as follows:

- a review of the previous archaeological investigations undertaken at CVC and its surrounds;
- an extensive search of the AHIMS database to identify previously recorded Aboriginal sites; and
- objects in and around the CVC project approval boundary.

An updated AHIMS search was conducted on 14 October 2020 with results provided in **Appendix 3**. A total of 86 Aboriginal sites were identified within the search area, the majority of which were located around the Lake Macquarie foreshore. Of these sites, 29 are located within the current CVC project area boundary as detailed in **Table 2** and shown on **Figure 2**. Fifteen additional Aboriginal sites have been included in this HMP within or near the CVC development consent boundary in comparison with the 2014 HMP.

Table 2: AHIMS registered sites within/near the CVC project area (as at 19 October 2020)

No.	AHIMS ID(s)	Site name	Site type/features
1	45-3-0334	Tiembula Creek Midden	Shell Midden
2	**45-7-0131**	Summerland Point	Shell Midden
3	**45-7-0166**	M8, Sugar Bay	Shell Midden
4	**45-7-0167**	Camp Brightwaters	Shell Midden

No.	AHIMS ID(s)	Site name	Site type/features
5	**45-7-0176**	Gwandalan	Shell Midden
6	45-7-0178	Hembula Creek	Scarred Tree (x2)
7	45-7-0179	Black Neds Point	Shell Midden
8	45-7-0181	Chain Valley Bay 1	Shell Midden
9	45-7-0182	Chain Valley Bay 2	Shell Midden
10	45-7-0189	Sandy Beach 1	Shell Midden
11	**45-7-0227**	St Johns 1	Artefact
12	**45-7-0255**	Trinity Point GG2	Grinding Groove
13	**45-7-0257**	Trinity Point Ochre	Ochre Quarry
14	**45-7-0258**	Trinity Point IF1	Artefact
15	**45-7-0262**	SJOG 7	Grinding Groove
16	**45-7-0263**	SJOG 6	Shell Midden
17	45-7-0271	CV-08-09	Shell Midden
18	45-7-0272	CV-09-09	Shell Midden
19	45-7-0273	CV-10-09	Shell Midden
20	45-7-0277	CV-16-09	Shell Midden
21	**45-7-0279**	CV-18-10	Shell Midden
22	**45-7-0281**	CV-20-10	Shell Midden
23	45-7-0282	CV-21-10	Shell Midden
24	**45-7-0293**	RPS MP3	Modified Tree (Carved or Scarred)
25	45-7-0154	M7	Shell Midden
26	45-7-0157	M10	Shell Midden
27	45-7-0339	CV-001	Isolated artefact
28	**45-7-0412**	**DC1**	**Shell**
29	**45-7-0413**	**DC2**	**Shell**

Sites listed in bold are sites not included in the 2014 HMP. It may be that some are located just outside the development consent boundary but have been included in this management plan for completeness.

3.3 Mannering Colliery Previous Assessments

3.3.1 Aboriginal Cultural Heritage Management Plan (ACHMP) (RPS 2012)

In 2012, RPS prepared an ACHMP for Centennial Coal's Northern Holdings. The Northern Holdings included Newstan Colliery, Awaba Colliery, Myuna Colliery, Mannering Colliery and Mandalong Mine.

A search of the Aboriginal Heritage Information Management System (AHIMS) database conducted on 21 March 2012 identified a total of 332 Aboriginal sites within the boundaries of Centennial's Northern Holdings. Of these sites, 28 were located within the MC project area boundary (RPS 2012: Attachment 3).

The most common site types identified were artefact scatters or isolated finds, grinding groove sites, shell middens and rock shelters. Modified trees, which included both scarred and carved trees, were present in moderate numbers. Potential archaeological deposits and shelters with art had been identified in relatively few numbers and have been considered less common in the region. The remainder of sites within Centennial's Northern Holdings were multi-component sites ranging between one and three instances, which most likely represent places where a range of subsistence activities took place. Multi component sites are places where a variety of activities may have taken pace and therefore have a range of site types within the overall assemblage.

3.3.1 Modification 3 Environmental Assessment (EMM 2015)

The current previous approved modification, Modification 3 Environmental Assessment for Mannering Colliery (EMM 2015) outlines an extensive AHIMS search conducted by EMM Consulting on 17 August 2014. The search was for an area of 5 km by 5 km encompassing MC (the search area), and adjacent catchments. The search identified a total of 112 registered sites, with middens being the most common site type recorded.

No Aboriginal sites were identified in the Modification 3 area.

3.3.2 Aboriginal Cultural Heritage Management Plan (ACHMP) Review 2019

The current review has been completed to extract relevant information from the previous Centennial Coal Northern Holdings ACHMP, and to develop an ACHMP specific to the MC project area.

Methods used to identify potential Aboriginal cultural heritage sites and/or objects for inclusion in this revised ACHMP were as follows:

- a review of the previous archaeological investigations undertaken at MC and its surrounds; and
- an extensive search of the AHIMS database to identify previously recorded Aboriginal sites and objects in and around the MC project approval boundary.

An updated AHIMS search was conducted on 14 October 2020 with results provided in **Appendix 3**. A total of 86 Aboriginal sites were identified within the search area, the majority of which were located around the Lake Macquarie foreshore. Of these sites, 10 are located within the current MC project area boundary as detailed in **Table 3** and shown on **Figure 2**. Only one additional Aboriginal site, 45-7-0363, has been recorded within the MC project area since completion of the 2012 ACHMP and has been shown in bold on the following table.

Table 3: AHIMS registered sites within/near the MC project area (as at 19 October 2020)

No.	AHIMS ID(s)	Site name	Site type/features
1	45-3-1553	Wyee Bay,Ruttleys Road	Midden
2	45-7-0001	Morisset Hospital	Midden
3	45-7-0003	Vales Point, Lake Macquarie	Midden
4	45-7-0190	Wyee Point	Midden/artefact
5	45-7-0207	The Hole (TH1)	Open Camp site
6	45-7-0291	RPS HSO M1	Shell
7	45-7-0316	RPS Wyee Point 2	Shell
8	45-7-0320	RPS Mannering 1	Shell
9	45-7-0321	RPS Mannering 2	Modified tree (carved or scarred)
10	45-7-0363	Woods Repatriation Site	Burial/modified tree (carved or scarred)

It may be that some are located just outside the development consent boundary but have been included in this management plan for completeness.

3.4 Items of Significance

Obligation to Avoid Harm

All employees, contractors, sub-contractors and visitors to CVC and MC have an obligation to avoid harming Aboriginal heritage unless engaged in an Aboriginal heritage management activity described in this plan.

The *National Parks and Wildlife Act 1974 (*NPW Act) defines “harm” to an object or place as any act or omission that:

(a) destroys, defaces or damages the object or place, or

(b) in relation to an object-moves the object from the land on which it had been situated, or

(c) is specified by the regulations, or

(d) causes or permits the object or place to be harmed in a manner referred to in paragraph (a), (b) or (c),

(e) desecrates the object or place, or

(f) is trivial or negligible, or

(g) is excluded from this definition by the regulations.

Any Aboriginal objects or sites at CVC and/or MC will be made aware for all employees, contractors and sub-contractors by the Environmental Compliance Coordinator or the Approvals Coordinator. This will include a message detailing:

- that the objects or sites are protected by law;
- potentially be distributed across the project area and that new sites may be exposed in areas outside of the disturbance footprints;
- are of significance to the Aboriginal community, and important to the wider community and must be treated with respect;
- have included stone tool sites; and
- can be hard to recognise, therefore reference must be made to the Aboriginal heritage maps in this management plan in order to clearly identify them.

In the process of undertaking any mining activities there is potential to impact Aboriginal objects or sites. Any activity which results in the disturbance of the surface has the potential to harm Aboriginal heritage sites. The level of impact to Aboriginal sites depends on the nature of the surface works/subsidence and the physical characteristics of the Aboriginal site types. The Mannering Colliery project approval currently allows for first workings mining only in the Great Northern and Fassifern seams, with <20 mm surface, negligible subsidence effects. This is less than the average natural ground swell movement of 29 mm (Delany et al). This first working mining method is the key management tool to avoiding harm to aboriginal heritage.

3.4.1 Artefact Scatters and Isolated Finds

The distinction between artefact scatters and isolated finds comes down to the interpretive value of these sites. An isolated find, as the name suggests, comprises of a single stone artefact which often cannot be contextualised by other artefacts in the landscape. Artefact scatters contain more than one artefact and have more interpretive value because they may provide information on processes such as procurement, manufacture, usage and discard (Holdaway et al 2002). These two types of sites are usually classified as “open” because they are usually set in exposed landscape (i.e. not a rock shelter) and the extent of these sites are based on an arbitrary boundary according to changes in density level and/or landform units (for artefact scatters). Isolated finds occur as a single artefact and are not generally found within 50 m of another artefact/artefact scatter.

3.4.2 Middens

Shell middens are commonly made up of the remains of edible shellfish and could be the result of a single meal or many meals at the same location over many years. A midden may also contain fish and animal bones, stone tools, or charcoal. They can vary in size and depth. Middens are sometimes associated with burials. Middens can be found on headlands, sandy beaches and dunes, around estuaries, swamps and tidal stretches of creeks and rivers, and along the banks of inland rivers, creeks and lands. Middens may also be found in the open or in rock shelters. Middens can indicate that a place was, and may continue to be, a key meeting place of significance. Middens can also provide information about the environment that existed when Aboriginal people collected the shellfish, such as changes in species, and tools or raw materials that were used. Middens which contain burials are particularly significant. Middens are amongst the most fragile cultural sites. They can be exposed by wind or degraded by human and animal activity. Effective management of midden sites may include stabilising the surface, such as by encouraging vegetation cover, or by restricting access to the site by erecting fencing (Excerpt from due diligence guidelines, DECCW 2010).

3.4.1 Stone Arrangements

Aboriginal stone arrangements are places where Aboriginal people have positioned stones deliberately in the landscape to form shapes or patterns. Although it is not certain why stone arrangements were made, scholars (O'Conner et al 2007) have suggested that they may have served a spiritual function (ie: rituals and ceremonial usage) or for practical subsistence purposes (ie: demarcating territorial boundaries or as fish traps along coastal regions). There are over 1000 known stone arrangements in NSW and Qld alone (Mulvaney & Kamminga 1999:25).

Stone arrangements are characterised as low height constructions, usually less than a metre high, and generally occur where there is a plentiful supply of boulders and suitable rock material to arrange. Although inferences can be made as to the reasons why particular stone arrangements were created based on research and intensive archaeological investigation, it is not possible to assign a generic function to stone arrangements. These types of sites can vary in size and shape and the choice of materials used in their construction can also vary greatly based on the availability of resources and selectivity of material. The spatial distribution of these arrangements may also have an interpretive implication on their function and usage.

Ground surface clearing activities and subsidence/upsidence can potentially harm stone arrangements. In terms of the potential harm associated with ground surface works, this can take place in the form of earth works activity directly where the site is located. However, these types of sites are more clearly identifiable in the natural landscape than artefact scatters and isolated finds because they are more physically imposing. Subsidence/upsidence may harm stone arrangements if the movement of the ground surface cause the stones move; thus, altering their original arrangement. Secondary effects of subsidence may include changes in drainage patterns which can also pose a risk to moving the stones in the arrangement.

3.4.2 Historic/Social/Ceremonial/Spiritual/ Dreaming Sites

Aboriginal ceremonial/Dreaming/spiritual sites are linked to cultural traditions and their function and significance are determined by the Traditional Owners. These types of sites can be for different types of purposes and would therefore need to be assessed individually. Although it is possible that archaeological remains can be associated with these types of sites, this however is not a necessary qualifier because their value largely hinges on the oral histories and traditions passed down in Aboriginal culture.

3.4.3 Grinding Grooves and Rock shelters

Natural processes such as the constant water flow over sandstone structures can cause erosion. Surface exfoliation can occur due to the heat of bush fires. Mining activities can also cause harm to grinding groove and rock shelter sites. It is observed that natural ground swell movement in Lake Macquarie region range between 7 mm and 58 mm with an average of 29 mm (Delany et al). This research suggests that any movement of the ground surface <58 mm could be attributed to natural processes rather than the result of mining inducted ground subsidence.

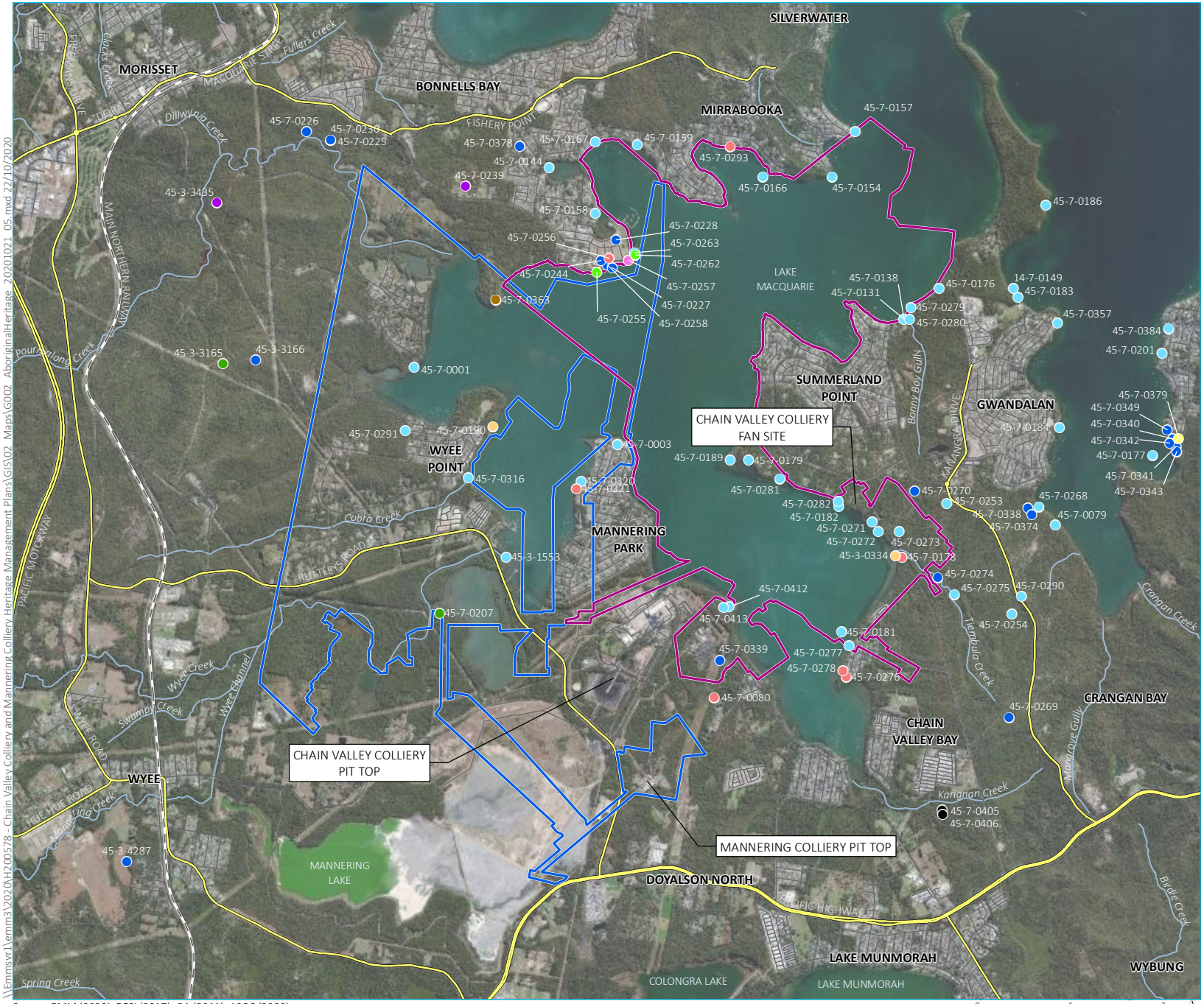
3.4.4 Scarred Trees/ Carved Trees

Aboriginal modified trees are trees which have been scarred or carved by Aboriginal people through the deliberate removal of bark or wood (Long 2005:6). There are numerous reasons why Aboriginal people removed bark from trees because it is a versatile and plentiful material. It can be used for a range of domestic activities including the manufacture of shelters, watercrafts, containers, weapons (shields/woomeras), etc.

All Aboriginal scarred trees are protected under state legislation and are recognised as sites. Given that the coastal margins of NSW and the valley are among the oldest European settlements in Australia, dating to the 1780s around Sydney and the 1800s in the Newcastle region (Long 2005:52), modified trees in the northern holdings would be expected to be older than 240 years.

The potential risk of subsidence/upsidence to scarred/carved tree sites is largely dependent on the condition of the tree (health) and where it is located in the landscape. If mature scarred/carved trees are healthy and alive, they generally have well established root systems which can keep them firmly affixed to the ground surface at the onset of subsidence.

Although a tree might be healthy, the ground condition and location of the site can also affect the sites stability. If the site is located on a precarious ledge along a ridge line or in loose or eroded soils, this would impact on how firmly affixed the tree is to the ground surface. Ground surface activity such as earthworks (including the construction of buildings, roads, vents, pollution ponds, stockpile areas) can harm scarred tree sites if they are within the area of proposed works. Changes in ground water levels or ponding areas, as a result of subsidence, may also lead to changes in tree health and potentially increase the risk of impact.



KEY

- Chain Valley Colliery development consent boundary
- Mannering Colliery project approval boundary
- Rail line
- Major road
- Minor road
- Named watercourse

AHIMS site type

- Aboriginal Ceremony and Dreaming
- Burial/scarred tree
- Grinding groove
- Isolated find
- Midden
- Midden and artefact
- Ochre quarry
- Open camp site
- Potential archaelogical deposit (PAD)
- PAD and midden
- Scarred tree

Identified Aboriginal heritage sites

Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

0 1 2 km

GDA 1994 MGA Zone 56

N

Delta coal

EMM creating opportunities

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4 Historic Heritage Management

This management plan included searches of the EPBC Act Matters of National Significance Register, the NSW State Heritage Register, Heritage and Conservation (Section 170) Register, Commonwealth Heritage List, World Heritage List, Lake Macquarie City Council LEP 2014, Wyong Local Environmental Plan 2013 and City of Lake Macquarie Heritage Study (1993). The following items were identified in the vicinity of the project area but are not expected to be impacted by CVC or MC. The locations of these sites are shown on **Figure 3**.

4.1 Morisset Hospital Precinct

Morisset Hospital site comprises almost 100 historic buildings on 1,244 hectares. It is approximately 3 km south-west of the township of Morisset. The Morisset Hospital Precinct is listed by Heritage NSW under the *NSW Heritage Act 1977.* Within the Morisset Hospital Precinct, 31 heritage items are individually listed by Local Government and State agencies. As outlined by Heritage NSW, the heritage items in the Morisset Hospital Precinct meet one or more criteria for listing on the SHR. The precinct is listing number 00827 and is of high state significance in the category of Health Services. Significant items also include impressive specimens of indigenous and introduced tree species, vegetation groups and native fauna.

The heritage item is listed as of state significance, item number 118 under the Lake Macquarie Local Environmental Plan 2014.

The Morisset Hospital Precinct area extends from the shoreline of Lake Macquarie and is west of the approval area.

4.2 Eaton Bulk Store Building

The Eaton Bulk Store Building is located at 464 Ruttleys Road, Mannering Park (Lot 11 DP 1091396), approximately 1.9 km south-west of the entrance road to CVC.

The heritage item is listed as of local significance, item I39 under the Wyong Local Environmental Plan 2013. The Council statement of significance:

'The bulk store building is significant locally as a representative example of a riveted steel building structure of the early twentieth century, which is historically part of nearby Wyee Colliery and illustrates the practice of building relocation and re-use typical of the mining industry in New South Wales. As a relocated structure, it provides evidence of the integrated management of multiple mining and generation sites. It retains this value despite its alterations for its reconstruction in a new site. It is a relic of the period of State ownership of electricity generation undertakings, including their fuel supplies in New South Wales. It is a type of building unusual in its vicinity and may have additional association significance arising from its origins at another site, possibly the Harbour Bridge Workshops.'

4.3 Great Northern Railway

The Great Northern Railway line passes through Lake Macquarie from Wyee to Garden Suburbs. The line is listed by Lake Macquarie City Council LEP 2014 as a heritage item (item 189) of local significance.

4.4 Wyee Coal Conveyor Rail Loop

The Wyee coal conveyor rail loop is located on the eastern side of the Great Northern Railway, north of Wyee. The line is listed in the Lake Macquarie City Council LEP 2014 as a heritage item (item 225) of local significance.

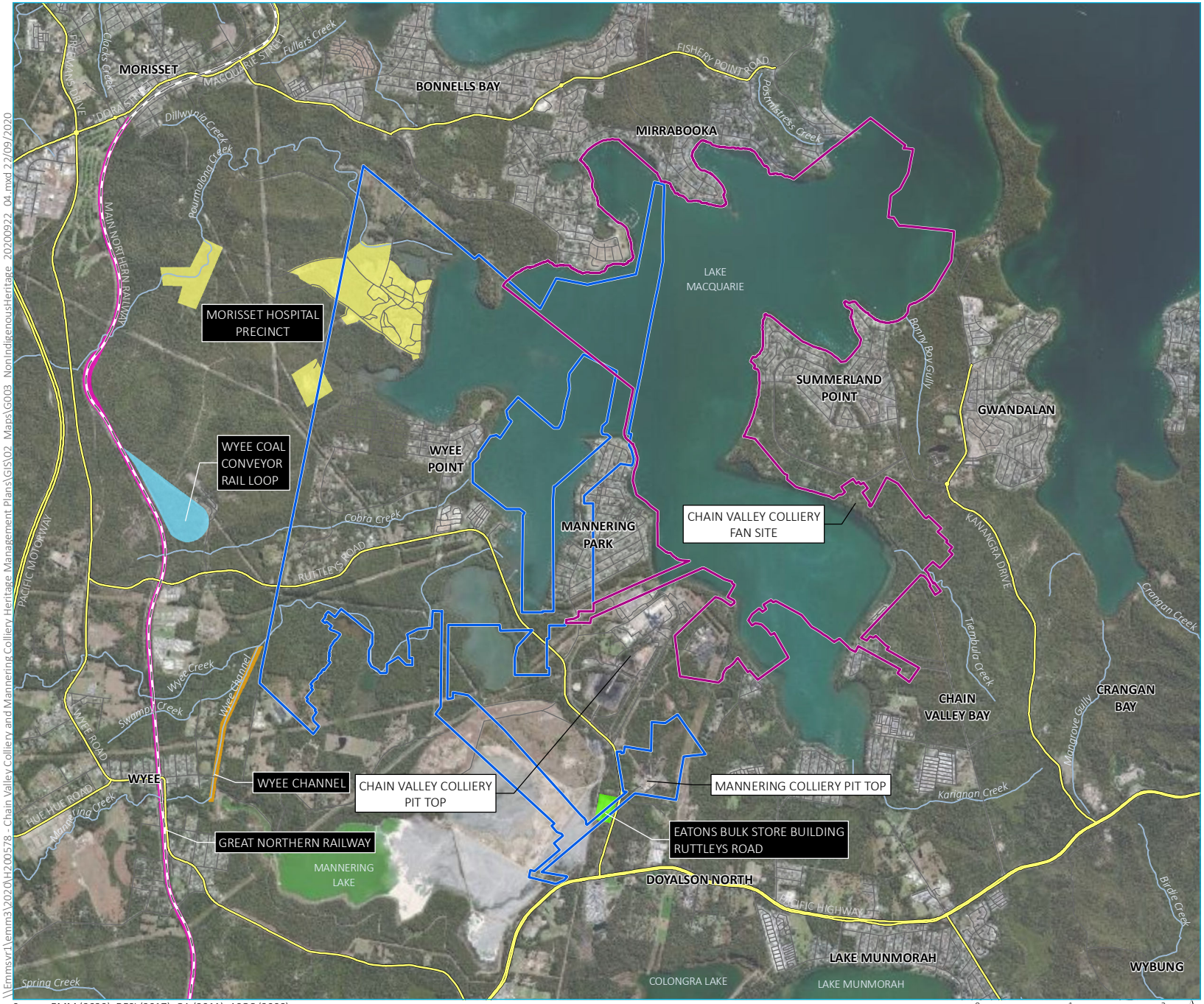
4.5 Wyee Channel

Wyee Channel is listed as a heritage item (Item 226) of local significance under the Lake Macquarie City Council LEP 2014.

Wyee Channel extends north from the Wyee Dam to Wyee Bay, extending under Summerhayes Road.

4.6 Vales Point Power Station

The WSC Heritage Review (Scobie Architects Pty Ltd 2010) investigated the historical context of the Wyong LGA and it identified the VPPS, located approximately 200 m west of CVC as an item of local heritage significance. It was recommended for inclusion in the Schedule of Heritage items within the Draft Wyong LEP by Scobie Architects Pty Ltd (2010) though it was ultimately not listed and is, therefore, not considered to have local or state heritage significance.



KEY

- Chain Valley Colliery development consent boundary
- Mannering Colliery project approval boundary
- Rail line
- Major road
- Minor road
- Named watercourse

Non-indigenous heritage sites

- Eatons bulk store building ruttleys road (LEP)
- Great northern railway (LEP)
- Morisset hospital precinct (SHP)
- Wyee channel (LEP)
- Wyee coal conveyor rail loop (LEP)

Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

0 1 2 km

GDA 1994 MGA Zone 56

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Historic heritage sites

Delta coal

EMM creating opportunities

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5 Monitoring, Management and Mitigation Measures

5.1 Aboriginal heritage

5.1.1 Identified Aboriginal Sites

As shown in **Figure 2**, all but two of the identified Aboriginal sites are located outside the pit top area, ventilation facility area or subsidence footprint at CVC. Site 45-7-0189 is located above existing or proposed areas of first workings on Summerland Point, with the remaining site identified at the pit top area in the vicinity of the dams (45-7-0339).

Monitoring of one site (45-7-0189) was previously committed to as part of the Statement of Commitments and the original Heritage Management Plan. Monitoring of site 45-7-0189 commenced in January 2013 (1st year), 2015 (3rd year) and concluded in 2017 (5th year) with no site impacts identified relating to subsidence caused by the mining activities (AECOM, 2018).

In addition to the above monitoring program, a due diligence site inspection of the area to be disturbed by the sediment dam D10 embankment and spillway upgrade was completed (AECOM) prior to commencement of works in those areas. Site CV-001 (45-7-0339) was fenced to exclude access to the area during upgrade works. No additional sites were found during the due diligence inspection or construction works.

Procedures for the discovery of previously unidentified sites or skeletal remains are covered in **Section 5.1.6** and **Section 5.1.7** respectively.

5.1.2 Monitoring of Aboriginal Sites

If monitoring is required for any future underground workings or surface works which could result in disturbance an initial visual inspection of the site by an archaeologist and Aboriginal stakeholders will be conducted. In order to identify any changes to the land surface over time, particularly in view of the negligible subsidence expected, monitoring of each site will be assisted by the:

- establishment of fixed datum point with defined relative level to Australian Height Datum (AHD) by registered surveyor;
- placement of stakes with horizontal markings on either extent of the site to enable accurate recording of landscape shifts;
- installation of a control reference point with defined Relative Level (RL) established outside proposed subsidence area such as a building;
- collecting photographic records from the fixed datum point to enable inter survey photographic comparisons. Photos will be large format with clear distinguishable features; and
- production of a letter report to be retained by DC with copies provided to Aboriginal stakeholders as requested.

A clear distinction will be made between natural processes of bioturbation, erosion, sand shifting events and landscape modification due to subsidence.

No additional monitoring aside from the above is considered necessary due to all secondary extraction and resultant subsidence occurring beneath Lake Macquarie.

5.1.3 Management of Aboriginal Heritage Sites

If mine-induced subsidence levels exceed 20 mm, a review will be undertaken to identify any potential impacts to cultural heritage in consultation with DPIE.

In the event of disturbance, the following management strategy should be implemented. The strategy will include an accurate recording of the heritage item including:

- mapping of the site;
- photographic recording; and
- detailed survey.

In addition, a monitoring program is to be established based on the placement and monitoring of control points. If there is unforeseen impact on the heritage item, appropriate remediation works should be implemented following advice from DPIE, the DC Environment Compliance Coordinator and the heritage consultant.

DC will endeavour to protect the heritage site from harm wherever practicable. Where relevant, this will be in consultation with RAPs by using non-invasive measures which may include barrier fencing, erosion control, supports or bracing.

DC will undertake all mining operations, Aboriginal stakeholder consultation, site surveys, reporting, impact assessment, site assessment, monitoring and management of Aboriginal sites in accordance with this HMP that has been developed in consultation with the RAPs.

It is advised that if the sites are at risk of harm, a Section 90 AHIP to salvage or destroy the site should be applied for (if the project is not under the State Significant Development or Part 3A provisions of the EP&A Act). In any instance where Aboriginal artefacts are salvaged, a care and control application will also need to be lodged for storage arrangements of artefacts.

Remediation measures must aim to repair the site to maintain the cultural significance and reduce any further impacts to the site. Remediation measures may include infilling of cracks in sandstone rock bars or overhangs to reduce the natural weathering process, which can result in further damage, or undertake repairs to areas of erosion upstream of grinding grooves. Mitigation measures may involve not undertaking any actions at all if it is determined culturally inappropriate to do so by the relevant Aboriginal parties.

With the exception of site CV-001 45-7-0339, all Aboriginal sites identified do not occur within CVC and MC approved boundaries or land controlled by Delta Coal, nor are these sites in areas that would be impacted by the proposed mining activities.

For the Aboriginal sites that are both outside potential impact areas and not within land controlled by DC, passive management is proposed. Passive site management will comprise avoidance of mapped site localities in accordance with this HMP. Passive site management is preferable to active management as there are no activities proposed in these areas and active management measures such as fencing and signage would likely draw unwanted attention to sites.

5.1.4 Obligation to Avoid Harm

All employees, contractors, sub-contractors and visitors to CVC and MC have an obligation to avoid harming Aboriginal heritage unless engaged in an Aboriginal heritage management activity described in this plan.

The Environmental Compliance Coordinator will ensure all employees, contractors, and sub-contractors are aware of any Aboriginal objects or sites at CVC and/or MC. This will include a message detailing that:

- the objects or sites are protected by law;
- they may potentially be distributed across the project area and that new sites may be exposed in areas outside of the disturbance footprints;
- they are of significance to the Aboriginal community, and important to the wider community and must be treated with respect;
- they have included stone tool sites; and
- they can be hard to recognise, therefore reference must be made to the Aboriginal heritage map in this HMP in order to clearly identify them.

In the process of undertaking any mining activities there is potential to impact Aboriginal objects or sites. Any activity which results in the disturbance of the surface has the potential to harm Aboriginal heritage sites. The level of impact to Aboriginal sites depends on the nature of the surface works/subsidence and the physical characteristics of the Aboriginal site types. The MC project approval currently allows for first workings mining only in the Great Northern and Fassifern seams, with <20 mm surface, negligible subsidence effects. This is less than the average natural ground swell movement of 29 mm (Delany et al). This first working mining method is the key management tool to avoiding harm to aboriginal heritage.

5.1.5 Assessment of Potential Impact

If mining or mining associated activities have the potential to harm Aboriginal site/s, an assessment of the potential and likely impact must be undertaken in the form of an Aboriginal Cultural Heritage Impact Assessment (ACHIA). It is important that all aspects of Aboriginal heritage be considered in the assessment and technical information is appropriately balanced with an assessment of cultural values.

The ACHIA must be developed in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) and any other relevant guidelines applicable to the planning instrument. As a minimum, The ACHIA must contain the following:

- a description of the Aboriginal object/s and declared Aboriginal places located within the area of the proposed activity;
- a description of the cultural heritage values, including the significance of the Aboriginal objects and declared Aboriginal places that exist across the whole area that will be affected by the proposed activity and the significance of these values for the Aboriginal people who have a cultural association with the project area and the surrounding land;
- how the requirements for consultation with Aboriginal people have been met;
- actual or likely harm posed to the Aboriginal object/s or declared Aboriginal places from the proposed activity with reference to the cultural heritage values identified and any practical measures that may be taken to protect and conserve those Aboriginal object/s or declared Aboriginal places; and
- any practical measures that may be taken to avoid or mitigate actual or likely harm, alternatives to harm or, if this is not possible, to manage (minimise) harm in accordance with this HMP and in consultation with the registered Aboriginal parties.

5.1.6 Unexpected Finds Procedure

As identified in the EA (AECOM, 2011), the following predictions were made with respect to the distribution of Aboriginal archeology in the vicinity of the site:

- Aboriginal shell midden sites are likely to occur in areas adjacent to lakes, creeks and coastal areas in the region;
- Aboriginal scarred or carved trees may be present where mature native trees remain, particularly in areas adjacent to lake foreshores and creek lines;
- stone artefacts, comprising artefact scatters or isolated finds, may occur associated with Aboriginal shell midden sites; and
- stone artefacts may occur across the landscape as random occurrences but are most likely to be associated with water bodies.

In light of the above predictive statements, Aboriginal archaeological sites including shell middens and artefact scatters are likely to occur on the Lake Macquarie foreshore and in areas adjacent to creek lines, particularly higher order creek lines.

In the event any new Aboriginal sites are discovered as part of any future archaeological investigations, or should unanticipated Aboriginal objects be found during approved site clearing or construction activities, the following actions will be undertaken:

- work will halt in the vicinity of the site;
- the Mine Manager, Environmental Compliance Coordinator and Approvals Coordinator are to be notified;
- the site will be assessed by a qualified archaeologist in consultation with the RAPs;
- where possible the site should be avoided, but if this is not feasible and the site is likely to be impacted, appropriate mitigation measures will be determined in consultation with the Aboriginal stakeholders;
- work will only recommence once the Environmental Compliance Coordinator advises that the site can be avoided or statutory approval for impact has been obtained; and
- an AHIMS site card will be completed and submitted in compliance with s.89A of the NPW Act within 21 days of discovering the site.

5.1.7 Discovery of Human Skeletal Remains

In the event that known or suspected burial site or suspected human skeletal remains are encountered within the CVC mine area and the MC project approval area, the following procedure must be followed:

- the immediate vicinity will be secured to protect the find and the find will be immediately reported to the work supervisor who will immediately advise the site supervisor or other nominated senior staff member, including the Mine Manager, Environmental Compliance Coordinator and Approvals Coordinator;
- the Environmental Compliance Coordinator or other nominated senior staff member will notify the police and the state coroner on the same day of the find (as required for all human remains discoveries);

- if the remains are historical and not of Aboriginal origin, Heritage NSW will be notified for further instruction; and
- works will not recommence until written approval is received.

5.1.8 Artefact records and storage facility

All cultural heritage items salvaged under the HMP will be held in an appropriate facility or location. The design and exact placement of the facility or location will be selected and established in consultation with the relevant RAPs.

All materials will be packaged and labelled generally in accordance with Australian Museum standards (refer to http://australianmuseum.net.au/document/Archaeological-CollectionDeposition-Policy).

All materials will be retained at the artefact storage facility for the life of the mine unless otherwise approved by Heritage NSW in a Section 85 Care and Control Permit under the NPW Act. At mine closure, the materials will be transferred to a facility nominated by the RAPs subject to approval by Heritage NSW in a Section 85 Care and Control Permit under the NPW Act.

The relevant material may alternatively be reburied within the CVC or MC area in a secure manner that allows later retrieval. The location must be chosen following consultation with the relevant Aboriginal stakeholders and Heritage NSW notified.

Where an agreed facility or burial location cannot be nominated, consideration will be given to lodging the material with either the Australian Museum (subject to its acceptance), a local Aboriginal cultural centre (if one is present) or a local heritage museum that can provide secure ongoing storage and curation.

5.2 Historic Heritage

There are no identified historic heritage items within the development consent or project approval boundary and therefore no management actions are currently proposed. Notwithstanding, unidentified historical relics are protected under Section 139 of the Heritage Act and if potential relics are uncovered during project-related activities, the land in which it is found cannot be disturbed or excavated without an excavation permit or other approval under SSD and PA conditions.

Considering the above, the following unexpected finds protocol applies for historic heritage:

- work will halt in the vicinity of the site;
- the Mine Manager, Environmental Compliance Coordinator and Approvals Coordinator are to be notified;
- the site will be assessed by a qualified archaeologist;
- where possible the site should be avoided, but if this is not feasible and the site is likely to be impacted, appropriate assessment, approvals and mitigation measures will be determined in consultation with Heritage NSW; and

  work will only recommence once the Environmental Compliance Coordinator advises that the site can be avoided or statutory approval for impact has been obtained.

If monitoring of any unexpected historic heritage finds indicate that mine-induced subsidence levels occur, a review will be undertaken to identify any potential impacts to unexpected finds in consultation with DPIE.

6 Reporting

6.1 Reporting impact to Aboriginal sites

An Aboriginal Site Impact Recording Form must be completed following impacts to AHIMS sites that are:

a) a result of test excavation carried out in accordance with the Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW;

b) authorised by an AHIP issued by Heritage NSW;

c) undertaken for the purpose of complying with Secretary's environmental assessment requirements issued by the DPIE for:

i) State Significant Development (SSD),

ii) State Significant Infrastructure (SSI), or

iii) a major project, or

d) authorised by an SSD/SSI/former Part 3A consent/approval under the EP&A Act.

Completed forms must be submitted to the AHIMS Registrar at the DPIE website. Aboriginal Site Impact Recording Forms can be downloaded from the DPIE website.

6.2 Annual Review

The results of the monitoring of any heritage sites will be reviewed upon receipt and a summary of any heritage monitoring undertaken will be included in the relevant Annual Review, along with a description of any actions being implemented or planned with respect to the known heritage sites. The Annual Review will be forwarded to the relevant authorities.

The Annual Review will also be forwarded to members of the Community Consultative Committee, local Councils (Central Coast and Lake Macquarie), to the Aboriginal stakeholders and be placed on the company's website.

6.3 Incident or Non-Compliance Reporting

If site inspections reveal that, as a direct result of CVC or MC, there has been unpredicted damage to a site, then DC will conduct an investigation into the source of the damage with a suitably qualified and experienced archaeologist. The report will be provided to relevant people and/or groups, including Councils, the Secretary of DPIE, RAPs and Heritage NSW.

The report will:

- describe the date, time and nature of the observation;
- identify the cause (or likely cause) of the damage;
- describe what action has been taken to date; and
- describe the proposed measures to address the damage and prevent further such occurrences.

DC will implement any recommendations in order to prevent future occurrences. Confidential information about Aboriginal site location will not be included in any report that enters the public domain. Additional details of the incident reporting process are provided in the Environmental Management Strategy (EMS). Any incident or complaint will be recorded and fully investigated to find root causes and corrective actions implemented where necessary.

7 Stakeholder Management and Response

7.1 Meetings

Regular meetings are to be held with RAPs on a minimum of an annual basis which will provide a project update and any required revisions to this management plan. These meetings may be on site or via teleconference.

7.2 Complaint Protocol

DC has a 24-hour telephone hotline (1800 115 277) through which members of the public can lodge complaints, concerns, or to raise issues associated with the operation. This service aims to promptly and effectively address community concerns and environmental matters.

All complaints are recorded and responded to and if, for some reason, no action is taken then the reason why is recorded. The information recorded in the complaint register includes:

- date and time the complaint was lodged;
- personal details provided by the complainant;
- nature of the complaint;
- action taken or, if no action was taken, the reason why; and
- follow up contact with the complainant.

7.3 Independent Review

As detailed in Condition 2, Schedule 5 of CVC SSD-5465 and Condition 1, Schedule 4 of MC PA 06_0311, an Independent Review can be requested by a landowner who "*considers the development to be exceeding the relevant criteria in Schedule 3".*

If the Secretary is satisfied that an independent review is warranted, then within 2 months of the Secretary's decision the Applicant shall:

(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to:
- *consult with the landowner to determine his/her concerns;*
- *conduct monitoring to determine whether the development is complying with the relevant criteria in Schedule 3; and*
- *if the development is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and*

(b) give the Secretary and landowner a copy of the independent review.

7.4 Dispute Resolution

If any disputes are not adequately addressed by the complaints handling process then they will be handled by the Environmental Compliance Coordinator. If the response by DC is not considered to satisfactorily address the concern of the complainant, a meeting may be convened with the complainant, the Mine Manager together with the Approvals Coordinator and Environmental Compliance Coordinator to determine any further options to reduce potential impacts.

Any actions agreed from the meeting will be implemented by DC. After implementation of the proposed actions the complainant will be contacted and advice sought as to the satisfaction or otherwise with the measures taken.

If no agreed outcome is determined or the complainant is still not satisfied by the action taken, then an Independent Review may be requested by the complainant. If determined to be warranted by the Secretary, an independent review will be undertaken in accordance with the process identified in CVC Schedule 5, Condition 2 of SSD-5465 and in MC Schedule 4, Condition 1 of PA 06_0311.

7.4.1 Conflict of Interest

The mediator must, prior to the commencement of the mediation, disclose to the parties to the best of his or her knowledge any prior dealings with any of the parties as well as any interests in the dispute. If in the course If, in the course of the mediation the mediator becomes aware of any circumstances that might reasonably be considered to affect the mediator's capacity to act impartially, the mediator must immediately inform the parties of these circumstances. In this instance, the parties will then decide whether the mediation will continue with that mediator or with a new mediator appointed by the parties.

7.5 Training, Awareness and Competence

Training is an essential component of the implementation phase of this HMP. The Environmental Compliance Coordinator will ensure that training and awareness processes are implemented to manage, identify and minimise potential impacts of CVC and MC, and to ensure personnel are aware of their roles and responsibilities in terms of cultural heritage management.

Generally training at DC consists of induction training for new starters and contractors along with environmental awareness training at two-year intervals and ongoing "toolbox" training for all permanent employees as required.

As the document owner, the Approvals Coordinator is the contact point for any person that does not understand this document or their specific requirements and will provide guidance and training to any person that requires additional training regarding this HMP.

7.5.1 Heritage Induction

Health safety and environment inductions will include content on the nature of heritage items present or likely to be present within the CVC and MC leases. Records of inductions will be kept according to DC's standard practices.

The induction includes the following content:

- Historic heritage sites have not been identified nor are considered likely to occur within the CVC and MC project area;
- CVC and MC are within the traditional land of the Darkinjung and Awabakal peoples for whom Lake Macquarie was a key feature of their territories;
- one Aboriginal site, a single artefact, has been identified, fenced off and signposted within the CVC pit top area;
- Aboriginal sites are known to occur above current and future mining areas, and along certain parts of the Lake Macquarie foreshore;
- Aboriginal sites known to occur are scarred trees and middens. Middens are made up of concentrations of mature shellfish such as oyster, cockle and club whelk;

- the burial remains of Aboriginal people have been found in some middens. Some middens also include Aboriginal stone artefacts which generally have the appearance of chipped stone; and
- all Aboriginal sites are protected by the NPW Act, which provides significant penalties for harm to Aboriginal objects and sites. Any shellfish deposits or stone artefacts encountered must not be collected.

8 Audit and Review

8.1 Review and Improvement

In accordance with Schedule 6, Condition 5 of CVC Development Consent SSD-5465 and Schedule 5, Condition 4 of MC Project Approval 06_0311 this HMP shall be reviewed, and if necessary revised, within 3 months of the following:

- the submission of an Annual Review;
- the submission of an incident report;
- the submission of an independent environmental audit; and
- following any modification to the development consent.

Changes to this HMP will be made in the following circumstances:

- where new Aboriginal sites are discovered, they must be added to the inventory in this HMP within three months of the find; and
- where an AHIP is issued, this HMP will be reviewed and updated where necessary to comply with the requirements of any AHIP conditions.

Where changes are made to the HMP, a draft of the modified plan will be provided to RAPs for review. RAPs will not be required to review the HMP for minor plan updates. This comprises:

- when a new Aboriginal site is discovered and is at no risk of impact by the project. In this instance, the inventory of the HMP will be updated to acknowledge the site, but RAPs will not be required to review the HMP; and
- when the status of a site needs to be updated on the inventory of the HMP. For example, once a site has been salvaged the HMP will be updated to reflect the site's status. However, RAPs will not be required to review this action.

Although RAPs are not required to review the HMP for minor plan updates, they will be notified if new sites are identified and of updates relating to the status of Aboriginal cultural heritage sites.

Matters raised in consultation which are specific to the changes in the plan will be acknowledged and addressed in the modified plan.

Any changes made to this HMP will be made in consultation with Heritage NSW, with a copy of the revised management plan provided for approval.

8.2 Auditing

The objectives of an audit are to maintain compliance with the HMP. Audits shall be carried out by personnel who have the necessary qualifications and experience to make an objective assessment of the issues. The extent of the audit, although pre-determined, may be extended if a potentially serious deviation from this document is detected.

Any audit non-conformances and/or improvement opportunities will have corrective and preventative actions implemented to avoid recurrence, these actions will be loaded into the site Incident Database to ensure the actions are assigned to the relevant people and completed.

External audits will be conducted utilising external specialists and will consider this document and related documents. External auditors shall be determined based on skills and experience and upon what is to be accomplished.

An Independent Environmental Audit (IEA) was undertaken during June 2019. In accordance with SSD-5465 Schedule 6, Condition 9 and PA 06_0311 Schedule 5, Condition 8, IEA's will be scheduled for every three years thereafter (unless the Secretary directs otherwise) by an audit team whose appointment has been endorsed by the Secretary.

9 Records and Document Control

9.1 Records

Generally, the Environmental Compliance Coordinator or delegate will maintain all Environmental Management System records which are not of a confidential nature. Records that will be maintained include:

- monitoring data;
- environmental inspections and auditing results;
- environmental incident reports;
- the complaints register; and
- licences and permits.

All records will be stored so that they are legible, readily retrievable and protected against damage, deterioration and loss. Records will be maintained for a minimum of 4 years or as otherwise required under any legislation, licence, lease, permit or approval.

If the relevant RAPs would like to undertake further documentation and archival recording of particular sites and places of spiritual significance or would like to document and record their oral histories about the County, these matters should be internally resourced from within their own organisations. However, if the RAPs seek assistance from DC to facilitate any cultural requests, then a meeting will be held to discuss the nature of the assistance, the scope of works involved and whether DC is able to facilitate the request.

In the event that DC agrees to assist with any cultural requests, a written agreement must be produced which specifies who will be undertaking the archival recording and lodgement of information (being either the Aboriginal parties or Delta Coal), the recording methodology to be adopted and matters related to the care and control of the intellectual property.

9.2 Document Control

This document and all others associated with the Environmental Management System shall be maintained in a document control system which is in compliance with the site Document Control Standard which is available to all site personnel. Any proposed change to this document will be via the Approvals Coordinator.

A copy of this document is available on the DC website. Document revision details are provided in **Table 4**.

Table 4: Document Revision Details

Version	Date	Details of Revision	Company	Reviewed by/ Authorised by
1	06/11/2012	Original HMP	LakeCoal	N. Baker C. Ellis
2	23/06/2014	Reviewed	LakeCoal	Peter Campbell Robert Corbett C. Ellis
3	01/12/2019	Updated to Delta Coal format	Delta Coal	K. Weekes R. Desic C. Armit
4	19/10/2020	Combined CVC and MC HMP	Delta Coal	K. Weekes N. Lane-Kirwan M. Wilcox C. Armit

10 Roles and Responsibilities

All employees and contractors at DC are responsible for environmental management. However, various positions in the organisation have roles, responsibilities and authorities for managing environmental aspects, action plans, programs and controls.

Roles and responsibilities specific to completing the requirements of this plan are identified in **Table 5**.

Table 5: Heritage Management Plan Roles and Responsibilities

Role	Responsibilities
Managing Director	• Ensure that adequate financial and personnel resources are made available for the implementation of the HMP.
Manager of Mining Engineering (Mine Manager)	• Maintain overall responsibility for environmental compliance with Mining Lease, EPL, development consent and other mining approvals as they pertain to the management of Aboriginal and historic heritage. • Ensure that adequate training is provided to staff to minimise impacts to cultural heritage.
Environmental Compliance Coordinator or delegate	• Point of contact of all onsite personnel regarding heritage. • Document owner responsible for managing the implementation of the plan. • Arrange for reviews of HMP. • Inclusion of any heritage monitoring summarised within the Annual Review. • Document owner responsible for managing the implementation of the plan. • Coordinate relevant specialist personnel to conduct regular monitoring at the required time and frequencies if required. • Ensure inclusion of heritage in worker inductions through delivery or input to induction documents. • Arrange inductions and training for all personnel involved in implementing this HMP. • If inadvertent impact on a listed heritage item occurs, implement remediation works following consultation with Heritage NSW and the heritage consultant. • Distribution of HMP copies as required. • Maintain a contact list for organisations and individuals who may need to be contacted under this HMP. • Be aware of the potential for further unrecorded heritage sites to occur.

Role	Responsibilities
Heritage Consultant	• Assist with the implementation of this HMP, as required. • Provide advice on remediation, if through unforeseen circumstances impact occurs on a heritage item. • Undertake the recording of new sites in accordance with government guidelines. • Provide heritage advice in accordance with relevant legislation. • Undertake recording of new sites in accordance with government guidelines. • Assist with updating this HMP when necessary.
All employees and contractors	• Comply with the requirements of this HMP. • Immediately notify Environmental Compliance Coordinator of possible heritage item or damage.

11 References

Documents referenced in the preparation of the HMP are detailed in **Table 6**.

Table 6: References

Reference	Title
Australian Standards	AS/NZS ISO 14001:2004 Environmental management systems – Requirements with guidance for use AS/NZS ISO 14004:2004 Environmental management systems – General guidelines on principles, systems and support techniques
Legislation and Regulations	*Environmental Planning and Assessment Act 1979* (EP&A Act) *Environment Protection and Biodiversity Act 1999* (EPBC Act) Environment Protection and Biodiversity Regulations 2000 *Mining Act 1992* *Protection of the Environment Operations Act 1997* (POEO Act) *Heritage Act 1977* Environment Protection Licence (EPL) 191 Environmental Protection Licence (EPL) 1770 Lake Macquarie City Council LEP 2014 Wyong Local Environmental Plan 2013 Project Approval (PA) 06_0311 (as modified) Development Consent SSD 5465 (as modified)
Delta Coal documents	Delta Coal Environmental Management Strategy
External documents	Delany et al 2005, Field Monitoring of Expansive Soil behaviour in the Newcastle-Hunter Region, Australian Geomechanics, Vol 40, Issue 2. Department of Environment, Climate Change and Water (DECCW) 2010, Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales. Department of Environment, Climate Change and Water (DECCW) 2010, Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales. Department of Environment, Climate Change and Water (DECCW) 2010, Aboriginal Consultation Requirements for Proponents. Department of Environment, Climate Change and Water (DECCW) 2011, Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales. Department of the Environment and Energy (2013), EPBC Act Protected Matters Search Tool, Australian Commonwealth Government

Reference	Title
	Department of Environment (2013), Matters of National Environmental Significance, Significant Impact Guidelines 1.1, Environment Protection and Biodiversity Conservation Act 1999, Commonwealth of Australia. Holdaway S et al. 2002, Artefact Visibility at Open Sites in Western New South Wales, Australia, Journal of Field Archaeology, Vol: 29, Number3/4, PP: 255-271 ICOMOS, (1999) The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, Australia ICOMOS Inc. Long A (2005) Aboriginal Scarred Trees in New South Wales: A field Manuel, Department of Environment and Conservation NSW. Mulvaney J & Kamminga J 1999, Prehistory of Australia, Allen and Unwin Publishing, NSW O'Connor S et al 2007, Stone Construction on Rankin Island, Kimberley, Western Australia, Australian Archaeology, Number 64, PP: 15-22 Office of Environment and Heritage (OEH) 2011, Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW. Report to State of NSW and the Office of Environment and Heritage, Department of Premier and Cabinet. OEH (2019), State Heritage Register, NSW Government, Office of Environment & Heritage

12 Definitions

ACHA Aboriginal Cultural Heritage Assessment

ACHCR Aboriginal Cultural Heritage Consultation Requirements

AHIMS Aboriginal Heritage Information Management System

AHIP Aboriginal Heritage Impact Permit

BCD Biodiversity and Conservation Division, DPIE

CCC Community Consultative Committee

CVC Chain Valley Colliery

DC Delta Coal

DPIE NSW Department of Planning, Industry and Environment

EL Exploration Licence

EA Environmental Assessment

EMS Environmental Management System

EP&A Act *Environmental Planning and Assessment Act 1979*

EPBC Act *Environment Protection and Biodiversity Act 1999*

EPL Environment Protection Licence

HMP Heritage Management Plan

ICOMOS International Council on Monuments & Sites

LEP Local Environment Plan

LGA Local Government Area

LMCC Lake Macquarie City Council

MC Mannering Colliery

NPW Act *National Parks and Wildlife Act 1974*

NPW Regulation National Parks and Wildlife Regulation 2009

NSW New South Wales

OEH Office of Environment & Heritage

PA Project Approval

PAD Potential Archaeological Deposits

POEO	*Protection of the Environment Operations Act 1997*
RAPs	Registered Aboriginal Parties
ROM	Run of Mine
Secretary	Secretary of the Department of Planning & Environment, or nominee
SHR	State Heritage Register

Appendix 1: Consultation, Endorsement Letter and Management Plan approval

Combined HMP

From: Chris Armit <CArmit@deltacoal.com.au>
Sent: Thursday, 22 October 2020 3:11 PM
To: ceo@birabanlalc.com.au; Barry Williams <barry.williams@dlalc.org.au>; Amanda Shields <amanda.shields@dlalc.org.au>; kerrie@awabakal.com.au; peterleven@y7mail.com; bahtabahmick@hotmail.com; tracey@guringai.com.au; cacatua@resetdsl.net.au; darkinjung@dlalc.org.au; daniellachedzey@yahoo.com.au; wonn1sites@gmail.com; kauwul@gmail.com; heritage@heritage.nsw.gov.au; HERITAGEMailbox@environment.nsw.gov.au; Laura.Dafter@environment.nsw.gov.au; rog.hcc@environment.nsw.gov.au
Cc: Lachlan McWha <LMcWha@deltacoal.com.au>; Chris Nicholas <CNicholas@deltacoal.com.au>; angela@insiteheritage.com.au; Morgan Wilcox <mwilcox@emmconsulting.com.au>; Katie Weekes <kweekes@emmconsulting.com.au>
Subject: Unexpected find at Mine Cottages and Draft DC HMP for comment

Dear All,

Please also find attached as promised the draft Delta Coal (combined Chain Valley Colliery and Mannering Colliery) Heritage Management Plan for comment. We will finalise and forward on to DPIE after 14 days.

Regards,
Chris

Chain Valley Colliery

You forwarded this message on 20/03/2020 5:29 AM.

From: Chris Armit Sent: Sun 01/12/2019 7:46 AM
To: 'kerrie@awabakal.com.au'; 'peterleven@y7mail.com'; 'bahtabahmick@hotmail.com'; 'ceo@birabanlalc.com.au'; 'tracey@guringai.com.au'; 'cacatua@resetdsl.net.au'; 'darkinjung@dlalc.org.au'; 'daniellachedzey@yahoo.com.au'; 'wonn1sites@gmail.com'; 'kauwul@gmail.com'; 'heritage@heritage.nsw.gov.au'; 'HERITAGEMailbox@environment.nsw.gov.au'
Cc: Ryan Desic; 'Morgan Wilcox'; Katie Weekes; Chris Nicholas; 'Colin Phillips'
Subject: Chain Valley Colliery Heritage Management Plan review

Message | CVC Heritage Management Plan.pdf (11 MB) | Open PDFs in Adobe Acrobat

Hi All,
Please find attached a review of the Chain Valley Colliery's Heritage Management Plan for your comment and review.
Please respond within 14 days, comments/consultation will be reviewed and after that it will be added onto the DPIE's portal for final review and then publication on DC's website.
If there's any questions don't hesitate to call.
Kind regards,
Chris

From: Chris Armit
Sent: Friday, 16 August 2019 3:21 PM
To: 'kerrie@awabakal.com.au'; 'peterleven@y7mail.com'; 'bahtabahmick@hotmail.com'; 'ceo@birabanlalc.com.au'; 'tracey@guringai.com.au'; 'cacatua@resetdsl.net.au'; 'darkinjung@dlalc.org.au'; 'daniellachedzey@yahoo.com.au'; 'wonn1sites@gmail.com'; 'kauwul@gmail.com'
Cc: Katie Weekes; 'Morgan Wilcox'
Subject: Introductions and Mannering Colliery ACHMP review

Hi All,

I'm just doing a group email out to the RAPs to introduce Delta Coal and the Delta Coal Environmental team.

NSW GOVERNMENT

Our ref: DOC19/104620

Chris Armit
Environmental and Community Coordinator
Chain Valley Colliery
MANNERING PARK NSW 2259

By email: CArmit@deltacoal.com.au

Dear Mr Armit

Re: Request for comment on Chain Valley Colliery's Heritage Management Plan (SSD 5465 Condition 21)

Thank you for your referral dated 2 December 2019 inviting comments from the Heritage Council of NSW on the Heritage Management Plan for the above State Significant Development proposal as a requirement of the conditions of consent.

The subject site is not listed on the State Heritage Register (SHR), nor is it in the immediate vicinity of any SHR items. Further, the site does not contain any known historical archaeological deposits. Therefore, no comment from the Heritage Council of NSW is required in this management plan.

I note the Heritage Management Plan refers primarily to Aboriginal Cultural Heritage (ACH) issues. Matters relating to ACH issues are handled by the Department of Planning, Industry and Environment.

If you have any questions regarding the above advice, please contact Gary Hinder, A/Senior Heritage Assessment Officer, at Gary.Hinder@environment.nsw.gov.au or on 9873 8547.

Yours sincerely

Adrian Hohenzollern
A/Director, Heritage Operations
Heritage NSW
Department of Premier and Cabinet
As Delegate of the Heritage Council of NSW
9 December 2019

Mannering Colliery

From: Katie Weekes
Sent: Friday, 11 October 2019 3:53 PM
To: Anthony Barnes <Anthony.Barnes@planning.nsw.gov.au>; Colin Phillips <Colin.Phillips@planning.nsw.gov.au>; Steve Clair <Steve.Clair@epa.nsw.gov.au>; Joel Curran <Joel.Curran@planning.nsw.gov.au>; Melissa Anderson <Melissa.Anderson@planning.nsw.gov.au>
Cc: Chris Nicholas <CNicholas@deltacoal.com.au>; Chris Armit <CArmit@deltacoal.com.au>; Katie Weekes <kweekes@emmconsulting.com.au>; Katie Weekes <KWeekes@deltacoal.com.au>; Tim Chisholm <TChisholm@deltacoal.com.au>
Subject: Revised Mannering Colliery management plans attached

Hi Colin, Steve and Anthony,

Please find attached the final Non-indigenous, Air quality and Greenhouse Gas and Land and Bushfire management plans for Mannering Colliery (MC). The comments previously sent through have been incorporated into the plans. I have also attached the Aboriginal Cultural Heritage management plan which has previously been sent to RAPs for comment.

If you have any questions, please do not hesitate to contact me.

Regards, Katie

Katie Weekes
P/T Environment and Community Officer
Phone: 02 4358 0875
Mobile: 0418 267 532

From: Colin Phillips
Sent: Monday, 14 October 2019 4:32 PM
To: Katie Weekes <KWeekes@deltacoal.com.au>
Cc: Melissa Anderson <Melissa.Anderson@planning.nsw.gov.au>; Anthony Barnes <Anthony.Barnes@planning.nsw.gov.au>; Stephen Shoesmith <Stephen.Shoesmith@planning.nsw.gov.au>
Subject: FW: DPIE Review of Revised Mannering Colliery Management Plan

Good Afternoon Katie,

Thank you for the submission of revised Management Plans (MPs) for Mannering Colliery.

There are still some matters that will need to be attended to. Some are matters that I didn't notice in my earlier review, some are related to the submission of MPs that have different title to those contained in the conditions of consent and some are where my suggestion has not been acted upon and now I will make those a requirement.

Aboriginal Cultural Heritage Management Plan (ACHMP)

12. I am pleased to see that the ACHMP has included an appendix (Appendix 1) to contain copies of consultation documents.

13. Section 7.2 needs to be expanded to accurately reflect that an Independent Review can be requested by a landowner who "*considers the project to be exceeding the impact assessment criteria in schedule 3*". (refer to condition 1 of Schedule 4).

    As Section 7.2 is titled "*Dispute Resolution*", is this the correct use of the Independent Review? Appendix 6 of the consent contains a flowchart of an "*Independent Dispute Resolution Process*" which seems more appropriate manner to complete a section on *Dispute Resolution*.

    I suggest that a better way to deal with these two related, but separate, processes would be to introduce a new section with the title of "*Independent Review*" and to keep this separate from the "*Dispute Resolution*" section.

14. Section 6.3 – *Incident or Non-compliance Reporting*. Last paragraph on Page 18. While this section is correct in terms of how to deal with the required written report of a non-compliance, condition 6 of Schedule 5 requires the Proponent to notify the Secretary, and any other relevant agencies, at the earliest opportunity of an incident that causes or threatens to cause material harm to the environment. For other incidents, the timing is as soon as practicable.

    Please note that the definition of an incident altered with the modification of 2012 and includes an exceedance of the limits of performance measures /criteria in this approval. This change was possibly not recognised in the most-recently approved version of the LBMP.

    Section 6.3 must be updated to identify the reporting requirement for all forms of "*incidents*", taking into consideration how these incidents could possibly occur in terms of Aboriginal cultural heritage. Possibly these matters are covered in the methodology set out in sections on dealing with unexpected finds and skeletal remains. However, I consider that the broader definition of an incident requires modification to the text in Section 6.3.

15. There are almost no typos in this document, which is a credit to those who prepared it. Paragraph 3 on page 23 contains the word "County" which I suspect should be "*Country*". Would you please check this and change it if needed.

Colin Phillips
Team Leader
Energy and Resources Assessments
320 Pitt Street | GPO Box 39 | Sydney NSW 2001
T 02 9274 6483 E: colin.phillips@planning.nsw.gov.au
Planning, Industry & Environment
Subscribe to our newsletter
I usually do not work Thursdays

Please consider the environment before deciding to print this e-mail.

Planning, Industry & Environment

Mr Chris Armit
Approvals Coordinator
Great Southern Energy Pty Ltd (t/as Delta Coal)
By Email: Carmit@DeltaCoal.com.au

09/10/2020

Dear Mr Armit

Chain Valley Colliery (SSD-5465) and Mannering Colliery (MP06_0311)
Request to Combine Management Plans and Approval of Experts

I refer to your letter of 2 October 2020 requesting the Planning Secretary's approval to combine specific management plans required under both the Chain Valley Colliery (SSD-5465) and Mannering Colliery (MP06_0311) development consents, in accordance with conditions 23(d) of Schedule 2 of SSD-5465 and 16(d) of Schedule 2 of MP06_0311 respectively.

The Department acknowledges the common ownership and management of both collieries by Great Southern Energy (trading as Delta Coal) and understands that they are managed in an integrated manner. Accordingly, the Department supports Delta Coal's request to combine specific management plans required under both consents to improve the on-site environmental management of the collieries.

Therefore, the Planning Secretary grants approval for Delta Coal to produce the following combined management plans:

- Heritage Management Plan – as required by condition 21A of Schedule 3 of SSD-5465 and condition 18A of Schedule 3 of MP06_0311;
- Land Management Plan – as required by condition 14 of Schedule 3 of MP06_0311;
- Noise Management Plan – as required by condition 9 of Schedule 3 of SSD-5465 and condition 3C of Schedule 3 of MP06_0311; and
- Air Quality and Greenhouse Gas Management Plan – as required by condition 13 of Schedule 3 of SSD-5465 and condition 17 of Schedule 3 of MP06_0311.

I also refer to your letter and supporting curriculum vitae requesting the Planning Secretary's approval of suitably qualified and experienced persons to prepare and review a number of management plans for the SSD-5465 and MP06_0311, in accordance conditions 21A(a) of Schedule 3 of SSD-5465 and 18A(a), 3C(a), 14(b), 17(a) of Schedule 3 of MP06_0311.

The Department has reviewed the nominations and information provided and is satisfied that the experts listed below are suitably qualified and experienced to assist in preparing the specified management plans. Consequently, the Planning Secretary approves the appointment of the following persons to prepare the listed management plans in accordance with the relevant conditions of SSD-5465 and MP06_0311.

Name	Organisation	Management Plan
Morgan Wilcox	EMM Consulting	Heritage Management Plan
Katie Teyhan	EMM Consulting	Noise Management Plan
Katie Weekes	EMM Consulting	Land Management Plan
Judith Cox	SLR Consulting	Air Quality and Greenhouse Gas Management Plan

For clarity, I would like to confirm that this approval is limited to the combining of the nominated management plans and does not extend to other requirements with respect to the preparation of, or required consultation for, other management plans for either of the development consents.

If you wish to discuss the matter further, please contact Melissa Anderson on 8275 1392.

Yours sincerely



Matthew Sprott
Director
Resource Assessments (Coal & Quarries)

As nominee of the Planning Secretary

Appendix 2: Development Consent Summary

Chain Valley Colliery Development Consent SSD-5465 Summary

This HMP has been prepared in accordance to Schedule 3, Condition 21A of SSD-5465 (MOD3), which states the requirements of the HMP and what it must address. **Table A2** outlines the requirements of the HMP and where this document addresses these requirements.

Table A2: Requirements from Chain Valley Colliery Development Consent (SSD-5465)

Condition No.	Requirement	Relevant section of this document
	Schedule 2 Administrative Conditions	
23	***Staging, Combining and Updating Strategies, Plans or Programs*** *With the approval of Planning Secretary, the Applicant may:*	**Section 8**
	a) prepare and submit any strategy, plan or program required by this consent on a staged basis (if a clear description is provided as to the specific stage and scope of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program);	**This Document**
	b) combine any strategy, plan or program required by this consent (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined);	**This Document**
	c) update any strategy, plan or program required by this consent (to ensure the strategies, plans and programs required under this consent are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the development); and	**Section 8.1**
	d) combine any strategy, plan or program required by this consent with any similar strategy, plan or program required by an adjoining mining consent or approval, in common ownership or management.	**This Document**
	Schedule 3 Environmental Conditions - General	
	Heritage	
21	*The Applicant must ensure that the development does not cause any direct or indirect impact on any identified heritage item located outside the approved disturbance area, beyond those predicted in the documents listed in condition 2(e) of Schedule 2.*	**This document**
21A	*The Applicant must prepare a Heritage Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:*	**This Document**
	a) be prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary;	**This HMP has been prepared by EMM Consulting in accordance with correspondence from**

Condition No.	Requirement	Relevant section of this document
		DPIE dated 9 October 2020
	b) *be prepared in consultation with BCD and Registered Aboriginal Parties;*	**Submission letter dated 20 November 2012; approval letter dated 1 July 2013**
	c) *include consideration of the Aboriginal and non-Aboriginal cultural context and significance of the site;*	**Section 3 and 4**
	d) *describe the procedures and management measures to be implemented on the site or within any offset area to:*	**Section 5**
	i) *ensure all workers receive suitable Aboriginal cultural heritage inductions prior to carrying out any activities which may cause impacts to Aboriginal objects or Aboriginal places, and that suitable records are kept of these inductions;*	**Section 7.5.1**
	ii) *protect, monitor and manage identified non-Aboriginal heritage, Aboriginal objects and Aboriginal places (including any proposed archaeological investigations of potential subsurface objects and salvage of objects within the approved disturbance area) in accordance with the commitments made in the document/s listed in condition 2(e) of Schedule 2 and including the ongoing monitoring of site 45-7-0189 at Summerland Point*	**Section 4, 5.1.1 and 5.1.2**
	iii) *protect non-Aboriginal heritage, Aboriginal objects and Aboriginal places located outside the approved disturbance area from impacts of the development;*	**Section 5.2**
	iv) *manage the discovery of suspected human remains and any new Aboriginal objects or Aboriginal places, including provisions for burials, over the life of the development;*	**Section 5.1.6 and 5.1.7**
	v) *maintain and manage reasonable access for relevant Aboriginal stakeholders to Aboriginal objects and Aboriginal places (outside of the approved disturbance area); and*	**Section 1.5.6**
	vi) *facilitate ongoing consultation and involvement of Registered Aboriginal Parties in the conservation and management of Aboriginal cultural heritage on the site; and*	**Section 1.5.5**
	e) *include a strategy for the care, control and storage of Aboriginal objects salvaged on site, both during the life of the development and in the long term.* *The Applicant shall implement the approved management plan as approved from time to time by the Secretary.*	**Section 5.1.8**
	Schedule 6 Environmental Management, Auditing and Reporting	

Condition No.	Requirement	Relevant section of this document
3	***Management Plan Requirements*** *Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:* *(a) a summary of relevant background or baseline data;* *(b) details of:* • *the relevant statutory requirements (including any relevant approval, licence or lease conditions);* • *any relevant limits or performance measures/criteria; and* • *the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;* *(c) any relevant commitments or recommendations identified in the document/s listed in condition 2(e) of Schedule 2;* *(d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;* *(e) a program to monitor and report on the:* • *impacts and environmental performance of the development; and* • *effectiveness of the management measures set out pursuant to condition 2(e) of Schedule 2;* *(f) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;* *(g) a program to investigate and implement ways to improve the environmental performance of the development over time;* *(h) a protocol for managing and reporting any:* • *incident, non-compliance or exceedance of any impact assessment criterion or performance criterion;* • *complaint; or* • *failure to comply with other statutory requirements;* *(i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and* *(j) a protocol for periodic review of the plan.* *Note: The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*	**This document**
4	*The Applicant must ensure that management plans prepared for the development are consistent with the conditions of this consent and any EPL issued for the site.*	**This Document**
5	*Revision of Strategies, Plans and Programs* *Within Three months of:* *a) the submission of an incident report under condition 6;* *b) the submission of an Annual Review under condition 8;* *c) the submission of an Independent Environmental Audit under condition 9; or*	**Section 8**

Condition No.	Requirement	Relevant section of this document
	d) the approval of any modification of the conditions of this consent (unless the conditions require otherwise), *the suitability of existing strategies, plans and programs required under this consent must be reviewed by the Applicant. If necessary, to either improve the environmental performance of the development, cater for a modification or comply with a direction, the strategies, plans and programs required under this consent must be revised, to the satisfaction of the Planning Secretary. Where revisions are required, the revised document must be submitted to the Planning Secretary for approval within six weeks of the review.* *Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the development.*	
	Appendix 9: Statement of Commitments	
	Management and monitoring of heritage will continue to be undertaken in accordance with the Colliery's HMP, which will be reviewed and updated as required to include the commitments made below. Great Southern Energy Pty Limited will:	
	• *review and revise the HMP to remove site #45-7-0154 and incorporate any other changes as a result of the proposed modification;*	**Section 5.1.1**
	• *update the HMP following approval of the Proposal to include the extended area to which it relates;*	**This document**
	• *ensure that should unanticipated Aboriginal or historic heritage artefacts be found during dam embankment and diversion works, work will cease and the site assessed by an archaeologist; and*	**Dam works complete**
	• *ensure that in the unlikely event that skeletal remains are found during dam embankment and diversion works, work will cease immediately in the area and the NSW Police Coroner called to determine if the material is of Aboriginal origin. BCD and relevant Aboriginal community stakeholders will be notified if the remains are positively identified as being of Aboriginal origin to determine their appropriate management prior to works recommencing.*	**Dam works complete**

Appendix 3: Project Approval Summary

Mannering Colliery Project Approval PA 06_311 Summary

This HMP has been prepared in accordance to Schedule 3, Condition 18 and 18A of PA 06_0311 (MOD5), which states the requirements of the HMP and what it must address. **Table A3** outlines the requirements of the HMP and where this document addresses these requirements.

Table A3: Requirements from Mannering Colliery Project Approval (PA-06_0311)

Condition No.	Requirement	Relevant section of this document
	Schedule 2 – Administrative Conditions	
16	*Staging, Combining and Updating Strategies, Plans or Programs* *With the approval of the Planning Secretary, the applicant may:*	
	a) prepare and submit any strategy, plan or program required by this consent on a staged basis (if a clear description is provided as to the specific stage and scope of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program);	**This Document**
	b) combine any strategy, plan or program required by this consent (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined);	**This Document**
	c) update any strategy, plan or program required by this consent (to ensure the strategies, plans and programs required under this consent are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the development); and	**Section 8.1**
	d) combine any strategy, plan or program required by this consent with any similar strategy, plan or program required by an adjoining mining consent or approval, in common ownership or management	**This Document**
	Schedule 3 – Specific Environmental Conditions	
	Heritage	
18	*Protection of Aboriginal Heritage* *The Applicant must ensure that the development does not cause any direct or indirect impact on any identified heritage item located outside the approved disturbance area, beyond those predicted in the documents listed in condition 2(e) of Schedule 2.*	**This document**
18A	*The Applicant must prepare a Heritage Management Plan for the development to the satisfaction of the Planning Secretary. This Plan must:*	**This document**
	a) be prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary;	**This HMP has been prepared by EMM Consulting in accordance with correspondence from DPIE dated 9 October 2020**
	b) be prepared in consultation with BCD and Registered Aboriginal Parties;	**Letter submitted; approval letter dated 26 November 2012**
	c) include consideration of the Aboriginal and non-Aboriginal cultural context and significance of the site;	**Section 3 and 4**
	d) describe the procedures and management measures to be implemented on the site or within any offset area to:	

Condition No.	Requirement	Relevant section of this document
	i) ensure all workers receive suitable Aboriginal cultural heritage inductions prior to carrying out any activities which may cause impacts to Aboriginal objects or Aboriginal places, and that suitable records are kept of these inductions;	**Section 7.5.1**
	ii) protect, monitor and manage identified non-Aboriginal heritage, Aboriginal objects and Aboriginal places (including any proposed archaeological investigations of potential subsurface objects and salvage of objects within the approved disturbance area) in accordance with the commitments made in the document/s listed in condition 2(e) of Schedule 2;	**Section 4 and 5.1.2**
	iii) protect non-Aboriginal heritage, Aboriginal objects and Aboriginal places located outside the approved disturbance area from impacts of the development;	**Section 5.2**
	iv) manage the discovery of suspected human remains and any new Aboriginal objects or Aboriginal places, including provisions for burials, over the life of the development;	**Section 5.1.6 and 5.1.7**
	v) maintain and manage reasonable access for relevant Aboriginal stakeholders to Aboriginal objects and Aboriginal places (outside of the approved disturbance area); and	**Section 1.5.6**
	vi) facilitate ongoing consultation and involvement of Registered Aboriginal Parties in the conservation and management of Aboriginal cultural heritage on the site; and	**Section 1.5.5**
	e) include a strategy for the care, control and storage of Aboriginal objects salvaged on site, both during the life of the development and in the long term. *The Applicant must implement the Heritage Management Plan approved by the Planning Secretary.*	**Section 5.1.8**
	Schedule 5 – Environmental Management, Monitoring, Auditing and Reporting	
3	***Management Plan Requirements*** *Management Plans required under this consent must be prepared in accordance with relevant guidelines, and include:* *a) a summary of relevant background or baseline data;* *b) details of:* • *the relevant statutory requirements (including any relevant approval, licence or lease conditions);* • *any relevant limits or performance measures and criteria; and* • *the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;* *c) any relevant commitments or recommendations identified in the document/s listed in condition 2(e) of Schedule 2;*	**This Document**

Condition No.	Requirement	Relevant section of this document
	d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria; *e) a program to monitor and report on the:* • *impacts and environmental performance of the development; and* • *effectiveness of the management measures set out pursuant to condition 2(e) of Schedule 2;* *f) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;* *g) a program to investigate and implement ways to improve the environmental performance of the development over time;* *h) a protocol for managing and reporting any:* • *incident, non-compliance or exceedance of any impact assessment criterion or performance criterion;* • *complaint; or* • *failure to comply with other statutory requirements;* *i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and* *j) a protocol for periodic review of the plan.* *Note: The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans*	
4	*The Applicant must ensure that management plans prepared for the development are consistent with the conditions of this consent and any EPL issued for the site*	**This Document**
5	***Revision of Strategies Plans and Programs*** *Within three months of:* *a) the submission of an incident report under condition 6;* *b) the submission of an Annual Review under condition 8;* *c) the submission of an Independent Environmental Audit under condition 9; or* *d) the approval of any modification of the conditions of this consent (unless the conditions require otherwise),* *the suitability of existing strategies, plans and programs required under this consent must be reviewed by the Applicant. If necessary, to either improve the environmental performance of the development, cater for a modification or comply with a direction, the strategies, plans and programs required under this consent must be revised, to the satisfaction of the Planning Secretary. Where revisions are required, the revised document must be submitted to the Planning Secretary for approval within six weeks of the review.* *Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the development.*	**Section 8**
	Appendix 3: Statement of commitments – Aboriginal Heritage	
	Activities will continue to be managed in accordance with the Colliery's Aboriginal Cultural Heritage Management plan (ACHMP).	**This Document**
	If monitoring indicates that mine-induced subsidence levels exceed 20 millimetres, a review will be undertaken to identify any potential impacts to cultural heritage in consultation with BCD.	**Section 5.1.2**
	All relevant Mannering staff and contractors will be made aware of their statutory obligations for Aboriginal cultural heritage under the NP&W Act as part of the existing mine induction process.	***Section 5.1 and 7.5***

Condition No.	Requirement	Relevant section of this document
	An Aboriginal Cultural Heritage Management Plan (ACHMP) will be developed and implemented for the identified Aboriginal heritage items within the Development Site in consultation with the relevant Aboriginal stakeholders. If additional sites are identified they will be assessed for cultural significance and be incorporated into the ACHMP.	**Section 1.5 and 5.1**
	In the unlikely event that skeletal remains are identified, the NSW Police Coroner will be contacted to determine if the material is of Aboriginal origin. If determined to be Aboriginal, contact will be made with the BCD, a suitably qualified archaeologist and representatives of the relevant Aboriginal stakeholder groups to determine an action plan for the management of the skeletal remains and formulate management recommendations if required.	**Section 5.1.7**
	Appendix 3: Statement of commitments – European Heritage	
	If monitoring indicates that mine-induced subsidence levels exceed 20 millimetres, a review will be undertaken to identify any potential impacts to non-indigenous heritage.	**Section 5.2**
	All relevant Mannering staff and contractors will be made aware of their statutory obligations for European cultural heritage under the Heritage Act 1977 as part of the existing mine induction process.	**Section 5.2 and 7.5**
	If, during the course of development works, significant non-indigenous cultural heritage material is uncovered within the Development Site, the Heritage Branch of BCD will be notified, and any required monitoring or management strategies instigated.	**Section 6.3**

Appendix 4: AHIMS Search

AHIMS Web Services (AWS)

Your Ref/PO Number : H200578

Client Service ID : 542698

Note: This Excel report shows the sites found in AHIMS on the 19/10/2020. If this date is not the same as the original date of the Search Results letter obtained during the Basic Search, then the search results might be different. The PDF version of this report will always coincide with the Basic Search Results letter.

Site ID	Site	Datum	Zone	Easting	Northing	Context	Site status	Primary contact	Site features	Site types	Recorders	Reports
45-7-0131	Summerland Point;	AGD	56	366820	6332970	Open site	Valid		Shell : -, Artefact : -	Midden	Helen Brayshaw	
45-7-0138	Bonny Boy Gully;	AGD	56	366820	6332970	Open site	Valid		Shell : -, Artefact : -	Midden	Helen Brayshaw	1846
45-7-0144	Windemere Ck 1;	AGD	56	363000	6334600	Open site	Valid		Shell : -, Artefact : -	Midden	Anne Lloyd	2237
45-7-0154	M7 Fishery Point	AGD	56	366050	6334500	Open site	Valid		Shell : 2, Artefact : -	Midden	Mary Dallas Consulting	2685
45-7-0157	M10 Casuarina Point Reserv	AGD	56	366300	6334990	Open site	Valid		Shell : -, Artefact : -	Midden	Mary Dallas Consulting	2685
45-7-0158	M11;Lakeview Road, Barden	AGD	56	363500	6334110	Open site	Valid		Shell : -, Artefact : -	Midden	Mary Dallas Consulting	2685
45-7-0159	M12;Bulgonia Road, Barden	AGD	56	363950	6334850	Open site	Valid		Shell : -, Artefact : -	Midden	Mary Dallas Consulting	2685
45-7-0166	M8;Dandaraga Road, Sugar	AGD	56	365300	6334500	Open site	Valid		Shell : -, Artefact : -	Midden	Mary Dallas Consulting	2685
45-7-0167	M9;Camp Brightwaters;	AGD	56	363500	6334880	Open site	Valid		Shell : -, Artefact : -	Midden	Mary Dallas Consulting	2685
45-7-0176	Gwandalan;	AGD	56	367200	6333300	Open site	Valid		Shell : -, Artefact : -	Midden	Tom Griffiths	2465,102129
45-7-0177	Camp Kanangra;	AGD	56	369500	6331500	Open site	Valid		Shell : -, Artefact : -	Midden	Mr.David Lambert,Mr.Gavin Newton	
45-7-0178	Hembula Creek - Scarred Tr	AGD	56	366800	6330400	Open site	Valid		Modified Tree (Carved	Scarred Tree	Mr.Gavin Newton	
45-7-0179	Black Neds Point;	AGD	56	365150	6331450	Open site	Valid		Shell : -, Artefact : -	Midden	L.M Nelson	
45-7-0181	Chain Valley Bay 1	AGD	56	366150	6329600	Open site	Valid		Shell : -, Artefact : -	Midden	L.M Nelson	101093
45-7-0182	Chain Valley Bay 2;	AGD	56	366120	6330950	Open site	Valid		Shell : -, Artefact : -	Midden	L.M Nelson	
45-7-0183	Diamond Drill Pt. North;	AGD	56	368050	6333200	Open site	Valid		Artefact : -, Shell : -	Midden	L.M Nelson	102129
45-7-0184	Gwandalan;	AGD	56	368500	6331800	Open site	Valid		Shell : -, Artefact : -	Midden	L.M Nelson	
45-7-0186	Pt Wolstonecraft 1;	AGD	56	368350	6334200	Open site	Valid		Shell : -, Artefact : -	Midden	L.M Nelson	
45-7-0189	Sandy Beach 1;	AGD	56	364950	6331450	Open site	Valid		Shell : -, Artefact : -	Midden	L.M Nelson	
45-7-0201	Nord 1 (N1)	AGD	56	369600	6332600	Open site	Valid		Shell : -, Artefact : -	Midden	Iain Stuart	3022
45-7-0207	The Hole 1 (TH1)	AGD	56	361820	6329800	Open site	Valid		Artefact : -	Open Camp Site	Kerry Navin,Mr.Kelvin C	3697,101093
14-7-0149	Gwandalan	AGD	56	368000	6333300	Open site	Valid		Shell : -, Artefact : -	Midden	Tom Griffiths	102129
45-3-3435	RPS HSO MwP1	AGD	56	359424	6334225	Open site	Valid		Shell : -, Potential Archaeological Deposit (PAD		RPS Australia East Pty Ltd - Blacktown	
45-7-0290	Gwandalan 1	AGD	56	368088	6329979	Open site	Valid		Shell : -		Doctor.Tim Owen,ERM Australia Pty Ltd- Sydne	
45-7-0316	RPS Wyee Point 2	GDA	56	362237	6331450	Open site	Valid		Shell : -		RPS Australia East Pty Ltd - Hamilton,Ms.Larai	
45-7-0293	RPS MP3	GDA	56	365058	6335017	Open site	Valid		Modified Tree (Carved or Scarred) : -		RPS Australia East Pty Ltd - Hamilton,Ms.Larai	
45-7-0190	Wyee Point	AGD	56	362398	6331810	Open site	Valid		Shell : -, Artefact : -	Midden	L.M Nelson,RPS Australia East Pty Ltd - Hamilt	
45-7-0291	RPS HSO M1	GDA	56	361555	6331952	Open site	Valid	Koompahtoo LALC	Shell : -		RPS Australia East Pty Ltd - Hamilton,Ms.Larai	
45-7-0357	Noamunga CR Midden	GDA	56	368583	6333118	Open site	Valid		Shell : -		Ms.Sharon Hodgetts	
45-3-4287	Wyee 7	GDA	56	358559	6327310	Open site	Valid		Artefact : -		Insite Heritage Pty Ltd,Ms.Elizabeth Wyatt	
45-3-4337	Mannering Creek AS1	GDA	56	358875	6328046	Open site	Valid		Artefact : -		Umwelt (Australia) Pty Limited - Individual users	
45-7-0226	K 4 Koompahtoo	AGD	56	360390	6334990	Open site	Valid		Artefact : -	Isolated Find	William Smith	99218
45-3-3165	K 1 Koompahtoo	AGD	56	359490	6332490	Open site	Valid		Artefact : -	Open Camp Site	William Smith	99218
45-7-0225	K 3 Koompahtoo	AGD	56	360650	6334900	Open site	Valid		Artefact : -	Isolated Find	William Smith	99218
45-7-0079	Crangan Bay;Stranger Gully;	AGD	56	368450	6330750	Open site	Valid		Shell : -, Artefact : -	Midden	ASRSYS	
45-7-0001	Morisset Hospital	AGD	56	361550	6332450	Open site	Valid		Shell : -, Artefact : -	Midden	L.M Nelson,A.J Barrett	1263
45-7-0003	Vales Point;Lake Macquarie;	AGD	56	363738	6331615	Open site	Valid		Shell : -, Artefact : -	Midden	Wyong Shire Council	
45-3-1553	Wyee Bay;Ruttleys Road;	AGD	56	362540	6330400	Open site	Valid		Shell : -, Artefact : -	Midden	Val Attenbrow,Glen Morris	
45-7-0262	SJOG 7	GDA	56	364036	6333848	Open site	Valid		Grinding Groove : 6		Mrs.Angela Besant	
45-7-0263	SJOG 6	GDA	56	364026	6333875	Open site	Valid		Shell : -		Mrs.Angela Besant	
45-7-0239	MP 1	AGD	56	362100	6334400	Open site	Valid	T Russell	Potential Archaeological Deposit (PAD) : -		Mrs.Angela Besant	
45-7-0253	Gwandalan 2	GDA	56	367386	6331169	Open site	Valid		Shell : -		Doctor.Tim Owen	
45-7-0254	gwanddalan 1	GDA	56	368088	6329979	Open site	Valid		Shell : -		Doctor.Tim Owen	
45-3-3166	K 2 Koompahtoo	AGD	56	359840	6332530	Open site	Valid		Artefact : -	Isolated Find	William Smith	99218
45-7-0255	Trinity Point GG2 (Catherine	GDA	56	363618	6333664	Open site	Valid		Grinding Groove : -		Mrs.Angela Besant	
45-7-0256	Trinity Point Scarred Tree 2 (	GDA	56	363749	6333815	Open site	Not a Site		Modified Tree (Carved or Scarred) : -		Mrs.Angela Besant,Insite Heritage Pty Ltd,Urba	
45-7-0257	Trinity Point Ochre (Catherin	GDA	56	363958	6333791	Open site	Valid		Ochre Quarry : -		Mrs.Angela Besant	
45-7-0258	Trinity Point IF1 (Catherine H	GDA	56	363730	6333744	Open site	Valid		Artefact : -		Mrs.Angela Besant	
45-7-0338	RPS GWANDALAN IF1	GDA	56	368263	6331126	Open site	Valid		Artefact : 1		RPS East Australia Pty Ltd - Echuca Victoria	

Report generated by AHIMS Web Service on 19/10/2020 for Morgan Wilcox for the following area at Datum :GDA, Zone : 56, Eastings : 359462 - 369462, Northings : 6328206 - 6334206 with a Buffer of 1000 meters. Additional Info : Update to heritage management plan. Number of Aboriginal sites and Aboriginal objects found is 86

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Site ID	Site	Datum	Zone	Easting	Northing	Context	Site status	Primary contact	Site features	Site types	Recorders	Reports
45-7-0320	RPS Mannering 1	GDA	56	363449	6331411	Open site	Valid		Shell : 1		Ms.Laraine Nelson	
45-7-0321	RPS Mannering 2	GDA	56	363401	6331331	Open site	Valid		Modified Tree (Carved or Scarred) : 1		Ms.Laraine Nelson	
45-7-0339	CV 001	GDA	56	364943	6329478	Open site	Valid		Artefact : 1		Mrs.Rebecca Newell,El	104283
45-7-0374	Gwan IF1	GDA	56	368302	6331050	Open site	Valid		Artefact : -		Mrs.Angela Besant,Insite Heritage Pty Ltd	
45-7-0379	Nords Whard PAD	GDA	56	369883	6331871	Open site	Destroyed		Artefact : -, Potential Archaeological Deposit (P.		MCH - McCardle Cultural Heritage Pty Ltd,MCH	
45-7-0378	Dungutti Elders office Clonec	GDA	56	362791	6335021	Open site	Valid		Artefact : -		Miss.Jessica Wegener,Mount Grenfell Aborigina	
45-7-0384	32 marine parade	GDA	56	369777	6333058	Open site	Valid		Shell : -		Mr.david ahoy,lower hunter aboriginal incorpora	
45-3-0334	Tiembula Creek Midden;Tien	AGD	56	366730	6330420	Open site	Valid		Shell : -, Artefact : -	Midden	Mary Dallas Consulting	1076
45-7-0227	St Johns 1	AGD	56	363680	6333520	Open site	Valid		Artefact : -		Mrs.Angela Besant	100896
45-7-0228	St Johns 2	AGD	56	363720	6333820	Open site	Valid		Artefact : -		Mrs.Angela Besant	100896,101024
45-7-0230	K3 KOOMPAHTOO	AGD	56	360650	6334900	Open site	Valid		Artefact : -		Stephen Griffen	
45-7-0080	Mannering Park;	AGD	56	364780	6328890	Open site	Valid		Modified Tree (Carved (	Scarred Tree	ASRSYS	101093
45-7-0244	St Johns 3	AGD	56	363560	6333600	Open site	Valid	T Russell	Artefact : 1		Mrs.Angela Besant	100896,102504
45-7-0268	CV-04-09	GDA	56	368381	6331136	Open site	Valid		Shell : 1		Mr.Geordie Oakes	
45-7-0269	CV-06-09	GDA	56	368061	6328867	Open site	Valid		Artefact : 1		Mr.Geordie Oakes	
45-7-0270	CV-07-09	GDA	56	367043	6331305	Open site	Valid		Artefact : 1		Mr.Geordie Oakes	
45-7-0271	CV-08-09	GDA	56	366587	6330975	Open site	Valid		Shell : 1		Mr.Geordie Oakes	
45-7-0272	CV-09-09	GDA	56	366650	6330868	Open site	Valid		Shell : 1		Mr.Geordie Oakes	
45-7-0273	CV-10-09	GDA	56	366875	6330868	Open site	Valid		Shell : 1		Mr.Geordie Oakes	
45-7-0274	CV-12-09	GDA	56	367290	6330372	Open site	Valid		Artefact : 1		Mr.Geordie Oakes	
45-7-0275	CV-14-09	GDA	56	367468	6330191	Open site	Valid		Shell : 1		Mr.Geordie Oakes	
45-7-0276	CV-15-09	GDA	56	366304	6329303	Open site	Valid		Modified Tree (Carved or Scarred) : 1		Mr.Geordie Oakes	
45-7-0277	CV-16-09	GDA	56	366335	6329635	Open site	Valid		Shell : 1		Mr.Geordie Oakes	
45-7-0278	CV-17-09	GDA	56	366273	6329369	Open site	Valid		Modified Tree (Carved or Scarred) : 1		Mr.Geordie Oakes	
45-7-0279	CV-18-10	GDA	56	367003	6333279	Open site	Valid		Shell : 1		Mr.Geordie Oakes	
45-7-0280	CV-19-10	GDA	56	366988	6333151	Open site	Valid		Shell : 1		Mr.Geordie Oakes	
45-7-0281	CV-20-10	GDA	56	365588	6331434	Open site	Valid		Shell : 1		Mr.Geordie Oakes	
45-7-0282	CV-21-10	GDA	56	366221	6331192	Open site	Valid		Shell : -		Mr.Geordie Oakes	
45-7-0340	Nords Wharf 1	GDA	56	369821	6331865	Closed si	Destroyed		Artefact : 1		MCH - McCardle Cultural Heritage Pty Ltd,Ms.P	
45-7-0341	Nords Wharf 2	GDA	56	369858	6331788	Open site	Destroyed		Artefact : 1		MCH - McCardle Cultural Heritage Pty Ltd,Ms.P	
45-7-0342	Nords Wharf 3	GDA	56	369788	6331822	Open site	Valid		Artefact : 1		Mr.Aaron Fogel	
45-7-0349	NWR NORDS WHARF ROA	GDA	56	369760	6331962	Open site	Valid		Artefact : -		Miss.Philippa Sokol	
45-7-0363	Woods Point Repatriation sit	GDA	56	362530	6333367	Open site	Valid	Doctor.User Test	Burial : 1, Modified Tree (Carved or Scarred) : 1		Ms.Mary Temple (nee Ghosn)	
45-7-0405	HN-LM-T01	GDA	56	367338	6327869	Open site	Valid		Aboriginal Ceremony and Dreaming : -		Mrs.Tessa Boer-Mah,Heritage Now - Belmont	
45-7-0406	HN-LM-T02	GDA	56	367343	6327823	Open site	Valid		Aboriginal Ceremony and Dreaming : -		Mrs.Tessa Boer-Mah,Heritage Now - Belmont	
45-7-0412	DC1;	GDA	56	365049	6330081	Open site	Valid		Shell : -		Mrs.Angela Besant,Insite Heritage Pty Ltd	
45-7-0413	DC2;	GDA	56	365006	6330070	Open site	Valid		Shell : -		Mrs.Angela Besant,Insite Heritage Pty Ltd	

Report generated by AHIMS Web Service on 19/10/2020 for Morgan Wilcox for the following area at Datum :GDA, Zone : 56, Eastings : 359462 - 369462, Northings : 6328206 - 6334206 with a Buffer of 1000 meters. Additional Info : Update to heritage management plan. Number of Aboriginal sites and Aboriginal objects found is 86

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Appendix 5: Criteria for Listing on the State Heritage Register

Heritage Council of New South Wales

Heritage Act 1977

CRITERIA FOR LISTING ON THE STATE HERITAGE REGISTER

The State Heritage Register is established under Part 3A of the Heritage Act (as amended in 1998) for listing of items of environmental heritage[1] which are of state heritage significance[2].

To be assessed for listing on the State Heritage Register an item will, in the opinion of the Heritage Council of NSW, meet more than one of the following criteria[3] or if an item satisfies only one of the criteria, the item is of such particular significance that it should be listed.

a) an item is important in the course, or pattern, of NSW's cultural or natural history;

b) an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history;

c) an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW;

d) an item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons;

e) an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history;

f) an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history;

g) an item is important in demonstrating the principal characteristics of a class of NSW's
   - cultural or natural places; or
   - cultural or natural environments.

An item is not to be excluded from the Register on the ground that items with similar characteristics have already been listed on the Register.

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[1] ***environmental heritage*** means those places, buildings, works, relics, moveable objects, and precincts, of state or local heritage significance (section 4, *Heritage Act, 1977*).

[2] ***state heritage significance***, in relation to a place, building, work, relic, moveable object or precinct, means significance to the State in relation to the historical, scientific cultural, social, archaeological, architectural, natural or aesthetic value of the item (section 4A(1), *Heritage Act, 1977*).

[3] Guidelines for the application of these criteria may be published by the NSW Heritage Division.

Appendix 10 Built Features Management Plan

Delta coal	Doc Owner: **Approvals Coordinator** Doc No:

CHAIN VALLEY COLLIERY

Built Features Management Plan

ENVIRONMENTAL MANAGEMENT PLAN

Author/s	Chris Armit – Delta Coal
Authorised by:	Chris Armit - Approvals Coordinator
Date:	6 April 2021

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1 Introduction

1.1 Purpose and Scope

The purpose of this Built Features Management Plan (BFMP) is to outline the process for management of built features within the subsidence affected zone associated with miniwall S5, pillar extraction area in the Northern Mining Area (Northern Pillar Area - NPA) and first workings beneath Morisset Peninsula. The primary objectives of the document are to:

- ensure compliance with SSD-5465 and relevant mining lease conditions and Extraction Plan approvals;
- identify all existing surface and subterranean infrastructure that may be potentially impacted by the secondary extraction of Miniwall S5, NPA pillar extraction and first workings underneath the Morisset Peninsula area;
- outline the process for developing monitoring and management protocols with the respective asset owners;
- describe the review and reporting requirements as well as the relevant frequencies and duration of monitoring and
- allocate roles and responsibilities within the Chain Valley Colliery (CVC) management structure such that all actions emanating from this document have specific task owners.

The scope of this document includes all land and subterranean man-made features that are located within the projected subsidence affected zone associated with above areas.

The timing of this management plan is such that the actions emanating from it shall be initiated prior to the commencement of the appropriate extraction area and will continue for a minimum of 12 months after the completion of extraction.

Data collected under this management plan shall be supplied to all relevant stakeholders and any exceedance of predicted subsidence effects or impacts shall be reported as soon as practicable. Prior to ceasing ongoing monitoring, all captured data is to be assessed for stability and mutual agreement to the cessation of monitoring reached between all relevant stakeholders and DC.

A formal Environmental Management System (EMS) has been developed as a systematic and structured approach to managing environmental issues at the operation. This has been developed in general accordance with the requirements of the international standard ISO 14001.

This BFMP is an element of the DC EMS.

1.2 Background

CVC is an underground coal mine located on the southern side of Lake Macquarie approximately 60 km south of Newcastle and 80 km north of Sydney (see Figure 1). The pit-top is located approximately 1 km south-east of the township of Mannering Park at the southern extent of Lake Macquarie.

In August 1960, J&A Brown and Abermain Seaham Collieries Ltd commenced clearing the present site with drift and shaft sinking starting a few months later. Production of coal from the Wallarah Seam, commenced with the first delivery to the adjacent Delta Electricity's Vales Point Power Station (VPPS) in April 1963.

Great Southern Energy Pty Ltd (trading as Delta Coal) took over as owner and operator of CVC and as operator of MC on 1 April 2019.

Mining is currently undertaken at CVC, with the coal being transported underground to MC where the coal is crushed and screened and sent directly to VPPS.

2 Statutory Requirements

2.1 Key Legislation, Policy and Guidelines

Both State and Commonwealth environmental legislation applies to DC's operation and activities. A number of legislative requirements, government policies and guidelines are applicable. Key items relevant to this management plan are:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Protection of the Environment Operations Act 1997* (POEO Act);
- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Mining Act 1992*;
- *National Parks and Wildlife Act 1974*;
- *Biodiversity Conservation Act 2016*;
- Department of Primary Industries (2013), *Policy and guidelines for fish habitat conservation and management*; and
- ANZECC 2000, Australian *and New Zealand Guidelines for Fresh and Marine Water Quality*.

Delta lands are within the LMCC and Central Coast Council local government areas (LGAs).

2.2 Development Consent SSD-5465 Requirements

This BFMP has also been completed to satisfy the requirement of Condition 7(g), Schedule 4 of Development Consent SSD-5465 (Modification 3).

Built features related requirements of SSD-5465, including specific requirements that are to be addressed in this plan, and where they are addressed, are detailed in **Appendix 2**.

Condition No.	Requirement	Relevant section of this document
	Schedule 4 Environmental Conditions – Underground Mining	
7(g)	include a Built Features Management Plan, which has been prepared in consultation with RR and the owners of affected public infrastructure, to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings, and which;	**This BFMP plan** **Section 2.3**
	addresses in appropriate detail all items of public infrastructure and all classes of other built features;	**Section 3**
	• has been prepared following appropriate consultation with the owner/s of potentially affected feature/s;	**Section 2.3**
	• recommends appropriate remedial measures and includes commitments to mitigate, repair, replace or compensate all predicted impacts on potentially affected built features in a timely manner	**Section 6**

2.3 Consultation

The BFMP is required to be prepared in consultation with the Resources Regulator (RR) and the owners of the affected public infrastructure to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings as per Schedule 4 (Specific Environmental Conditions) condition 7 (g). A draft for comment copy of the BFMP was provided to Delta Coal employees with roles and responsibilities under the BFMP on the 8 September 2020. A draft for comment copy of the BFMP including updates for miniwall S5 and the northern mining pillar extraction area was provided to DPIE, RR, Lake Macquarie City Council (LMCC), Central Coast Council (CC Council), Subsidence Advisory NSW (SA), combined CVC and MC CCC, Roads and Maritime Services (TfNSW) on 16 December 2020. An update with consultation from these stakeholders was uploaded onto the Planning Portal on 18 January 2020. Comments were received from DPIE and updated in March 2020. This management plan is an Appendix to the CVC Miniwall S5 and NPA Extraction Plan. Evidence of consultation is provided in **Appendix 1**.

TfNSW who are the managers of the Pelican Rock navigational marker and other navigational markers, have been previously consulted on the development of the S2/S3 and S4 Built Features management plans and have provided guidance on the serviceability limits of the marker. Lake Macquarie Marine Rescue were originally consulted on the Pelican Rock Navigational Marker.

All DC workers affected by the requirements of this management plan shall have access to a copy of this document and associated documents via the workplace document control system for review purposes.

MC and CVC have a combined Community Consultation Committee (CCC) made up of various members from the surrounding communities. The planned development of the miniwalls S2, S3,S4, S5 and northern pillar area and the predicted subsidence effects and impacts were discussed during the 2020 quarterly CCC meetings.

The resultant monitoring and inspection report prior, during and subsequent to the miniwalls S2, S3,S4, S5 and NPA development will continue to be presented and discussed at future CCC meetings. In the event of an unexpected subsidence impact and/or an exceedance of predicted subsidence effects or impacts, the CCC members will be notified as soon as practicable.

Closer to the mining being undertaken home owners along the appropriate shoreline will receive a letter detailing the current mining operations and proposed foreshore subsidence monitoring and most owners, where house are inhabited, have been previously been amendable to allowing access to their property to conduct this monitoring. This plan was approved by DPIE on the 6 April 2021 as part of the Miniwall S5 and Northern Pillar Area extraction plan **(Appendix 1)**.

Table 1: Consultation Summary

Stakeholder	Comments	Response / Action
DPIE-Resource Assessments	• Request for information (RFI) provided on 5 March 2020. See attached DPIE RFI letter and attachment (Appendix 1).	• Section 2.3 updated • See tracked changed document provided on planning portal for updated consent references and mining panel numbering
Resource Regulator	• See Appendix 1 for consultation • Applicability for High Risk Activity and clause 67 for secondary extraction	• See Appendix 1 for High Risk Activity Management Report submission
LMCC	• No comments	• Nil
Subsidence Advisory	• No comments	• Nil
TfNSW – Maritime	See Appendix 1 for consultation • 1-Notification requirements for construction • 2 Vessel safety requirements • 3 Vessel safety requirements • 4 Notification/Action requirements	• Plan updated for comments and consultation included in Appendix 1 • Site survey personnel notified of TfNSW -Maritime vessel requirements

Stakeholder	Comments	Response / Action
	• 5 Confirmation request on subsidence at NLM045 • 6 and 7 Acknowledgement of acceptable subsidence on Navigational markers	• See Section 7.3 for updated notification requirements • See Section 4.1.1 for updated acceptable subsidence limits of navigational markers • Response provided by DC on 1/2/2021 on subsidence at NLM045
CCC	• No comments	• Nil

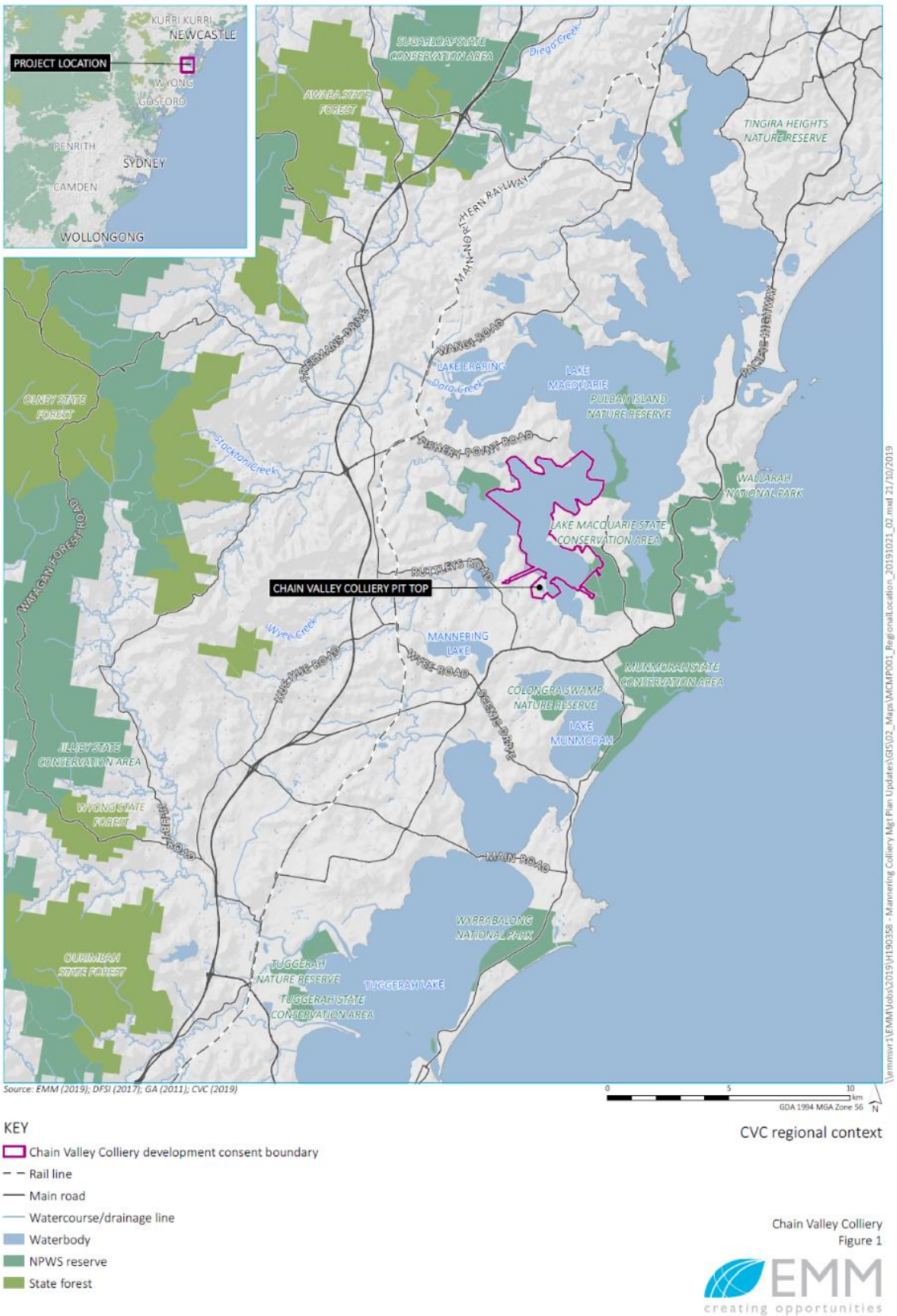


Figure 1: Regional Context

3 Built Features Management

3.1 Identification

A surface field mapping exercise has been undertaken by DC above the S5 Miniwalls and Northern Pillar Area extraction and Morisset Peninsula with the intent of identifying surface-built features which could be potentially affected by the completion of secondary extraction. The following sections list the identified built features as well as a description of each.

3.2 Navigational Markers



Figure 2: Navigational Markers on Lake Macquarie

The Pelican Rock Navigational Marker NLM045 (Isolated Danger) is located above Tailgate S2 (TGS2) (Figure 2).

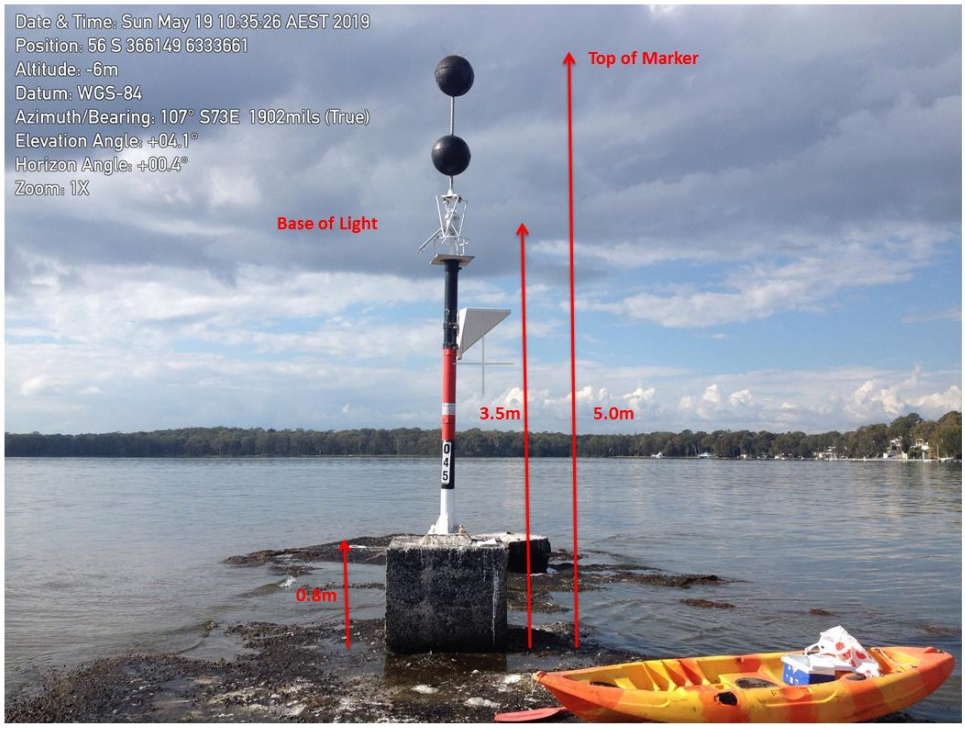


Figure 3: Pelican Rock Isolated danger Navigational Marker NLM045

The navigational marker on Pelican Rock falls into the category of 'Other buoys and signs – Isolated danger' (Figure 5)

The Isolated Danger beacon indicates specific dangers with generally safe waters all around (e.g. a wreck). It is advised to sailors to pass them on any side but not to pass too close. If lit, it shows a white light flashing in groups of two (RMS, 2019). There is a lit isolated danger beacon (NLM062) on the rock/point south of Sugar Bay

There are 2 navigational markers (NLM063) and (NLM064) off Morisset East Peninsula within SSD5465 project area that fall into the category of 'Cardinal Marks' (see Figure 6). Cardinal Marks take their name from the compass quadrant in which they are placed and indicate the safe side of a danger on which to pass, eg north of the north mark, (RMS, 2020).



Figure 5: Other Buoys and Signs – Isolated Danger

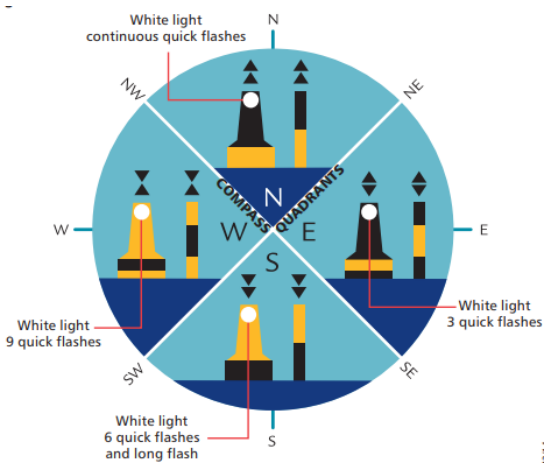


Figure 6: Cardinal Marker

3.3 Houses and other structures along the Summerland Point Foreshore and Morisset Peninsula Foreshore

Many of the built features along the foreshores can be seen in Figure 7 (photo) and Figure 8. These include houses, other associated structures, jetties, moorings, roads and services. There are workings adjacent in the stratigraphically overlying Wallarah seam as shown in Figure 9 and adjacent Myuna Colliery Fassifern workings.

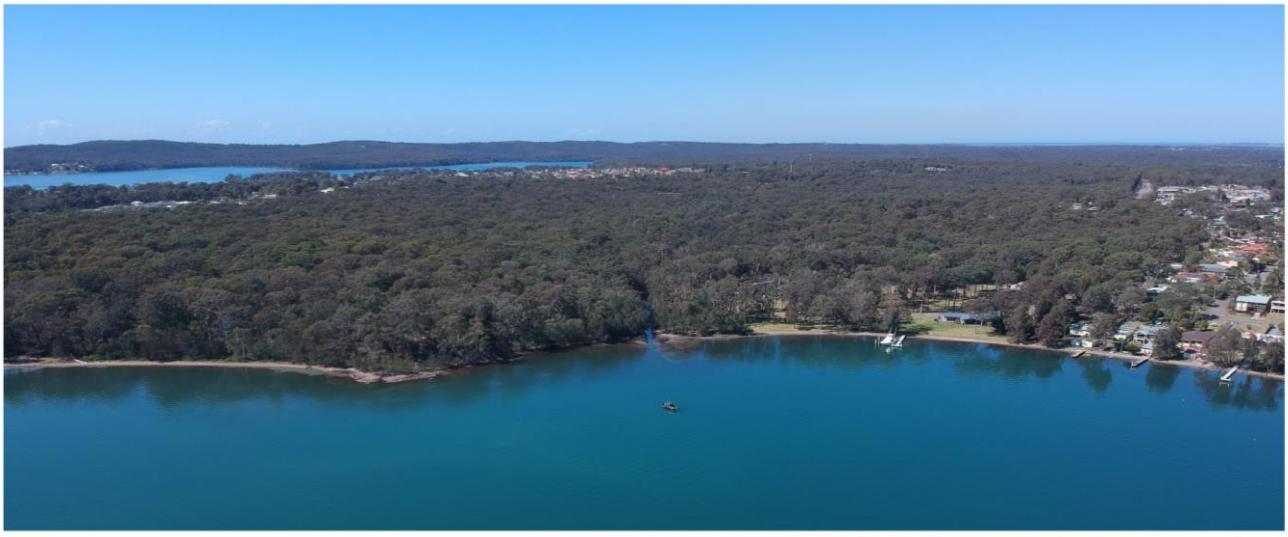


Figure 7: Aerial Photography of the Built Features along the Foreshore adjacent to MWS5



Figure 8: Aerial Photography of the Built Features along the Foreshore at Fishery Point, Morisset Peninsula

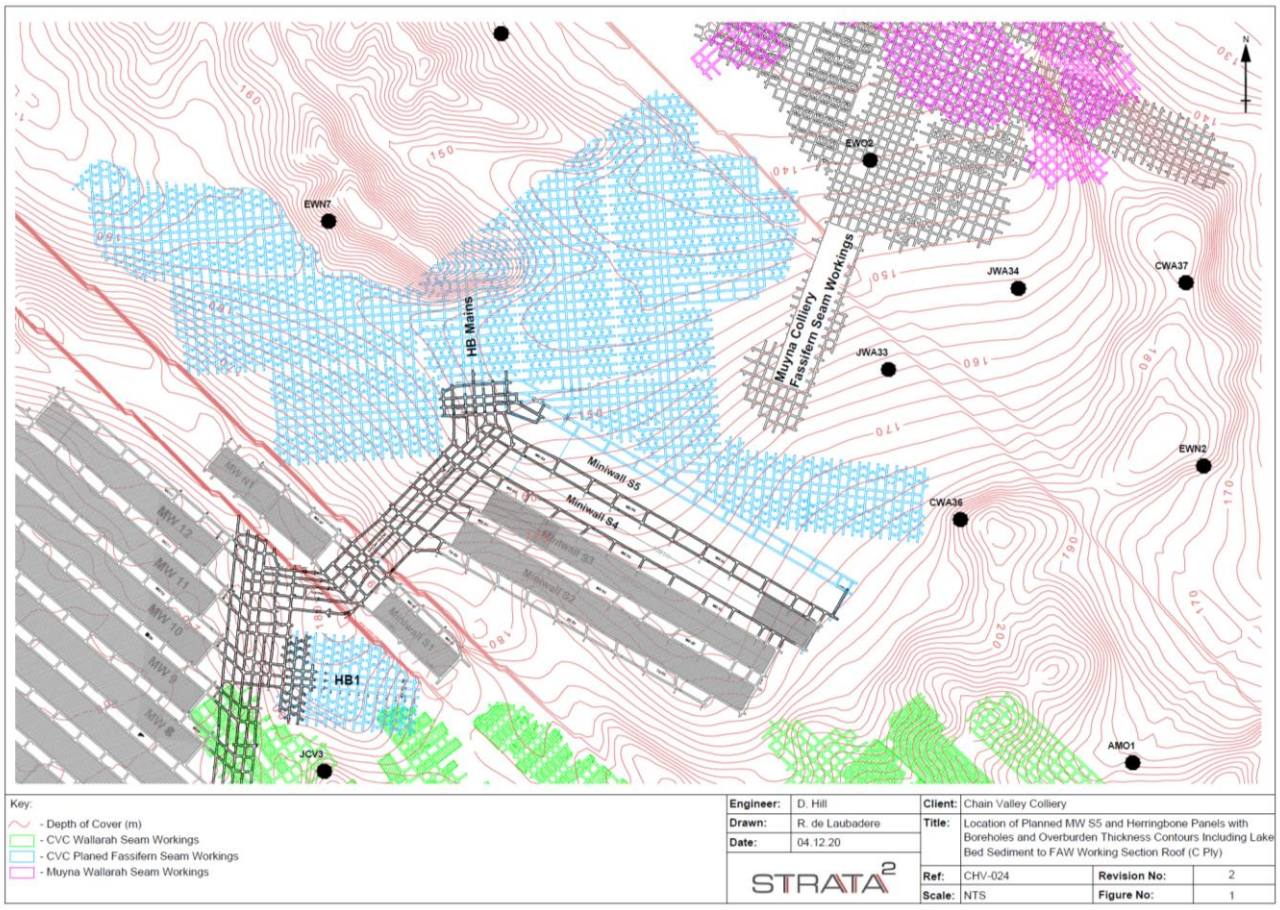


Figure 9: Overlying Wallarah workings and Myuna workings (Wallarah and Fassifern seams)

4 Subsidence Predictions and Management Procedures

4.1 Subsidence Predictions

Subsidence effect predictions have been undertaken for Miniwalls S5, NMA and Morisset Peninsula by Strata 2 Ground Control Consulting. (Strata2, 2019). A site-specific geotechnical model has been developed by Strata2, taking into consideration the design of the mining geometries, a review of previous subsidence performances, and an assessment of pillar behaviour as well as roof and floor stability in the Fassifern Seam workings.

These predicted subsidence effects have then be used in conjunction with the location of the identified surface built features to predict the subsidence effects at each identified feature.

4.1.1 Navigational Markers

The predicted vertical subsidence for the Pelican rock navigational marker (NLM045)due to MWS2, MWS3, MWS4 and MWS5 is 155 mm and tilt values <4 mm/m. The predicted subsidence has been provided to TfNSW- Maritime and the resources regulator. Subsidence monitoring and management strategies have been developed for the marker. TfNSW-Maritime serviceability criteria of the Pelican Rock Navigational marker (NLM045) and Sugar Bay Rock Navigational marker are <500 mm vertical subsidence and <5 degrees tilt. At the time of this document review both S2 and S3 miniwalls have been extracted with 30mm change in height measured with no change in tilt from vertical (0 degrees).

Navigational Marker	Vertical Subsidence Predictions	Tilt predictions
Pelican Rock (NLM045)	• 155mm	• <4mm/m
Sugar Bay Rock (NLM062)	• < 20mm	• N/A
Fishery Point (NLM063)	• <20mm	• N/A
Casuarina Point (NLM064)	• <20mm	• N/A

NSW Maritime acknowledged that the 4mm/m tilt on NLM045 is less than 0.25 degrees and using this same criteria for NLM062 the 20mm movement and 0 tilt is also acceptable. The NLM063 and NLM064 are buoys so the tide has more impact on the aid to navigation height than the mining with the effect on the chain length and <20mm vertical subsidence is almost undetectable. Therefore, the subsidence values for these features were deemed acceptable by TfNSW-Maritime.

4.1.1 Houses and other structures along the Summerland Point and Morisset East Peninsula Foreshores

The predicted vertical subsidence at the mapped sea grass beds, and hence at the lake foreshore is less than 20 mm. It is unlikely, therefore that there would be adverse impacts on the surface features located above the sea grass beds (i.e. jetties and moorings) or along the lake foreshore, including houses, other associated structures, roads and services.

The state survey control marks located near MWS2, MWS3, MWS4 and MWS5 could experience low-level horizontal movements. NSW Spatial services will be notified so that the affected state survey marks can be managed and re-established after the active subsidence, as required.

4.2 Subsidence Management

Subsidence management is mainly controlled via the geotechnical assessment, mine design and subsidence predictions and impact assessment process. There are no built features located directly above S5 miniwall

panel and the Northern Mining Area Pillar Extraction Area with adequate subsidence barriers in place for the identified nearby built features. There is a Subsidence Management Trigger Action Response Plan (TARP) which details Monitoring triggers, actions and adaptive management responses.

5 Subsidence Monitoring

DC survey department utilise a number of different subsidence monitoring methods including bathymetric surveys, terrestrial land based surveys, remote sensing (LiDAR) and visual inspections. Subsidence monitoring areas, survey types and frequencies are outlined in the MWS5 and NMA Pillar Extraction Subsidence Monitoring Program.

6 Subsidence Remediation

Subsidence remediation is outlined in the Delta Coal Rehabilitation Management Plan. As per Table 7 in the CVC consent DC commits to mitigating, monitoring, repairing to pre-mining condition at full cost or equivalent unless the owner agrees otherwise or the damage is fully restored, repaired or compensated under the Coal Mine Subsidence Compensation Act 2017 features which are damaged by mining operations. The timely repair is also required from a public safety aspect. This is detailed further in the CVC Public Safety Management Plan.

7 Reporting

7.1 Regular Reporting

In accordance with Schedule 6, Condition 8, the Applicant shall provide regular reporting on the environmental performance of the development on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of the development consent.

The subsidence monitoring results will be reviewed as survey reports are received to confirm compliance/non-compliance with the applicable conditions specified in the development consent and above in Section 5 and the applicable stakeholders will be notified.

7.2 Annual Review

In accordance with Schedule 6, Condition 4, the Applicant shall review the environmental performance of the development to the satisfaction of the Secretary, by the end of March each year, or other timing as may be agreed by the Secretary.

The Annual Review will also include a summary of monitoring results during the past year, discussion with reference to the impact assessment criteria, and any relevant details related to comparisons between actual results and predictions in the Environmental Impact Statement. The Annual Review will be forwarded to the relevant authorities including DPIE, and EPA. The Annual Review will also be forwarded to members of the Community Consultative Committee (CCC) and local Councils (Central Coast and Lake Macquarie). It will also be placed on the company's website along with a summary of environmental monitoring results.

7.3 Incident or Non-Compliance Notifications and Reporting

If there is a built features incident as a direct result of CVC operations, DC must immediately notify DPIE and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name) and set out the location and nature of the incident. If subsidence monitoring detects an exceedance as per Section 4.1.1. criteria to the navigational markers, TfNSW-Maritime should be notified immediately.

Within seven days of becoming aware of a non-compliance, the DC must notify DPIE of the non-compliance. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name), set out the condition of the consent that the development is non-compliant with, why it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.

The investigation into the incident/non-compliance will consider any activities, plant operations or other factors that may have caused or contributed. The investigation will consider any activities or other factors that may have generated the non-compliance.

The report will:

- describe the date, time and nature of the exceedance / incident;
- identify the cause (or likely cause) of the exceedance / incident;
- describe what action has been taken to date; and
- describe the proposed actions to address the exceedance / incident

DC will implement the recommendations of the investigation in order to minimise the potential for any similar future incident or non-compliance. Additional details of the incident reporting process are provided in the DC Environmental Management Strategy.

8 Stakeholder Management, Response and Training

8.1 Complaint Protocol

DC has a 24-hour telephone hotline (1800 115 277) through which members of the public can lodge complaints, concerns, or to raise issues associated with the operation. This service aims to promptly and effectively address community concerns and environmental matters.

All complaints are recorded and responded to and if, for some reason, no action is taken then the reason why is recorded. The information recorded in the complaint register includes:

- date and time the complaint was lodged;
- personal details provided by the complainant;
- nature of the complaint;
- action taken or, if no action was taken, the reason why; and
- follow up contact with the complainant.

8.2 Independent Review

As detailed in Condition 2, Schedule 5 of SSD-5465, an Independent Review can be requested by a landowner who "*considers the development to be exceeding the relevant criteria in Schedule 3".*

If the Secretary is satisfied that an independent review is warranted, then within 2 months of the Secretary's decision the Applicant shall:

(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to:
- *consult with the landowner to determine his/her concerns;*
- *conduct monitoring to determine whether the development is complying with the relevant criteria in Schedule 3; and*
- *if the development is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and*

(b) give the Secretary and landowner a copy of the independent review.

8.3 Dispute Resolution

If any disputes are not adequately addressed by the complaints handling process then they will be handled by the Environmental Compliance Coordinator. If the response of CVC is not considered to satisfactorily address the concern of the complainant, a meeting may be convened with the complainant, Mine Manager together with the Environment and Community Coordinator to determine any further options to reduce potential impacts.

Any actions agreed from the meeting will be implemented by CVC. After implementation of the proposed actions the complainant will be contacted and advice sought as to the satisfaction or otherwise with the measures taken.

If no agreed outcome is determined or the complainant is still not satisfied by the action taken, then an Independent Review may be requested by the complainant. If determined to be warranted by the Secretary, an independent review will be undertaken in accordance with the process identified in Schedule 5 of SSD-5465.

8.4 Training, Awareness and Competence

Training is an essential component of the implementation phase of this BFMP. The Environmental Compliance Coordinator will ensure that training and awareness processes are implemented to manage, identify and minimise potential impacts of CVC and to ensure personnel are aware of their roles and responsibilities in terms of built features management.

Generally training at CVC consists of induction training for new starters and contractors along with environmental awareness training at two-year intervals and ongoing “toolbox” training for all permanent employees as required.

As the document owner, the Approvals Coordinator is the contact point for any person that does not understand this document or their specific requirements, and will provide guidance and training to any person that requires additional training regarding this BFMP.

9 Audit and Review

9.1 Review and Improvement

This document shall be reviewed, and if necessary revised, within 3 months of the following:

- the submission of an Annual Review;
- the submission of an incident report;
- the submission of an independent environmental audit; and
- following any modification to the development consent.

As outlined in **Section 7.2**, the Annual Review will include a review of the seasonal monitoring program and mine plans to ensure that any reference sites that have been impacted by mining reclassified as impacted impact sites, and replacement reference sites identified and sampled. Survey methods will be reviewed every two years to refine the sampling program if required. Improvements identified during reviews or audits will be incorporated into the BFMP.

9.2 Auditing

Where required, audits shall be carried out by personnel who have the necessary qualifications and experience to make an objective assessment of the issues. The extent of the audit, although pre-determined, may be extended if a potentially serious deviation from this document is detected.

DC has an external independent Environmental Audit every three years. Due to the timing and relatively small geometry of the miniwall panels, a review of the finalised document will not be required as mining will have been completed within a year from authoring.

10 Records and Document Control

10.1 Records

Generally, the Environment and Community Coordinator will maintain all Environmental Management System records which are not of a confidential nature. Records that will be maintained include:

- monitoring data;
- environmental inspections and auditing results;
- environmental incident reports;
- the complaints register; and
- licences and permits.

All records will be stored so that they are legible, readily retrievable and protected against damage, deterioration and loss. Records will be maintained for a minimum of 4 years or as otherwise required under any legislation, licence, lease, permit or approval.

10.2 Document Control

This document and all others associated with the Environmental Management System shall be maintained in a document control system which is in compliance with the site Document Control Standard which is available to all site personnel. Any proposed change to this document will be via the Environment and Community Coordinator. A copy of this document is available on the DC website. Document revision details are provided in **Table 2**.

Table 2: Document Revision Details

Version	Date	Details of Revision	Company	Reviewed by/ Authorised by
0	16/12/2020	Draft Prepared using S4 BFMP as a base document including proposed S5 and NMA pillar extraction workings. Review following SSD5465 Modification 3 approval.	Delta Coal	Chris Armit
0.1	18/01/2021	Plan including stakeholder consultation (DPIE comments not yet received)	Delta Coal	Chris Armit

Version	Date	Details of Revision	Company	Reviewed by/ Authorised by
0.2	19/03/2021 6/04/2021	Plan including DPIE consultation DPIE Approval of MWS5 and NPA Extraction Plan including this management plan	Delta Coal	Chris Armit

11 Roles and Responsibilities

All employees and contractors at CVC are responsible for environmental management. However, various positions in the organisation have roles, responsibilities and authorities for managing environmental aspects, action plans, programs and controls.

Roles and responsibilities specific to completing the requirements of this plan are identified in **Table 3**.

Table 3: Built Features Management Plan Roles and Responsibilities

Role	Responsibilities
Manager of Mining Engineering (Mine Manager)	• Ensure that adequate financial and personnel resources are made available for the implementation of the BFMP. • Maintain overall responsibility for environmental compliance with Mining Lease, EPL, development consent and other mining approvals as they pertain to the management of built features • Ensure that adequate training is provided to staff to minimise impacts to built features.
Technical Services Manager	• Oversee the implementation of the BFMP for applicable areas
Mine Surveyor	• Identify all built features within the S5 miniwall and NPA Pillar extraction footprint • Ensure that all survey monitoring is conducted and reported appropriately to stakeholders • Report triggers and monitoring to applicable stakeholders • Conduct pre and post mining inspections
Environment Compliance Coordinator or delegate	• Write the BFMP in consultation with relevant government agencies and stakeholders • Undertake reviews of this document • Undertake or coordinate the required audits of this document • Develop management actions in consultation with regulatory agencies as/if required from the monitoring results • Compile the Annual Review (including a summary of the built features monitoring) • Conduct pre and post mining inspections • Report triggers and monitoring to applicable stakeholders • Organise remediation if required • Notify relevant agencies if there are any exceedances in impact thresholds • Ensure complaint handling and response is undertaken

Role	Responsibilities
All employees and contractors	• Comply with the requirements of this BFMP. • Immediately notify Environment Compliance Coordinator of possible incident.

12 References

Documents referenced in the preparation of the BFMP are detailed in **Table 4**.

Table 4: References

Reference	Title
Australian Standards	AS/NZS ISO 14001:2004, *Environmental management systems – Requirements with guidance for use* AS/NZS ISO 14004:2004, *Environmental management systems – General guidelines on principles, systems and support techniques* ANZECC 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*
Government Department	Roads and Maritime Services, 2019. https://www.rms.nsw.gov.au/maritime/safety-rules/rules-regulations/navigation-marks-and-signs.html SSD-5465 Development Consent SSD-5465 (Modification 2), 16 December 2015 NSW EPA Environment Protection Licence: EPL 1770, 2 April 2019
Delta Coal documents	EMS Environmental Management Strategy Public Safety Management Plan Rehabilitation Management Plan
External documents	Strata Ground Control Consulting, 2019. *S4 Panel: Geotechnical Environment, Subsidence Estimates and Impacts,* prepared for Delta Coal Chain Valley Colliery

13 Definitions

BCD Biodiversity Conservation Division

Built Features Any building or work erected or constructed on land or water, and includes dwellings and infrastructure such as any formed road, street, path, walk, marina or driveway; any pipeline, water, sewer, telephone, gas or other service main

CVC Chain Valley Colliery

DA Development approval

DC Delta Coal

DP&E Department of Planning & Environment (former)

DPIE Department of Planning, Industry and Environment

DPI Fisheries Department of Primary Industries – Fisheries NSW

EMS Environment Management System

EPA NSW Environment Protection Authority

EPL Environmental Protection License

EP&A Act *Environmental Planning and Assessment Act 1979*

LMCC Lake Macquarie City Council

MC Mannering Colliery

POEO Act *Protection of the Environment Operations Act 1997*

ROM Run-of-mine

RR Resource Regulator

Planning Secretary Planning Secretary of the Department of Planning and Environment, or nominee

SSD-5465 Development Consent SSD-5465 (for the Chain Valley Colliery Mining Extension 1 Project)

SA NSW Subsidence Advisory NSW

TARP Trigger Action Response Plan

TfNSW Transport for New South Wales

Appendix 1: Consultation

TfNSW Consultation

From: Lynda Hourigan **On Behalf Of** Navigation Advice North
Sent: Monday, 1 February 2021 1:18 PM
To: Kumar Kuruppu <Kumar.Kuruppu2@transport.nsw.gov.au>; Navigation Advice North <navigationadvicenorth@rms.nsw.gov.au>
Cc: Mike Baldwin <Mike.Baldwin@transport.nsw.gov.au>; Brett Boehm <Brett.Boehm@transport.nsw.gov.au>; Chris Austen <Chris.Austen@transport.nsw.gov.au>; Peter Browne <Peter.Browne@transport.nsw.gov.au>; Nicole Waller <Nicole.Waller@transport.nsw.gov.au>; Lun Yeung <lun.yeung@transport.nsw.gov.au>; Sonia Mckay <Sonia.McKay@transport.nsw.gov.au>; Nathan Koch <Nathan.Koch@transport.nsw.gov.au>
Subject: RE: Major Projects – Proponent Request for Advice - Chain Valley Extension Project- SSD-5465 - CVC Built Features Management Plan (SSD-5465-PA-38) (Central Coast,Lake Macquarie City)

Hello Kumar

Thank you for your email requesting TfNSW Maritime's comment on the CVC Built Features Management Plan below.

Transport for NSW (TfNSW) Maritime is responsible for the ongoing maintenance of safe navigation throughout NSW under the Marine Safety Act 1998. As such, proposals like this are reviewed to ensure that any disruption to navigation for vessels is minimised as much as is practical.

The project documentation provided has been assessed as having minimal impact on the safety of navigation to vessels operating in this area and Maritime has no objections to the proposed works.

TfNSW Maritime advises the following matters need to be considered and addressed when preparing the REF and / or the Scope of Works for the Chain Valley Extension Project:

1. Any works impacting on navigation during the construction phase must seek TfNSW Maritime support 21 days prior to works commencing. A full scope of works including dates is to be provided to *navigationadvicenorth@rms.nsw.gov.au.*
2. All associated work boats to comply with the relevant NSW Marine Legislation for survey, registration and safety equipment, and comply with the Marine Safety (Domestic Commercial Vessels) National Law Act 2012.
3. Vessels must exhibit lights and shapes in accordance with International Regulations for Preventing Collisions at Sea.
4. *"That If the subsidence was >500mm or the pylon ends up with more than 5° of lean on it, then there would need to be action taken."* and NSW Maritime is to be notified immediately.
5. For pelican rock NLM045, please confirm if this is an additional 155mm vertical subsidence to the 130mm already predicted for the mining of Miniwall S2-S4. NSW Maritime is seeking confirmation that the vertical subsidence is still within the limits allowing the project to go ahead without any action needed to be taken on NLM045.
6. NSW Maritime acknowledges that the 4mm/m tilt on NLM045 is less than 0.25 degrees so this is not an issue and using this same criteria for NLM062 the 20mm movement and 0 tilt is also acceptable.
7. NSW Maritime notes that NLM063 and NLM064 are both buoys so the tide has more impact on the Aid to Navigation height than the mining with the effect on the chain length and scope being almost undetectable. Therefore the subsidence values for these are also acceptable.

Subsequently, NSW Maritime advises that "There is no action required for these 4 navigation aids for the predicted subsidence and tilts and no further action required unless the subsidence and tilt exceed the values that have previously stipulated"

For more information, please direct all correspondence to *navigationadvicenorth@rms.nsw.gov.au*.

Kind regards

Lynda Hourigan
Project Officer North Maritime Greater Sydney **Transport for NSW M** 0409 483 676 PO Box 426 BALLINA NSW 2478

Resource Regulator Consultation

CA Chris Armit Resources Regulator; gang.li@planning.nsw.gov.au; alexander.tutt-branco@planning.nsw.gov.au; dan.adams@planning.nsw.gov.au; Melissa Anderson; Chris Nicholas; Tim Chisholm 01/01/2021

RE: AREQ0014285 | Chain Valley Colliery | Action required | 14 Dec 2020 12:20:01

Hi Ray,

Thanks for your email re: BFMP. To answer your question, yes, we are currently seeking approval under a modification application (CVC MOD 4) to mine under the greater Morisset Peninsula.

However, Chain Valley Colliery already has approval under SSD 5465 to mine under a smaller section of Morisset Peninsula (see below Appendix 3 from SSD5465 – I've added a red box to outline the location of consent approval area.

Mining under Fishery Point has been referenced in the last MOP approval letter and is included in the current approved MOP plans (cc'ed Dan and Melissa, if you wish to consult with them on MOP/Consent approval from an internal regulator perspective).

The BFMP scope has been outlined in the draft for comment doc (see below excerpt). I'm compelled by the consent as part of the extraction plan application process to have a BFMP for secondary extraction (i.e. MWS5 and NMA Pillar extraction) but thought it good practice to include the first workings area under the Peninsula to get some buy in from the Resource Regulator given existing built features. If you don't deem this approach necessary, happy to remove mention of it from this BFMP. Let me know if you have any comments on the draft BFMP and can make appropriate amendments if necessary.

Cheers,
Chris

APPENDIX 3
DEVELOPMENT LAYOUT



1 Introduction

1.1 Purpose and Scope

The purpose of this Built Features Management Plan (BFMP) is to outline the process for management of built features within the subsidence affected zone associated with miniwall S5, pillar extraction area in the Northern Mining Area and first workings beneath Morisset Peninsula. The primary objectives of the document are to:

CA Chris Armit Resources Regulator; gang.li@planning.nsw.gov.au; alexander.tutt-branco@planning.nsw.gov.au; dan.adams@planning.nsw.gov.au; Melissa Anderson; Chris Nicholas; Tim Chisholm 01/01/2021

RE: AREQ0014285 | Chain Valley Colliery | Action required | 14 Dec 2020 12:20:01

From: Resources Regulator <nswresourcesregulator@service-now.com>
Sent: Monday, 21 December 2020 1:47 PM
To: Chris Armit <CArmit@deltacoal.com.au>
Cc: gang.li@planning.nsw.gov.au; alexander.tutt-branco@planning.nsw.gov.au
Subject: AREQ0014285 | Chain Valley Colliery | Action required | 14 Dec 2020 12:20:01

Dear Chris,

Further to your submission of a Built Features Management Plan (BFMP), dated 17 December 2020, to the Resources Regulator (RR) I require some clarification.

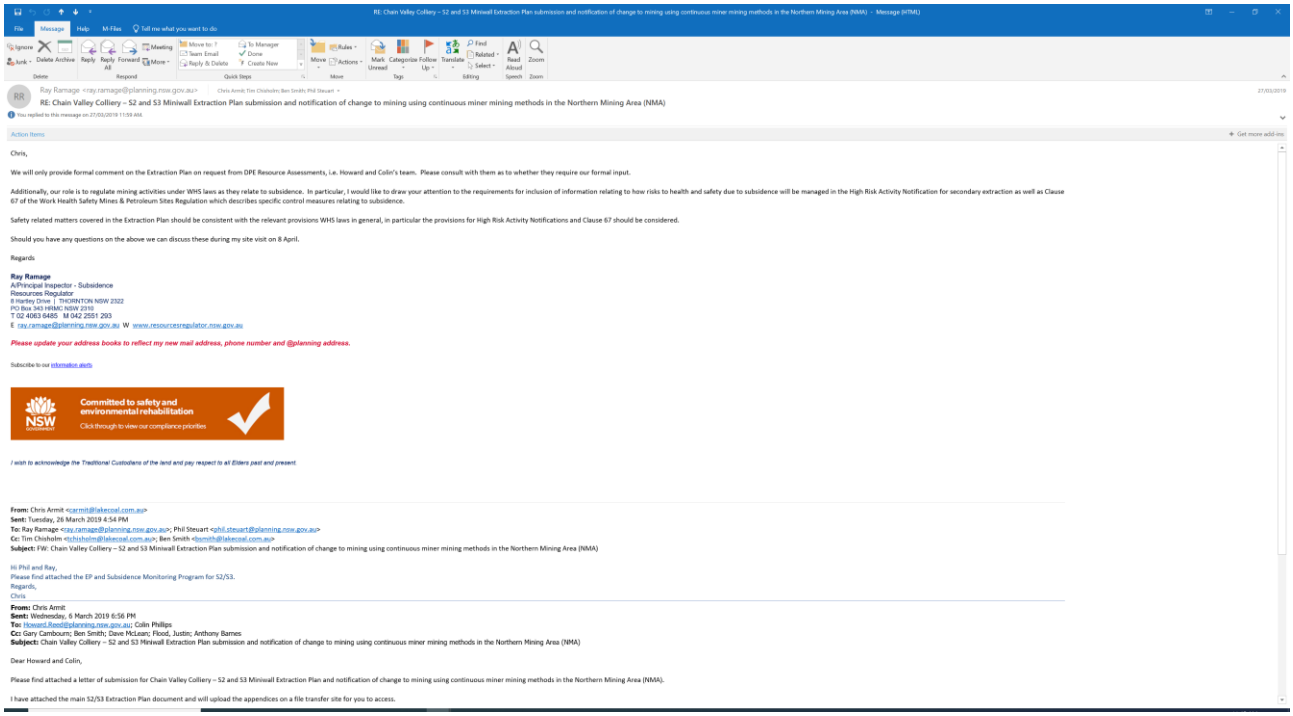
I understand that the BFMP has been submitted to RR for the purposes of consultation as required under Schedule 4, Condition 7(g) of SSD-5465.

The BFMP makes reference to Miniwall S5, first workings under Morriset Peninsula and the Northern Mining Area. It is also understood that the mine operator is currently seeking planning approval for mining in the Northern Mining Area including the suburbs of Brightwaters, Mirrabooka and Sunshine.

It is not clear to me whether Northern Mining Area subject of the BFMP has current planning approval and therefore it is not possible to provide comment in relation to that area. Can you please clarify the extents to which the BFMP applies and the status all relevant planning approvals.

Regards,

Ray Ramage
Senior Mine Safety Officer Subsidence
Subsidence Engineering | Resources Regulator
M 0422 551 293



RE: Chain Valley Colliery – S2 and S3 Miniwall Extraction Plan submission and notification of change to mining using continuous miner mining methods in the Northern Mining Area (NMA) – Message (HTML)

RR Ray Ramage <ray.ramage@planning.nsw.gov.au> Chris Armit; Tim Chisholm; Ben Smith; Phil Steuart 27/03/2019

RE: Chain Valley Colliery – S2 and S3 Miniwall Extraction Plan submission and notification of change to mining using continuous miner mining methods in the Northern Mining Area (NMA)

You replied to this message on 27/03/2019 11:59 AM.

Chris,

We will only provide formal comment on the Extraction Plan on request from DPE Resource Assessments, i.e. Howard and Colin's team. Please consult with them as to whether they require our formal input.

Additionally, our role is to regulate mining activities under WHS laws as they relate to subsidence. In particular, I would like to draw your attention to the requirements for inclusion of information relating to how risks to health and safety due to subsidence will be managed in the High Risk Activity Notification for secondary extraction as well as Clause 67 of the Work Health Safety Mines & Petroleum Sites Regulation which describes specific control measures relating to subsidence.

Safety related matters covered in the Extraction Plan should be consistent with the relevant provisions WHS laws in general, in particular the provisions for High Risk Activity Notifications and Clause 67 should be considered.

Should you have any questions on the above we can discuss these during my site visit on 8 April.

Regards

Ray Ramage
A/Principal Inspector - Subsidence
Resources Regulator
8 Hartley Drive | THORNTON NSW 2322
PO Box 345 HRMC NSW 2310
T 02 4063 6485 M 042 2551 293
E ray.ramage@planning.nsw.gov.au W www.resourcesregulator.nsw.gov.au

Please update your address books to reflect my new mail address, phone number and @planning address.

Subscribe to our information alerts

NSW Government — Committed to safety and environmental rehabilitation — Click through to view our compliance priorities

I wish to acknowledge the Traditional Custodians of the land and pay respect to all Elders past and present.

From: Chris Armit <carmit@lakecoal.com.au>
Sent: Tuesday, 26 March 2019 4:54 PM
To: Ray Ramage <ray.ramage@planning.nsw.gov.au>; Phil Steuart <phil.steuart@planning.nsw.gov.au>
Cc: Tim Chisholm <tchisholm@lakecoal.com.au>; Ben Smith <bsmith@lakecoal.com.au>
Subject: FW: Chain Valley Colliery – S2 and S3 Miniwall Extraction Plan submission and notification of change to mining using continuous miner mining methods in the Northern Mining Area (NMA)

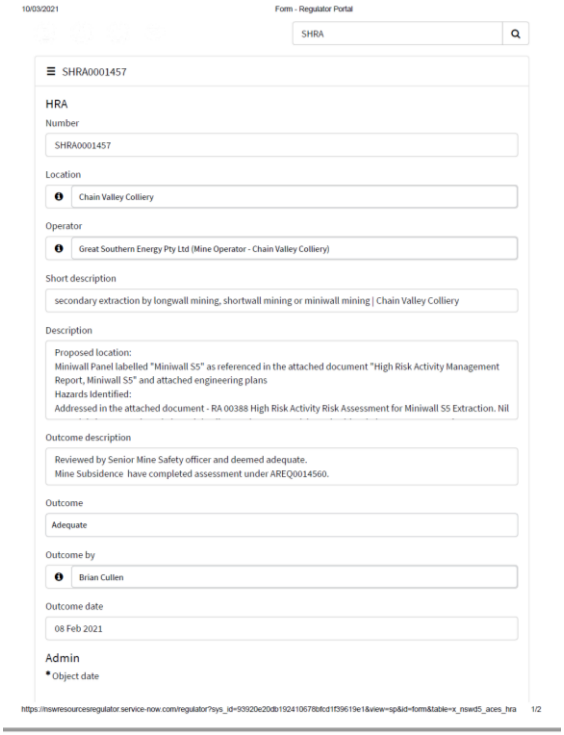
Hi Phil and Ray,
Please find attached the EP and Subsidence Monitoring Program for S2/S3.
Regards,
Chris

From: Chris Armit
Sent: Wednesday, 6 March 2019 6:56 PM
To: Howard.Reed@planning.nsw.gov.au; Colin Phillips
Cc: Gary Cambourn; Ben Smith; Dave McLean; Flood, Justin; Anthony Barnes
Subject: Chain Valley Colliery – S2 and S3 Miniwall Extraction Plan submission and notification of change to mining using continuous miner mining methods in the Northern Mining Area (NMA)

Dear Howard and Colin,

Please find attached a letter of submission for Chain Valley Colliery – S2 and S3 Miniwall Extraction Plan and notification of change to mining using continuous miner mining methods in the Northern Mining Area (NMA).

I have attached the main S2/S3 Extraction Plan document and will upload the appendices on a file transfer site for you to access.


10/03/2021 Form - Regulator Portal

SHRA

SHRA0001457

HRA

Number

SHRA0001457

Location

Chain Valley Colliery

Operator

Great Southern Energy Pty Ltd (Mine Operator - Chain Valley Colliery)

Short description

secondary extraction by longwall mining, shortwall mining or miniwall mining | Chain Valley Colliery

Description

Proposed location:
Miniwall Panel labelled "Miniwall S5" as referenced in the attached document "High Risk Activity Management Report, Miniwall S5" and attached engineering plans
Hazards Identified:
Addressed in the attached document - RA 00388 High Risk Activity Risk Assessment for Miniwall S5 Extraction. Nil

Outcome description

Reviewed by Senior Mine Safety officer and deemed adequate.
Mine Subsidence have completed assessment under AREQ0014560.

Outcome

Adequate

Outcome by

Brian Cullen

Outcome date

08 Feb 2021

Admin

*Object date

https://nswresourcesregulator.service-now.com/regulator?sys_id=93920e20db192410678bfcd1f59619e1&view=sp&id=form&table=x_nswd5_aces_hra 1/2


10/03/2021 Form - Regulator Portal

22 Dec 2020 16:30:53

*Received date

22 Dec 2020 16:30:53

Notifier

Tim Chisholm

Notification Details

Proposed commencement date

23 Mar 2021

Request reduced waiting period

Nature

DPIE Consultation



Chris Armit
Approvals Coordinator
Chain Valley Colliery

Off Construction Rd (Off Ruttleys Rd)
MANNERING PARK, NSW, 2259

05/03/2021

Dear Mr Armit

Chain Valley Colliery
Extraction Plan – Miniwall S5 and Northern Pillar Area

I refer to the Extraction Plan dated January 2021 for Miniwall S5 and the Northern Pillar Area (NPA) at the Chain Valley Colliery, submitted in accordance with condition 7 of Schedule 4 of the Chain Valley Extension Project development consent (SSD 5465).

The Department has reviewed the Extraction Plan and identified several clarifications and minor matters that must be addressed by way of improvements to various parts of the Extraction Plan and its sub-plans (see Attachment A). The Department is satisfied that these matters can be addressed in a timely manner and would not materially change the ability of Delta Coal to effectively manage subsidence impacts.

In summary, the revised Extraction Plan should:

- include the detailed plans of existing and proposed first and second workings that clearly indicate the High Water Mark Subsidence Barrier (Plan 2) and show that all areas of proposed extraction are outside of the Seagrass Protection Barrier;
- where necessary refer to the proposed extraction of Miniwall S5 and the NPA, not previously extracted miniwalls;
- include detailed performance indicators and contingencies for Threatened Species or Endangered Populations, as required by Table 6 of the conditions of consent;
- include timeframes for the implementation of contingency measures set out in the Subsidence Management TARP;
- include evidence of further consultation, including specific details of the comments received from agencies and the actions taken in response to those comments; and
- align with the current consolidated conditions of consents, including alignment with the timing of document reviews and revisions.

The attached comments on the Extraction Plan and its sub-plans must be addressed to the satisfaction of the Secretary prior to the Department granting its final approval of the Extraction Plan. As noted above, the Department believes that they can be readily addressed in a timely manner. It would be appreciated if Delta Coal provides an electronic copy of the revised document, with tracked changes, allowing for a more expedient review.

If you require any more information, please contact James McDonough on 9585 6313.

Yours sincerely

DPIE Request for Information Letter - Response Summary Table

DPIE Review	Response
include the detailed plans of existing and proposed first and second workings that clearly indicate the High Water Mark Subsidence Barrier (Plan 2) and show that all areas of proposed extraction are outside of the Seagrass Protection Barrier	Plan 2 updated to include clear indication of the High Water Subsidence Barrier. All secondary workings extraction areas are located outside of Seagrass Protection Barrier.
where necessary refer to the proposed extraction of Miniwall S5 and the NPA, not previously extracted miniwalls	Document updated for legacy miniwall naming (see tracked changes)

include detailed performance indicators and contingencies for Threatened Species or Endangered Populations, as required by Table 6 of the conditions of consent	Subsidence Management TARP updated to include Threatened Species or Endangered Populations
include timeframes for the implementation of contingency measures set out in the Subsidence Management TARP	Incident and non-compliance reporting timeframes included. Timeframes of contingency measures implementation added to the Subsidence Management TARP
include evidence of further consultation, including specific details of the comments received from agencies and the actions taken in response to those comments	See updates in section 2.5 Table 1 and Appendix 1 which includes specific stakeholder comment details and communications.
align with the current consolidated conditions of consents, including alignment with the timing of document reviews and revisions	Consent references updated to changes in SSD5465 Modification 3 numbering and conditions.
It would be appreciated if Delta Coal provides an electronic copy of the revised document, with tracked changes, allowing for a more expedient review	A Microsoft Word document has been provided with tracked changes included at the start of the document change process. Plan 2 amendment and Subsidence Management TARP were not able to be tracked changed as they were drafted in software without the tracked changes option.

DPIE Extraction Plan Approval Letter

Planning, Industry & Environment

Chris Armit
Approvals Coordinator
Chain Valley Colliery
Delta Coal Pty Ltd
Off Construction Road (Off Rutleys Road)
Mannering Park NSW 2259

06/04/2021

Dear Mr Armit

Chain Valley Colliery (SSD 5465)
Miniwall S5 and NPA Extraction Plan

I refer to the Miniwall S5 and NPA Extraction Plan which was submitted on 18 January 2021 in accordance with Condition 7 of Schedule 4 of the consent for Chain Valley Colliery (SSD 5465).

The Department has carefully reviewed the document and is satisfied that it addresses the requirements of the conditions of consent for Extraction Plans (see Attachment A).

Accordingly, the Planning Secretary has approved the Miniwall S5 and NPA Extraction Plan (Revision 1.2, dated 10 March 2021). Please ensure that the approved plan is placed on the project website at your earliest convenience.

If you wish to discuss the matter further, please contact James McDonough on 9585 6313.

Yours sincerely

Lauren Evans
A/Director
Resource Assessments (Coal & Quarries)
As nominee of the Planning Secretary

Planning, Industry & Environment

ATTACHMENT A

Consideration of Approval of Miniwall S5 and NPA Extraction Plan

1. As required by condition 7 of Schedule 4 of the consent for Chain Valley Colliery (SSD 5465), the Extraction Plan (EP) for proposed Miniwall S5 and the Northern Pillar Area (NPA) consists of an overarching document that describes the proposed mining operations, supported by a specialist subsidence assessment, and a series of specialist management plans (MPs) including a:
   - Public Safety MP;
   - Built Features MP;
   - Groundwater MP;
   - Rehabilitation MP;
   - Benthic Communities MP;
   - Seagrass MP;
   - Subsidence Monitoring MP; and
   - Subsidence Management Trigger Action Response Plan (TARP).

   The EP was submitted by Delta Coal. The EP was prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Secretary. Many of these MPs are little changed from when they were reviewed in March 2020 as part of the EP for Miniwall S4, which was approved in June 2020.

Appendix 2: Development Consent Summary

Chain Valley Colliery Development Consent SSD-5465 Summary

Table A2 outlines the consent requirements of the BFMP and where this document addresses these requirements.

Table A2: Requirements from Chain Valley Colliery Development consent SSD-5465

Condition No.	Requirement	Relevant section of this document
	Schedule 2 Administrative Conditions	
23	*STAGING, COMBINING AND UPDATING STRATEGIES, PLANS OR PROGRAMS* *With the approval of the Planning Secretary, the Applicant may:* *(a) prepare and submit any strategy, plan or program required by this consent on a staged basis (if a clear description is provided as to the specific stage and scope of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program);* *(b) combine any strategy, plan or program required by this consent (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined);* *(c) update any strategy, plan or program required by this consent (to ensure the strategies, plans and programs required under this consent are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the development); and* *(d) combine any strategy, plan or program required by this consent with any similar strategy, plan or program required by an adjoining mining consent or approval, in common ownership or management.*	**Section 10**
27	Unless the Applicant and the applicable authority agree otherwise, the Applicant must: (a) repair, or pay the full costs associated with repairing, any public infrastructure[a] that is damaged by carrying out the development; and (b) relocate, or pay the full costs associated with relocating, any public infrastructure[a] that needs to be relocated as a result of the development. [a] *This condition does not apply to any damage to roads caused as a result of general road usage or to damage that has been compensated under the Mining Act 1992.*	**Section 6**
28	The Applicant must ensure that all of its employees, contractors (and their sub-contractors) are made aware of, and are instructed to comply with, the conditions of this consent relevant to activities they carry out in respect of the development.	**Section 8.4**
	Schedule 3 Environmental Conditions – Underground Mining	
25	The Applicant must rehabilitate the site in accordance with the conditions imposed on the mining lease(s) associated with the development under the *Mining Act 1992*. This rehabilitation must be generally consistent with the proposed rehabilitation strategy described in the EIS, and comply with the objectives in Table 5. *Table 7: Rehabilitation Objectives* ***Feature*** | ***Objective***	**Section 6**

	Built features damaged by mining operations • Repair to pre-mining condition or equivalent unless: – the owner agrees otherwise; or – the damage is fully restored, repaired or compensated under the *Coal Mine Subsidence Compensation Act 2017.*	
	Schedule 4 Specific Environmental Conditions	
4	***Performance Measures- Built Features*** The Applicant must ensure that the development does not cause any exceedances of the performance measures in Table 7, to the satisfaction of the Planning Secretary. *Table 7: Subsidence Impact Performance Measures – Built Features* ***Built Features*** / ***Performance Measure*** Trinity Point Marina Development Other built features • Always safe. • Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. • Damage must be fully repaired, replaced or fully compensated. *Notes:* *• The Applicant will be required to define more detailed performance indicators for each of these performance measures in Built Features Management Plans or a Public Safety Management Plan (see Condition 7 below).* *• Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Planning Secretary will be the final arbiter.* *• The requirements of this condition only apply to the impacts and consequences of mining operations undertaken following the date of this development consent.* *• Requirements regarding safety or serviceability do not preclude preventative actions or mitigation being taken prior to or during mining in order to achieve or maintain these outcomes.* *Requirements under this condition may be met by measures undertaken in accordance with the Coal Mine Subsidence Compensation Act 2017.*	**This document**
5	Any dispute between the Applicant and the owner of any built feature over the interpretation, application or implementation of the subsidence performance measures in Table 7 is to be settled by the Planning Secretary, following consultation with the SA NSW and MEG. Any decision by the Planning Secretary shall be final and not subject to further dispute resolution under this consent.	**Noted**
7	***Extraction Plan*** *(g) include a Built Features Management Plan, which has been prepared in consultation with RR and the owners of affected public infrastructure, to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings, and which* *• addresses in appropriate detail all items of public infrastructure and all classes of other built features;* *• has been prepared following appropriate consultation with the owner/s of potentially affected feature/s;* *• recommends appropriate remedial measures and includes commitments to mitigate, repair, replace or compensate all predicted impacts on potentially affected built features in a timely manner; and;* *• The Applicant shall implement the approved management plan as approved from time to time by the Planning Secretary.*	**This document**
8	*The Applicant must ensure that the management plans required under conditions 7(g)-(j) above include: (a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this*	**Section 4 and 6**

	consent; and (b) a detailed description of the measures that would be implemented to remediate predicted impacts	
	Schedule 6 – Environmental Management, Reporting and Auditing	
6	***Reporting and Auditing*** **Incident Notification** *The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name) and set out the location and nature of the incident.*	**Section 7.3**
7	**Non-compliance notification** *Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name), set out the condition of this consent that the development is non-compliant with, why it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.* ***Note**: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.*	**Section 7.3**

Appendix 11 Public Safety Management Plan

Delta coal	Doc Owner: **Approvals Coordinator** Doc No:

CHAIN VALLEY COLLIERY

Public Safety Management Plan Miniwall S5, NMA Pillar Extraction and Morisset Peninsula

ENVIRONMENTAL MANAGEMENT PLAN

Reviewers	
	Chris Armit
Authorised by:	Chris Armit
	Approvals Coordinator
	Delta Coal
Date:	18 January 2020

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1 Introduction

1.1 Purpose and Scope

The purpose of this Public Safety Management Plan (PSMP) is to:

- ensure compliance with SSD-5465, relevant mining lease conditions and Extraction Plan approvals;
- outline subsidence predictions associated with the mining of miniwall panels S2 to S5 and pillar extraction;
- identify potential public safety risks arising out of subsidence from secondary extraction of Miniwall S5, NMA pillar extraction and first workings underneath the Morisset Peninsula area
- identify public safety monitoring requirements;
- identify public safety reporting requirements;
- ensure negligible additional public safety risk as a result of subsidence arising from extraction associated with the mining areas; and
- allocate roles and responsibilities within the CVC Management structure such that all actions emanating from this document have specific task owners

A formal Environmental Management System (EMS) has been developed as a systematic and structured approach to managing environmental issues at the operation. This has been developed in general accordance with the requirements of the international standard ISO 14001.

This PSMP is an element of the Chain Valley Colliery (CVC) Environmental Management System (EMS).

1.2 Background

Chain Valley Colliery (CVC) is an underground coal mine located on the southern side of Lake Macquarie approximately 60 km south of Newcastle and 80 km north of Sydney (see Figure 1). The pit-top is located approximately 1 km south-east of the township of Mannering Park at the southern extent of Lake Macquarie.

In August 1960, J&A Brown and Abermain Seaham Collieries Ltd commenced clearing the present site with drift and shaft sinking starting a few months later. Production of coal from the Wallarah Seam, commenced with the first delivery to the adjacent Delta Electricity's Vales Point Power Station (VPPS) in April 1963.

Great Southern Energy Pty Ltd (trading as Delta Coal) took over as owner and operator of CVC and as operator of MC on 1 April 2019.

Mining is currently undertaken at CVC, with the coal being transported underground to MC where the coal is crushed and screened and sent directly to VPPS.

1.3 Consultation

The PSMP is required to be prepared in consultation with the Department of Planning, Industry and Environment (DPIE) and Resource Regulator (RR) as per Schedule 4 (Specific Environmental Conditions) conditions 7 (j). A draft for comment copy of the PSMP was provided to Delta Coal employees with roles and responsibilities under the PSMP on the 7 September 2020. A copy of the PSMP including updates for miniwall S5 and the northern mining pillar extraction area was provided to DPIE, RR, Lake Macquarie City Council (LMCC), Central Coast Council (CC Council), Subsidence Advisory NSW (SA), combined CVC and MC CCC, Roads and Maritime Services (RMS) on 18 September 2020 as part of the extraction plan application process. This management plan is an Appendix to the CVC Miniwall S5 and NMA Pillar Extraction Plan. Evidence of consultation is provided in **Appendix 1**.

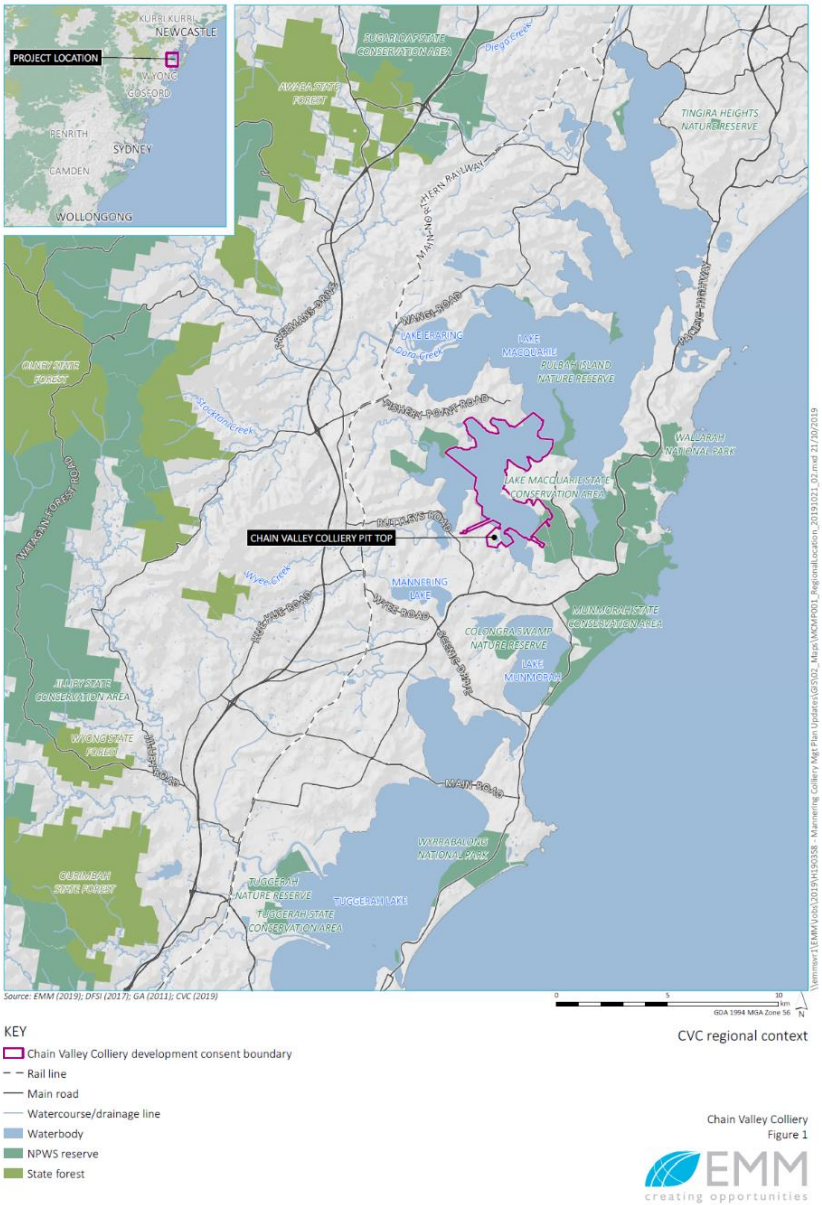


Figure 1: Regional Context

2 Statutory Requirements

2.1 Key Legislation, Policy and Guidelines

Both State and Commonwealth environmental legislation applies to DC's operation and activities. A number of legislative requirements, government policies and guidelines are applicable. Key items relevant to this management plan are:

- *Protection of the Environment Operations Act 1997* (POEO Act);
- *Environmental Planning and Assessment Act 1979* (EP&A Act); and
- *Mining Act 1992*.

Delta lands are within the LMCC and Central Coast Council local government areas (LGAs).

2.2 Development Consent SSD-5465 Requirements

An Extraction Plan has been developed in order to manage the process of mining layout design and mitigate any subsidence impacts on surface infrastructure, natural features and/or stakeholders. A part of the S5 and Northern Mining Area Pillar Extraction Plan is this PSMP, which have been developed from the risks identified in the S5/Pillar Extraction Plan risk assessment process.

The PSMP is an element of the Chain Valley Colliery (CVC) Extraction Plan, and has been developed to satisfy the requirements of Development Consent SSD-5465, Condition 4, Condition 7(j) and Table 9 in Schedule 4.

Public safety related requirements of SSD-5465, including specific requirements that are to be addressed in this plan, and where they are addressed, are detailed in **Appendix 2**.

3 Background

3.1 Operations

CVC is an underground coal mine with current coal mining methods including development of roadways in the coal seam known as first workings and secondary extraction (miniwall). These first workings develop panels to support the installation of a miniwall, a modern secondary coal extraction method.

Lake Macquarie is the largest saline lake in New South Wales. It lies on the central coast between Sydney and Newcastle within the local government areas of Wyong and Lake Macquarie. Lake Macquarie has a catchment of 700 km^2 and a water surface area of 125 km^2 (Bell & Edwards, 1980). The lake has a permanent entrance to coastal waters at Swansea and has an average depth of around 6 m (Laxton, 2005).

The catchment of Lake Macquarie is largely rural with large areas of bush land and grazing land. The shoreline of Lake Macquarie is heavily urbanised, especially the eastern, western and northern shorelines. The region has a relatively long history of coal mining and power generation, with mining occurring since the late 1800s and the first power station at Lake Macquarie commencing operations in 1958.

The mine has been operating since 1962. Mining is currently undertaken using miniwall methods with first workings to support the development in advance of each miniwall panel. All secondary extraction is currently occurring in the Fassifern Seam, in line with Development Consent SSD–5465.

3.2 Subsidence Predictions

Subsidence modelling has predicted up to approximately 360 mm of subsidence to the lake floor associated with the planned miniwall mining of panels S2 to S5 within the sites Northern Mining Domain (**Figure 2**), with

an approved maximum of 780 mm (SSD-5465). No additional subsidence is expected to occur within the seagrass or foreshore areas as a result of Fassifern extraction due to the application of High Water and Seagrass Protection Barriers (extraction separation).

It is emphasized, however, that future workings will require detailed planning to address the full range of relevant issues, including pillar stability and subsidence. (Strata Ground Control Consulting, 2019).

Important features of the S5 panel area are:

- the Karingal Conglomerate, beneath the Great Northern (GN) Seam, thins from 39m in the NW to 6m in the SE,
- the Teralba Conglomerate, immediately above the GN Seam, thins from 30m in the SE to 12m in the NW,
- the interburden from the Fassifern Seam extraction horizon to the GN Seam floor thins from 62m in the NW to 44m in the south and
- the other major unit in the overburden is the Munmorah Conglomerate, which is typically around 50m thick and 100m above the Fassifern Seam.

The Fassifern Seam floor includes interbedded coal / carbonaceous shale beds, plus moisture sensitive claystone. The individual claystone beds are 50mm to 300mm thick and the cumulative thickness of claystone in the first 2m of floor in the vicinity of MW S5 and the NMA Herringbone Panels is 0.9m to 1.2m, slightly thinner than that encountered in the MW7-12 area. The claystone typically has a strength of <5MPa and is considered weak.

3.3 Public Safety Management – Scope

3.3.1 Identified Features

All secondary extraction mining activities within the Extraction Plan application area are to occur beneath Lake Macquarie and as such will have no direct impact on surface facilities and infrastructure due to negligible vertical subsidence. Despite this, CVC will monitor the foreshore for change and if impacts were observed to be occurring, a review of public safety would be triggered via the Subsidence Management TARP. This focuses on potential changes to flooding and drainage.

The Pelican Rock navigational marker located off Summerland Point is not predicted to see any significant impacts as a result of the mining of panels S2 to S5. The marker located above the Tailgate S2 gate road on Pelican Rock (**Figure 2**) is expected to see approximately 145 mm of vertical subsidence. Roads and Maritime Services (RMS) have been consulted in relation to the marker and the level of subsidence impact and have concluded that no direct management will be required, and the marker will be monitored as a part of their routine inspections.

A Built Features Management Plan was developed for Miniwalls S2/S3, S4 and is being compiled for the S5/NMA Pillar extraction plan.

The predicted low strains indicate a very low likelihood of impact to any sensitive features such as steep slopes/cliffs, retaining walls or jetties as a result of the extraction of panels S2 to S5 and pillar extraction, with horizontal movement and strain less than accuracy of measurement techniques. As such routine visual inspections during subsidence monitoring is proposed to identify any changes outside those expected.

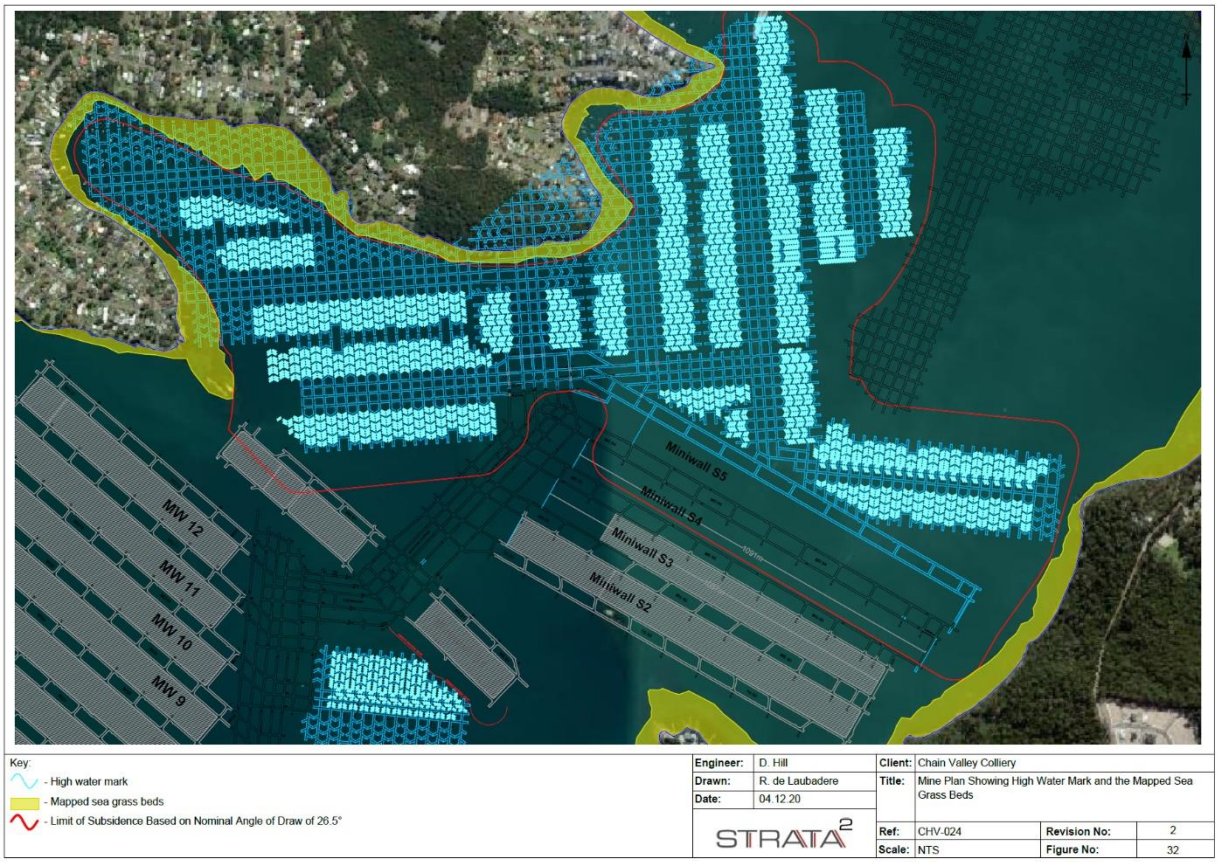


Figure 2: General underground layout and Predicted Limit of Subsidence Associated with Panels S2 and S5 and the Northern Pillar extraction area

4 Public Safety Monitoring

4.1 Subsidence Monitoring Methods

4.1.1 Bathymetric Surveys

Bathymetric Surveys of the lake beds will occur across the area as described by the Subsidence Monitoring Program. These routine surveys will allow for identification of subsidence starting to develop outside predicted levels and thus trigger a review of any potentially new public safety concerns.

4.1.2 Foreshore Monitoring

Established and proposed (subject to access restrictions) survey monitoring points will be monitored around the southern and northern foreshore areas about the extraction plan area. These will consist of either star pickets, feno pegs or survey pins (**Figure 3**). The marks will be monitored as per the Subsidence Monitoring Program. These routine surveys prior, during and after extraction will allow for the identification and review of any subsidence starting to develop outside predicted levels and thus trigger a review of any potentially new public safety concerns. NPWS approved a Conservation Risk Assessment in 6 November 2019 to allow the installation of the Miniwall S4 survey markers on the Lake Macquarie foreshore within the State Conservation area. During the routine foreshore monitoring, observations and records for change will be noted as outlined in the Subsidence Monitoring Program. This will include observations for surface cracking, embankment movement, cracking, and validation of impacts to drainage or dwellings in areas of measured subsidence increase outside predicted.



Figure 3: Example of subsidence monitoring point with safety cap

5 Public Safety Management

5.1 Management Practices

Survey pegs installed for monitoring will be clearly identified and as appropriate have 'safety caps' placed on them as per **Figure 3**. Survey pins will be the main type of marks installed and are smaller than the pickets and less of a public health and safety risk.

Given the expected negligible impact to public safety, any management practices will be triggered via the aforementioned monitoring strategies and the Subsidence Management TARP included in the Extraction Plan.

Triggering of a potential requirement for a public safety response will be based on the following management strategy:

- If subsidence measured indicates potentially increased impact at the foreshore or to sensitive features DPIE and RR will be notified;
- DC will investigate the area of potential increase for any change in public safety risk;
- DC will inform relevant parties that may be further impacted in relation to public safety. This may include landholders, infrastructure owners, RMS, LMCC, CC Council, the DPIE or EPA;
- where required, DC will immediately implement public safety controls to control imminent risk (i.e. identification, barriers and signage, all of which are available at the mine site); and
- DC will develop long term safety control with relevant parties.

6 Reporting

6.1 Regular Reporting

On receipt of any monitoring reports, results will be reviewed to confirm compliance with the relevant criteria. This will ensure corrective action is taken where results or trends indicate a non-compliance or risk of future non-compliance. On acceptance of these results by DC, reports will be published on the DC website within 7 days where required.

6.2 Annual Review

Monitoring results will be presented in the Annual Review, and include:

- a summary of results for the previous calendar year;
- a comparison against limits/criteria;
- a comparison of the impacts with those predicted in the Environmental Assessment; and
- present an analysis of the potential cause(s) of any significant discrepancies between measured and predicted levels.

The Annual Review will be provided to the relevant authorities and a copy will be placed on the DC website.

6.3 Incident or Non-Compliance Notifications and Reporting

If there has been a public safety incident as a direct result of CVC operations, DC must immediately notify DPIE and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name) and set out the location and nature of the incident.

Within seven days of becoming aware of a non-compliance, the Delta Coal must notify DPIE of the non-compliance. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name), set out the condition of the consent that the development is non-compliant with, why it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.

The investigation into the incident/non-compliance will consider any activities, plant operations or other factors that may have caused or contributed. The investigation will consider any activities or other factors that may have generated the non-compliance.

The report will:

- describe the date, time and nature of the exceedance / incident;
- identify the cause (or likely cause) of the exceedance / incident;
- describe what action has been taken to date; and
- describe the proposed actions to address the exceedance / incident

DC will implement the recommendations of the investigation in order to minimise the potential for any similar future incident or non-compliance. Additional details of the incident reporting process are provided in the DC Environmental Management Strategy.

7 Stakeholder Management, Response and Training

7.1 Complaint Protocol

DC has a 24-hour telephone hotline (1800 115 277) through which members of the public can lodge complaints, concerns, or to raise issues associated with the operation. This service aims to promptly and effectively address community concerns and environmental matters.

All complaints are recorded and responded to and if, for some reason, no action is taken then the reason why is recorded. The information recorded in the complaint register includes:

- date and time the complaint was lodged;
- personal details provided by the complainant;

- nature of the complaint;
- action taken or, if no action was taken, the reason why; and
- follow up contact with the complainant.

7.2 Independent Review

As detailed in Condition 2, Schedule 5 of SSD-5465, an Independent Review can be requested by a landowner who "*considers the development to be exceeding the relevant criteria in Schedule 3".*

If the Secretary is satisfied that an independent review is warranted, then within 2 months of the Secretary's decision the Applicant shall:

(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to:
- *consult with the landowner to determine his/her concerns;*
- *conduct monitoring to determine whether the development is complying with the relevant criteria in Schedule 3; and*
- *if the development is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and*

(b) give the Secretary and landowner a copy of the independent review.

7.3 Dispute Resolution

If any disputes are not adequately addressed by the complaints handling process then they will be handled by the Environment Compliance Coordinator. If the response of CVC is not considered to satisfactorily address the concern of the complainant, a meeting may be convened with the complainant, Mine Manager together with the Environment Compliance Coordinator to determine any further options to reduce potential impacts.

Any actions agreed from the meeting will be implemented by CVC. After implementation of the proposed actions the complainant will be contacted and advice sought as to the satisfaction or otherwise with the measures taken.

If no agreed outcome is determined or the complainant is still not satisfied by the action taken, then an Independent Review may be requested by the complainant. If determined to be warranted by the Secretary, an independent review will be undertaken in accordance with the process identified in Schedule 5 of SSD-5465.

7.4 Training, Awareness and Competence

Training is an essential component of the implementation phase of this PSMP. Any person or position that has a role or responsibility under this document will be provided with a copy of the document and be advised verbally regarding their requirements by the Environmental Compliance Coordinator.

As the document owner, the Environment Compliance Coordinator or delegate is the contact point for any person that does not understand this document or their specific requirements and will provide guidance and training to any person that requires additional training regarding this management plan.

8 Audit and Review

8.1 Review and Improvement

This document shall be reviewed, and if necessary revised, within 3 months of the following:

- the submission of an Annual Review;
- the submission of an incident report;
- the submission of an independent environmental audit; and
- following any modification to the development consent.

As outlined in **Section 6.2**, the Annual Review will include a review of the PSMP. Improvements identified during reviews or audits will be incorporated into the PSMP.

8.2 Auditing

Where required, audits shall be carried out by personnel who have the necessary qualifications and experience to make an objective assessment of the issues. The extent of the audit, although pre-determined, may be extended if a potentially serious deviation from this document is detected.

DC has an external independent Environmental Audit every three years. Due to the timing and relatively small geometry of the miniwall panels, a review of the finalised document will not be required as mining will have been completed within a year from authoring.

9 Records and Document Control

9.1 Records

Generally, the Environment and Community Coordinator will maintain all Environmental Management System records which are not of a confidential nature. Records that will be maintained include:

- monitoring data;
- environmental inspections and auditing results;
- environmental incident reports;
- the complaints register; and
- licences and permits.

All records will be stored so that they are legible, readily retrievable and protected against damage, deterioration and loss. Records will be maintained for a minimum of 4 years or as otherwise required under any legislation, licence, lease, permit or approval.

9.2 Document Control

This document and all others associated with the Environmental Management System shall be maintained in a document control system. Any proposed change to this document will be via the Approvals Coordinator or Environmental Compliance Coordinator. Details on document revisions are provided in **Table 3**.

Table 3: Document Revision Details

Version	Date	Details of Revision	Company	Reviewed by/ Authorised by
0	18/01/2020	Draft Prepared using the 2020 S4 PSMP as a base document including proposed S5 and NMA pillar extraction workings. Review following SSD5465 Modification 3 approval.	Delta Coal	Chris Armit

10 Roles and Responsibilities

All employees and contractors at CVC are responsible for environmental management. However, various positions in the organisation have roles, responsibilities and authorities for managing environmental aspects, action plans, programs and controls.

Roles and responsibilities specific to completing the requirements of this PSMP are identified in **Table 4**.

Table 4: Public Safety Management Roles and Responsibilities

Role	Responsibilities
Operations Manager	• Ensure that adequate financial and personnel resources are made available for the implementation of the Public Safety Management Plan
Technical Services Manager	• Oversee the implementation of the BFMP for applicable areas
Mine Surveyor	• Co-ordinate subsidence monitoring, through the use of bathymetric surveys & conventional surveys along foreshore • Review subsidence monitoring results against Subsidence Management TARP triggers • Inform the Environmental Compliance Coordinator and Mine Manager of results and outcomes of monitoring reviews
Approvals Coordinator	• Write the PSMP in consultation with relevant government agencies and stakeholders • Undertake reviews of this document • Undertake or coordinate the required audits of this document • Develop management actions in consultation with regulatory agencies as/if required from the monitoring results

Environmental Compliance Coordinator	• Develop management actions in consultation with regulatory agencies as/if required from the monitoring results
	• Respond to any potential or actual non-compliance and report these as required to regulatory bodies and other stakeholders
	• Notify the relevant government agencies and other affected parties should exceedances in impact thresholds potentially be reached
	• Regularly audit the public safety equipment made available at the mine site
	• Ensure complaint handling and response is undertaken, including determination of sources and potential remedial action to avoid recurrence
	• Review, and if necessary, revise this document:
	  ○ In the event of any exceedance in impact thresholds;
	  ○ Following any modification to the development consent.

11 References

Documents referenced in the preparation of the PSMP are detailed in **Table 5.**

Table 5: References and Associated Documents

Reference type	Document
Australian Standards	AS/NZS ISO 14001:2004, Environmental management systems – Requirements with guidance for use AS/NZS ISO 14004:2004, Environmental management systems – General guidelines on principles, systems and support techniques
Legislation and Regulations	Development Consent SSD-5465 (as modified) Environment Protection Licence (EPL) 1770
Delta Coal documents	EMS Environmental Management Strategy
LakeCoal documents	MSEC 2019, S2 and S3 Panel, prepared for Lake Coal- Chain Valley Colliery
External documents	Strata Ground Control Consulting 2019, S4 Panel: Geotechnical Environment, Subsidence Estimates and Impacts, prepared for Delta Coal Chain Valley Colliery ANZECC 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

12 Definitions

CVC Chain Valley Colliery

DA Development approval

DC Delta Coal

DP&E Department of Planning & Environment (former)

DPIE Department of Planning, Industry and Environment

DPI Fisheries Department of Primary Industries – Fisheries NSW

EMS Environment Management System

EPA NSW Environment Protection Authority

EPL Environmental Protection License

EP&A Act *Environmental Planning and Assessment Act 1979*

LMCC Lake Macquarie City Council

MC Mannering Colliery

POEO Act *Protection of the Environment Operations Act 1997*

OEH Office of Environment and Heritage

ROM Run-of-mine

Planning Secretary Secretary of the Department of Planning, Industry and Environment, or nominee

SSD-5465 Development Consent SSD-5465 (for the Chain Valley Colliery Mining Extension 1 Project)

Appendix 1: Consultation

Stakeholder	Comments	Response/Action
DPIE-Resource Assessments	•	•
DPIE-Resources Regulator	•	•
OEH - NPWS	•	•
RMS	•	•
LMCC	•	•
Central Coast Council	•	•
Combined CVC and MC Community Consultative Committee	•	•
Delta Coal employees and contractors	•	•

Appendix 2: Development Consent Summary

Chain Valley Colliery Development Consent SSD-5465 Summary

This PSMP has been prepared in accordance to Schedule 3, Condition 21 of SSD-5465, which states the requirements of the PSMP and what it must address. **Table A2** outlines the requirements of the PSMP and where this document addresses these requirements.

Table A2: Requirements from Chain Valley Colliery Development consent SSD-5465

Condition No.	Requirement	Relevant section of this document
	Schedule 2 Administrative Conditions	
18	***Updating and Staging Strategies, Plans or Programs*** *The Applicant must regularly review the strategies, plans and programs required under this consent and ensure that these documents are updated to incorporate measures to improve the environmental performance of the development and reflect current best practice in the mining industry. To facilitate these updates, the Applicant may at any time submit revised strategies, plans or programs for the approval of the Secretary.* *With the agreement of the Secretary, the Applicant may also submit any strategy, plan or program required by this consent on a staged basis. With the agreement of the Secretary, the Applicant may prepare a revision or stage of any strategy, plan or program required under this consent without undertaking consultation with all parties nominated under the applicable condition in this consent.* *Notes:* • *While any strategy, plan or program may be submitted on a staged basis, the Applicant must ensure that the existing operations on site are covered by suitable strategies, plans or programs at all times.* • *If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage to which the strategy, plan or program applies, the relationship of this stage to any future stages, and the trigger for updating the strategy, plan or program.*	**Section 8**
22.	***Evidence of Consultation*** *Where conditions of this consent require consultation with an identified party, the Applicant must:* *(a) consult with the relevant party prior to submitting the subject document;* *(b) provide details of the consultation undertaken including:* *i. the outcome of that consultation, matters resolved and unresolved; and* *ii. details of any disagreement remaining between the party consulted and the Applicant and how the Applicant has addressed the matters not resolved.*	**Section 1.3 and Appendix 1**
28	***Compliance*** *The Applicant must ensure that all of its employees, contractors (and their sub-contractors) are made aware of, and are instructed to comply with, the conditions of this consent relevant to activities they carry out in respect of the development.*	**Appendix 1**

<table>
<tr><td></td><td>Schedule 4 Specific Environmental Conditions</td><td></td></tr>
<tr><td>4</td><td>Performance Measures- Built Features
The Applicant shall ensure that the development does not cause any exceedance of the performance measures in Table 9 to the satisfaction of the Secretary.

Table 9: Subsidence Impact Performance Measures – Built Features
<table>
<tr><th>Built Features</th><th>Performance Measure</th></tr>
<tr><td>Trinity Point Marina Development
Other built features</td><td>• Always safe.
• Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated.
• Damage must be fully repaired, replaced or fully compensated.</td></tr>
<tr><td colspan="2">Public Safety</td></tr>
<tr><td>Public Safety.</td><td>Negligible additional risk.</td></tr>
</table>
Notes:
• The Applicant will be required to define more detailed performance indicators for each of these performance measures in Built Features Management Plans or a Public Safety Management Plan (see Condition 7 below).
• Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Secretary will be the final arbiter.
• The requirements of this condition only apply to the impacts and consequences of mining operations undertaken following the date of this development consent.
• Requirements regarding safety or serviceability do not preclude preventative actions or mitigation being taken prior to or during mining in order to achieve or maintain these outcomes.
• Requirements regarding safety or serviceability do not preclude preventative actions or mitigation being taken prior to or during mining in order to achieve or maintain these outcomes.</td><td>This document</td></tr>
<tr><td>7</td><td>Extraction Plan
(j) include a Public Safety Management Plan, which has been prepared in consultation with RR, to ensure public safety;

The Applicant shall implement the approved management plan as approved from time to time by the Secretary.</td><td>This document</td></tr>
<tr><td>8</td><td>The Applicant must ensure that the management plans required under conditions 7(g)-(j) above include: (a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this consent; and (b) a detailed description of the measures that would be implemented to remediate predicted impacts</td><td>Section 4 and 6</td></tr>
<tr><td></td><td>Schedule 6 – Environmental Management, Reporting and Auditing</td><td></td></tr>
<tr><td>6</td><td>Reporting and Auditing
Incident Notification
The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name) and set out the location and nature of the incident.</td><td>Section 6.3</td></tr>
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</table>

	compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. ***Note**: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.*	

Appendix 3: Approval Letter

Appendix 12 Rehabilitation Management Plan

Delta coal	Doc Owner: Environment and Community Coordinator Doc No:

CHAIN VALLEY COLLIERY

Rehabilitation Management Plan

Reviewer	Katie Weekes – EMM Consulting
	Chris Armit – EMM Consulting
Authorised by:	Chris Armit
	Environment and Community Coordinator
Date:	10 March 2020

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1 Introduction

1.1 Purpose

This management plan addresses the requirements for Development Consent SSD-5465, Schedule 3, Condition 27 which specifies that a Rehabilitation Management Plan (RMP) be prepared.

The RMP applies to the surface operations at Chain Valley Colliery (CVC), including pit top facilities and lands where additional infrastructure may be constructed.

The purpose of this management plan is to:

- provide an overall framework for consultation related to rehabilitation;
- set out the rehabilitation objectives and proposals for CVC;
- meet the requirements of the development consent in respect of the RMP;
- detail monitoring requirements (if required);
- facilitate the effective management of closure and rehabilitation;
- compliment the role of the CVC MOP as an instrument to attain desirable rehabilitation outcomes;
- define specific responsibilities of all stakeholders and function as a management tool for all relevant operational personnel; and
- identify the requirements for review of the document and a procedure for continual improvement.

The overall aim of this management plan is to promote a high level of environmental performance through the minimisation of impacts.

1.2 Background

Chain Valley Colliery (CVC) is an underground coal mine located on the southern side of Lake Macquarie approximately 60 km south of Newcastle and 80 km north of Sydney (see **Figure 1**). The pit-top is located approximately 1 km south-east of the township of Mannering Park at the southern extent of Lake Macquarie.

In August 1960, J&A Brown and Abermain Seaham Collieries Ltd commenced clearing the present site with drift and shaft sinking starting a few months later. Production of coal from the Wallarah Seam, commenced with the first delivery to the adjacent Delta Electricity's Vales Point Power Station (VPPS) in April 1963.

LakeCoal was formed in 2001 to acquire BHP Billiton's 80% share in the Wallarah Coal Joint Venture (WCJV), the remaining 20% share was owned by Sojitz. In October 2006, Peabody Energy, a US listed company acquired LakeCoal Pty Limited.

In November 2009 LDO Coal Pty Limited purchased LakeCoal Pty Limited. LDO Coal is a consortium consisting of LD Operations, AMCI and private investors. In March 2011 the 20% share in the WCJV which Sojitz held was acquired by LDO Coal shareholders through the entity Fassi Coal Pty Ltd. The WCJV had operated the Wallarah, Moonee and Chain Valley underground coal mines and the Catherine Hill Bay Coal Preparation Plant, all located at the southern end of Lake Macquarie. At the time of LakeCoal's acquisition by LDO Coal, both the Wallarah and Moonee mines were closed.

In 2013 the owners of Mannering Colliery (MC) and CVC entered into an agreement which enabled LakeCoal to operate the MC until 2022. LakeCoal became the operator of MC effective 17 October 2013, with the underground link between CVC and MC completed in October 2017.

LakeCoal was placed into Voluntary Administration on 3 October 2018. The receivers continued operation of the mines in the period 3 October 2018 to 1 April 2019. As of 1 April 2019, Great Southern Energy Pty Ltd

(trading as Delta Coal, DC) own and operate the two underground coal mines, CVC and MC. Mining is currently undertaken at CVC, with the coal being transported underground to MC where the coal is crushed and screened and sent directly to VPPS.

1.3 Operation

With changes to the Mining Act 1992 and amendments to the Environmental Planning and Assessment Regulation 2000, LakeCoal was required to obtain approval under the *Environmental Planning and Assessment Act 1979* (EP&A Act) to permit continued operation. Approval of the mine was granted on 23 January 2012 (MP10_0161) following submission of an environmental assessment (EA) (AECOM, 2011). Development consent (SSD-5465) was subsequently approved on 23 December 2013, granting approval for underground mining over an additional area of Lake Macquarie and a consolidation of approved activities granted by virtue of MP10_0161. Mining operations are approved to occur until 31 December 2027.

Mining operations in NSW are required, as a condition of an authorisation issued under the *Mining Act 1992*, to conduct mining operations in accordance with an approved Mining Operations Plan (MOP). A MOP sets out in detail how mines will be rehabilitated over the course of the mining project.

The existing guidelines for the preparation of MOPs state that premature or unplanned closure would typically require a new MOP to be developed. This new MOP should be prepared using the current MOP guidelines at the time, with additional information as required from the "Strategic Framework for Mine Closure", (Minerals Council Australia).

1.4 Consultation

A key component for the development of the RMP is consultation. Previous versions of this RMP were prepared in consultation with a number of stakeholders, including Wyong Shire Council (now part of Central Coast Council), Lake Macquarie City Council (LMCC), Fisheries NSW (now Department of Primary Industries, DPI), Office of Environment and Heritage (OEH), NSW Office of Water (now part of the Department of Planning, Infrastructure and Environment), Delta Electricity and the Community Consultative Committee (CCC). Outcomes of prior consultation were incorporated into previous versions of the RMP.

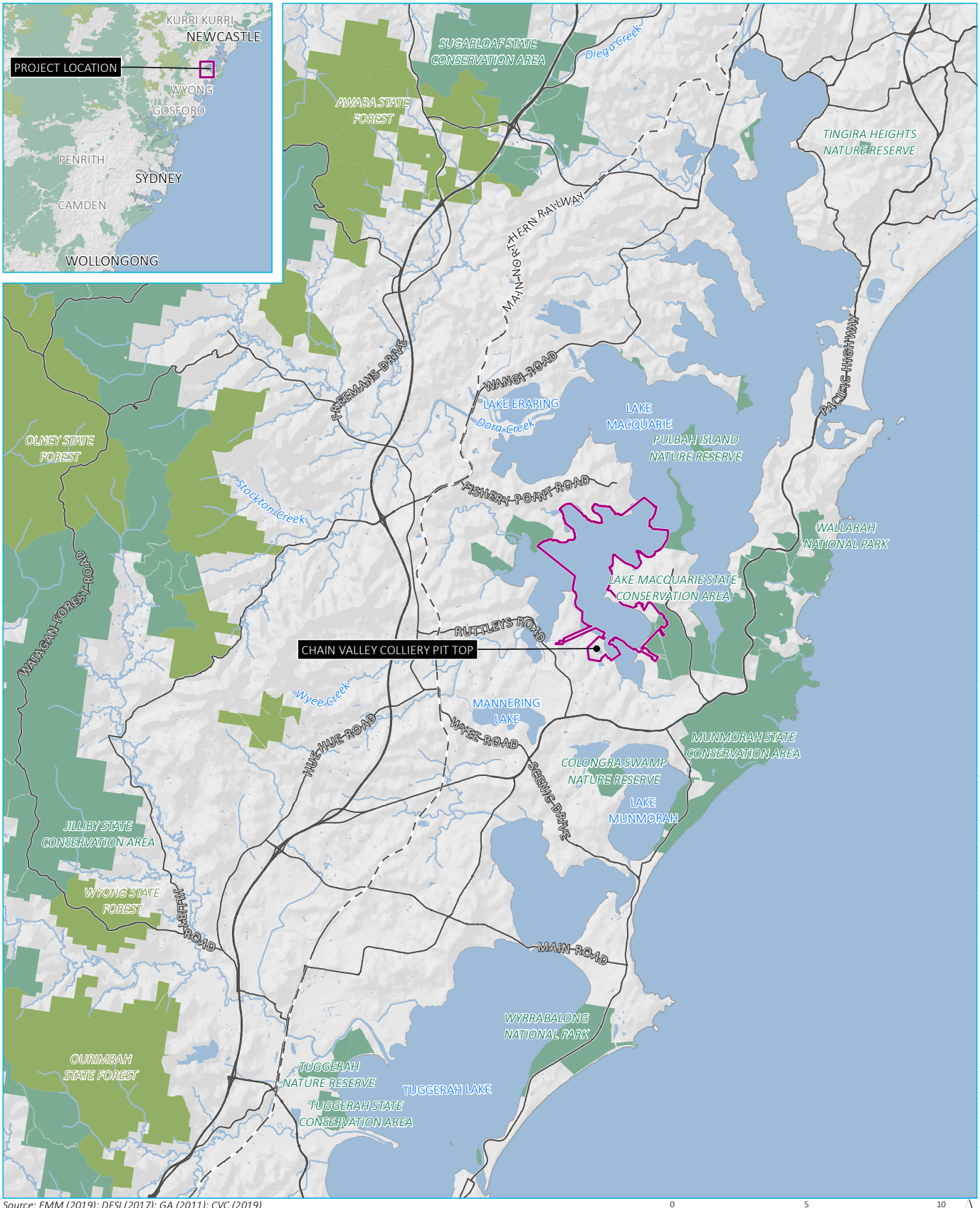
This RMP, while based substantially on the previously approved LakeCoal RMP (V3), has been updated to reflect the recommendations and minor changes of the Independent Environmental Audit (IEA) conducted by SLR in June 2019. These updates are administrative only and there are no changes to activities, impacts, and the mine footprint or development consent requirements associated with CVC.

As required in Schedule 3, Condition 27 of SSD-5465, this RMP was provided to the Department of Planning, Industry and Environment (DPIE), DPIE-Biodiversity Conservation Division (DPIE-BCD), DPIE-Resources Regulator, LMCC, Central Coast Council and the CCC on 19 November 2019 for their review and comment. A summary of the comments received, and amendments subsequently made to the document prior to finalisation are detailed in **Table 1**. Evidence of consultation is provided in **Appendix 1**.

Table 1: Consultation Summary

Stakeholder	Comments	Response/Action
DPIE-Resource Assessments	• No comments received as of the 10 March 2020.	• Nil required
DPIE-BCD	• Letter 3 December 2019 Bushland rehabilitation is targeted to create recognisable Plant Communities Types. Refine closure criteria for species diversity, plant density and plant cover	• Baseline monitoring undertaken in 2019. Refinement of Closure criteria and bushland rehabilitation PCTs with detailed mine closure plan. Appendix 1.
DPIE-Resources Regulator	• No comments received as of the 10 March 2020. Note: MOP Amendment for	• EP being submitted including updated Rehabilitation Management Plan.

Stakeholder	Comments	Response/Action
	miniwall S4 and demolition activities approved in Feb 2020. Require an Extraction Plan	Mining under lake Macquarie for S4
LMCC	• Any infrastructure (slabs, pits, pipes, etc.) that is to be abandoned and covered over should be mapped and this map made available to any future user or purchaser of the site. • Spelling mistake “mircobat” Appendix 1	• No detailed Closure Plan developed yet. Noted in consultation section for future plan. Rehabilitation Cost estimate has included infrastructure removal. • Spelling adjusted
Central Coast Council	• No comments received as of the 10 March 2020.	• Nil required
Community Consultative Committee	• No comments received as of the 10 March 2020.	• Nil required



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Source: EMM (2019); DFSI (2017); GA (2011); CVC (2019)

0 5 10 km

GDA 1994 MGA Zone 56

N

KEY

- Chain Valley Colliery development consent boundary
- Rail line
- Main road
- Watercourse/drainage line
- Waterbody
- NPWS reserve
- State forest

CVC regional context

Chain Valley Colliery
Figure 1

EMM
creating opportunities

2 Statutory Requirements

2.1 Key Legislation, Policy and Guidelines

Both State and Commonwealth environmental legislation applies to Delta's operation and activities. Compliance with State regulations requires the implementation of activities ranging from the control of priority weeds (*Biosecurity Act 2015*), monitoring for threatened species (*Biodiversity Conservation Act 2016)* and management of forest fuels to prevent fire spread (*Rural Fire Services Act 1997).*

A number of legislative requirements, government policies and guidelines relating to rehabilitation are applicable, key items relevant to this RMP are:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Protection of the Environment Operations Act 1997* (POEO Act);
- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Mining Act 1992*;
- *Biosecurity Act 2015* and Biosecurity Regulation 2017;
- *Local Land Services Act 2013*,
- *National Parks and Wildlife Act 1974*;
- *Biodiversity Conservation Act 2016*; and
- *Rural Fires Act 1997*.

Delta lands are within the LMCC and Central Coast Council local government areas (LGAs).

2.2 Development Consent (SSD-5465) Requirements

Rehabilitation related requirements of the development consent (SSD-5465) include specific conditions that are to be addressed. **Appendix 1** details where in the RMP they are addressed.

DC will also carry out works generally in accordance with the Environmental Assessment (EA), EA (Mod 1), EA (Mod 2), Project Layout Plans, and Statement of Commitments.

3 Existing Environment

3.1 Physical Environment

The climate at CVC is oceanic/humid subtropical with warm summers, mild winters and generally heavy precipitation in late autumn and early winter. A review of Bureau of Meteorology (BOM) weather stations in the Lake Macquarie region found that the average annual rainfall in the vicinity of CVC is 1,230 mm with an average annual evaporation of approximately 820 mm.

The pit top area and Summerland Point ventilation shaft site are located on lands comprising the Doyalson and Wyong soil landscapes. Doyalson soils are strongly acidic with low fertility and slight to high erodibility. Wyong soils are strongly acidic, poorly drained, impermeable, and saline with very low fertility.

The NSW Acid Sulfate Soil Risk Maps for the Lake Macquarie area shows that acid sulfate soils are likely to occur at a depth of 1 to 2m along the foreshore of Lake Macquarie adjacent to the pit top area and the Summerland Point ventilation shaft. The acid sulfate soil risk warrants consideration during the development of the detailed mine closure plan.

3.2 Land Tenure and Use

CVC comprises two individual surface areas, the main pit top area (14 hectares) directly adjacent to the VPPS and the ventilation shaft site on Summerland Point (0.3 hectare area). The pit top area is comprised five (5) separate lots while the ventilation shaft site is a single lot, details of the lots and ownership is detailed in **Table 2**.

Table 2: Land Ownership Details

Site	Owner	Lot	Deposited Plan
Pit top area	Delta Electricity (utilised under access agreement)	A	379918
		B	379918
		C	349733
		A	187570
		1B	339441
Ventilation shaft site	Great Southern Energy Pty Ltd	1	226133

3.3 Coal processing

Up until 2011, operations consisted of bord and pillar methods for secondary extraction. Since 2011, secondary extraction at the Colliery has employed the miniwall mining method. Historically coal has been extracted from three seams – the Wallarah, Great Northern and Fassifern seams. Current mining activities are limited to the Fassifern Seam.

Historic workings are located under the southern extent of Lake Macquarie and areas of Summerland Point, Chain Valley Bay, Mannering Park and Kingfisher Shores. Areas of these historic Colliery workings are being used for passive operational activities such as ventilation; water drainage; movement of personnel, materials and coal; conveyors; and services.

Run of Mine coal is transported to MC via underground conveyor where it is screened, crushed and sized on site and sent via surface conveyor to VPPS.

3.4 Waste management

Waste management at CVC consists of two main areas; solid and liquid waste management. A licenced waste contractor is engaged to remove and dispose of waste from CVC. Through the implementation of a total waste management system with the waste management contractor, continuous improvements are made on site to increase recycling and decrease waste to landfill.

Liquid waste primarily from washdown bays and the oil separator is removed from site via a licenced waste contractor under appropriate waste tracking. Stormwater runoff from the potentially hydrocarbon containing areas flow to the wash down sump. Solids are removed in a grit trap and oil is removed from the water by a packed bed oil water separator and stored in a waste oil tank prior to removal from site. Excess oil from the compressors (condensate) and surrounds is contained and piped to a separator tank which is inspected weekly and pumped out as required.

Coal fines, which are captured by sediment dams, sumps and other sediment control devices are recovered and re-incorporated to final product coal, further reducing potential waste streams.

3.5 Hydrocarbon Management

Oil and diesel fuel at CVC are stored within a number of bunded areas. Drainage from the bunded areas is connected to the oil separator and sedimentation sumps. In the event of a major spill, the drainage system can be blocked off to contain any spill in the outdoor storage area. Spill kits, booms and absorbent are available on site if required. The diesel fuel storage tanks are situated adjacent to the main workshop.

3.6 Hydrology

3.6.1 Surface water

CVC has a series of 13 interconnected sediment dams (as shown on **Figure 3**) which receive inflow from surface catchment runoff, septic treated bathhouse wastewater, treated water from the oil water separator and, primarily, underground mine water. These ponds treat the wastewater and runoff through settlement of fines and suspended solids prior to discharge. The discharge is licenced under Environment Protection Licence (EPL) 1770, which includes a volumetric limit of 12,161 kilolitres per day.

Potable water is supplied to CVC via a mains connection from the Central Coast Council water supply. While currently utilised for operational activities, the potable supply will be an important source of clean water when undertaking site rehabilitation works. Further details of the site surface water management are provided in the Water Management Plan.

3.6.2 Groundwater

The hydrogeological regime of the mining area and its surrounds comprises a Quaternary terrestrial and marine / estuarine alluvial / coalluvial groundwater system. There is also underlying Permian strata with low permeability and yielding sandstone, siltstone, conglomerate and tuff with low to moderately permeable coal seams which are the predominant water bearing strata.

The groundwater is naturally saline and migrates into the Colliery's underground workings in the Wallarah, Great Northern and Fassifern seams with the majority of inflows currently seen in the Great Northern and Wallarah seams. All water is transferred to a main sump within the Great Northern Seam, and then to the sediment dams on the surface via the main underground pumps. The groundwater cannot be used for operational purposes due to it being highly saline and also would not be suitable for mine rehabilitation.

As the groundwater table is lower than any of the mine entries or shafts, there will be no risk of groundwater exiting through sealed drifts or shafts post mine closure. Details of the groundwater systems in the vicinity of the Colliery are provided in the Water Management Plan.

3.7 Geology

The stratigraphy in the local area comprises the Permian coal measures overlain by the Triassic Narrabeen subgroup and Quaternary lacustrine and terrestrial alluvial / colluvial deposits. There are a number of faults and dykes which have been mapped or are inferred within the Colliery and its surrounds. The current Fassifern Seam workings have intersected some of these geological structures, which have impacted on approved mining activities; however, no significant inflows were observed when installing the main headings.

The Fassifern Seam is mined at a depth of approximately 200 m, with the seam being approximately 30 m deeper than the Great Northern Seam, which underlies the Wallarah Seam by approximately 30 m. The Fassifern Seam is overlain by a tuffaceous claystone material which varies in thickness between 20 and 30 m. The Fassifern Seam measures up to 5 m in thickness, with roadway development carrying a coal roof and floor. **Figure 2** shows the typical stratigraphy at CVC, including the Wallarah, Great Northern and Fassifern seams.

3.8 Aquatic Ecology

The current mine workings are located in the southern part of Lake Macquarie, west of Summerland Point. Lake Macquarie is a large barrier estuarine lake characterised by an open water area of 115 km^2. The Lake opens to the sea and strong tidal flows occur at the entrance channel, where the tidal range is 1.2 m (Watterson et al. 2011). However, in areas removed from the Lake's entrance such as Chain Valley Bay (13 km from the entrance), tidal range and influence is not as pronounced. Lake Macquarie is a wave-dominated estuary, with a high sediment trapping efficiency, naturally low turbidity and salt wedge/partially mixed circulation where there is likely to be sedimentation (Cardno Ecology Lab, 2011). The average depth of the Lake is 7 m and exhibits a relatively flat floor characterised by fine soft silt/mud sediments. The water depth in the vicinity of mining ranges from 0.5 to 8.5 m and depth of sediment is up to 10 m thick (AECOM, 2011).

Seagrass communities within the Lake have been mapped adjacent to current workings and a seagrass protection barrier has been applied to the mine plan to ensure the seagrass beds are not subsided. Annual seagrass monitoring and reporting is also undertaken in accordance with the current Seagrass Management Plan.

Studies of benthic communities (organisms that live in or on the bottom of water bodies) have also been undertaken both above the mining areas as well as at control sites. There is no correlation between mining activities and community abundance and/or diversity. However, ongoing monitoring will be undertaken in accordance with the Benthic Communities Management to ensure that potential impacts to benthic communities are monitored throughout mining. There is no rehabilitation at mine closure expected in relation to the aquatic environment above mining areas.

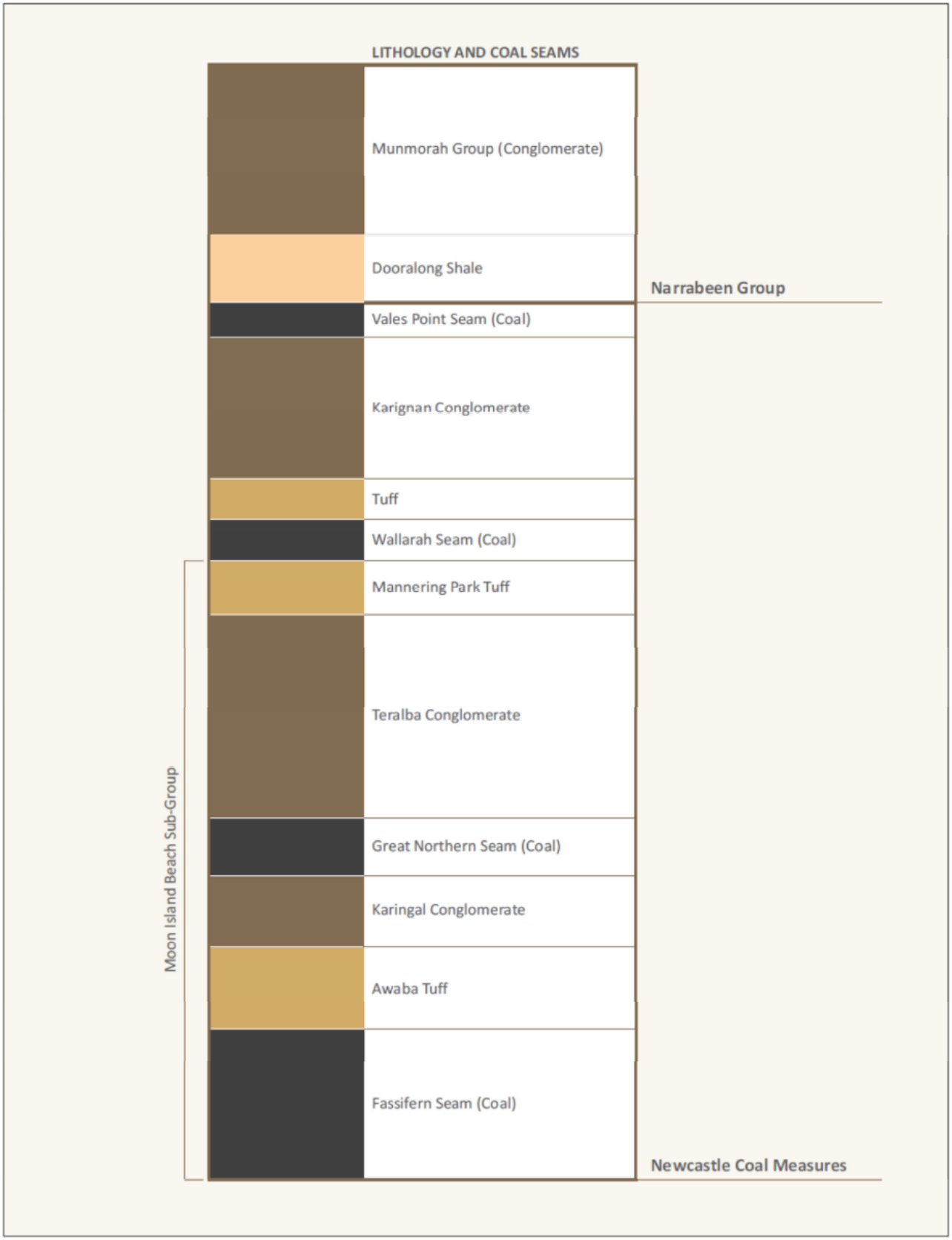


Figure 2: Typical Stratigraphy at Chain Valley Colliery

3.9 Terrestrial Ecology

Vegetation mapping undertaken during 2012 in areas surrounding the pit top identified the surrounding vegetation communities as coastal open woodland, swamp oak forest and swamp sclerophyl forest. Mapping was also undertaken at the ventilation shaft site and identified coastal open woodland, grassy open woodland and swamp sclerophyl forest. Additional details on the terrestrial ecology are contained within the Biodiversity Management Plan.

From the above both the swamp oak forest and swamp sclerophyl forest are listed as Endangered Ecological Communities under the *Biodiversity Conservation Act 2016*.

The surrounding vegetation communities are also known to provide habitat for threatened fauna species such as the Squirrel Glider (*Petaurus norfolcensis*), Regent Honeyeater (*Anthochaera phrygia*), Swift Parrot (*Lathamus discolor*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and microbats.

Accordingly, consideration of the valuable vegetation communities and habitat they provide will be an essential part of the detailed mine closure plan.

In addition to the natural habitat within the site, built structures are also known to provide potential habitat for a number of fauna species. Of relevance to the Colliery, it is known that endangered microbat populations have inhabited mine portals elsewhere in NSW (Olsen Consulting Group, 2009). The Colliery sediment dams have become used by a number of native fauna species. Potential impact to endangered microbat populations and other fauna species as a result of mine closure activities will need to be considered.

3.10 Socio-economic and Cultural Environment

While not specifically related to mine rehabilitation, DC employees and contractors are major stakeholders when considering mine closure and subsequent rehabilitation. The socio-economic aspects of mine closure planning are to be considered to reduce potential impacts.

The CVC workforce comprises DC employees and contractors with the majority living in Lake Macquarie, Central Coast or Newcastle LGAs.

Based on a 2012 workforce survey, weekly household goods purchased by the CVC workforce is generally from Lake Macquarie, predominantly at Swansea and Belmont, and Central Coast LGA, primarily at Lake Haven. Consistent with the above trend, local medical facilities close to their place of residence would be favoured.

Some households will have children who would be attending high school, primary school or childcare/preschool. As a result, voluntary donations would be made to local schools, the local surf club and local sporting clubs. It is also likely that the CVC workforce participates in local voluntary services, such as with the local surf club, schools, Rural Fire Service (RFS) and animal rescue groups.

3.11 Cultural Heritage

The DC Heritage Management Plan (HMP), should be referenced for detailed background in relation to the cultural environment and stakeholders, the below sections build on this management plan in relation to rehabilitation and mine closure only.

3.11.1 Aboriginal Cultural Heritage

Aboriginal archaeological sites including shell middens and artefact scatters occur, and are likely to occur, on the Lake Macquarie foreshore and in areas adjacent to creek lines, particularly higher order creek lines. Monitoring of cultural heritage sites is not currently considered necessary due to secondary extraction being undertaken by CVC and resultant subsidence occurring beneath Lake Macquarie.

As part of the site rehabilitation and closure, any monitoring for mine subsidence will be undertaken as required.

3.11.2 Non-indigenous Cultural Heritage

Due to the presence of mining activities on the CVC site since the 1960s it is highly unlikely that any historic heritage remains on the site, a conclusion supported by the Heritage Council in its submission in responses to the EA dated 29 July 2011 and the EIS dated 01 July 2013. Despite this, five items of heritage significance or potential significance have been identified in the vicinity of CVC, namely:

- VPPS;
- Eaton Bulk Store Building;
- Wyee Channel;
- Wyee Coal Conveyor; and
- Morisset Hospital Precinct.

Each of these historic heritage items lies outside the area of approved mining activity and consequently there would be no direct or indirect impact from the CVC.

In consideration of the above, and that CVC has been providing coal to VPPS since 1963, final mine closure and rehabilitation planning will include consultation with Delta Electricity (or future owners) in relation to representing the historic linkage.

4 Rehabilitation Management

4.1 Proposed Rehabilitation During Life of the Current MOP

The current CVC and MC MOP was approved 24 September 2018, with a completion date of 30 November 2020. The current development consent will expire on 31 December 2027. Due to the continuing need for surface infrastructure for operational use, there is relatively little rehabilitation anticipated over the life of the current or proceeding MOP. Surface works are expected to be limited to replacement, upgrade or maintenance work for the existing surface improvements. Some demolition of structures will be undertaken in preparation for staged closure.

Final rehabilitation will not be achieved under the current MOP. However, the anticipated rehabilitation status at mine closure is generally rehabilitation to a semi-natural vegetation cover (while maintaining the existing 330kV power line easement) with a view to lease relinquishment. Rehabilitation to be implemented under a future MOP at mine closure is described in the current MOP.

4.2 Mine Closure Planning

A detailed mine closure plan will be prepared at least one year before the mine is closed. The plan will be comprehensive and not only consider such issues as the physical rehabilitation of the Colliery site and the decommissioning and removal of plant but also community engagement and socio-economic issues. It is not expected that such a plan would be required until approximately 2026, however this date would be dependant on future approvals and access to resources and reserves.

Should events occur that result in CVC being placed into temporary closure or care and maintenance, a risk assessment will be triggered, with the resulting actions being included in a care and maintenance plan. The care and maintenance plan would be implemented until such a time that CVC resumes mining activities or a detailed mine closure plan is developed and approved.

4.3 Mine Closure and Final Rehabilitation Objectives

Generally, it is proposed to revegetate the surface facilities areas to a near-native ecosystem compatible with the surrounding vegetation communities (with exception of the area that lies within the 330kV power line easement, which will remain a grassland community). As the goal is to return the areas of disturbance to a native plant community (or communities) aligned with the surrounding bushland, no introduced species (e.g., *Melaleuca armillaris*, *Pinus radiata* and non-endemic eucalypts) would be used in the revegetation program. Rather, the focus of the works would be the use of plant material grown from locally sourced species.

CVC is on land owned by Delta Electricity who will, therefore, be a key stakeholder in determining the final revegetation and landform of the area.

In addition to reinforcing the objectives of the MOP, the objectives of this RMP are prescribed in Table 7 of Condition 25, Schedule 3 of the development consent and are reproduced in **Table 3**.

Table 3: Rehabilitation Objectives

Feature	Objective
Mine site (as a whole)	• Safe, stable and non-polluting. • Final land use that is compatible with surrounding land uses.
Surface infrastructure	• To be decommissioned and removed, unless the Executive Director Mineral Resources agrees otherwise.
Portals and ventilation shafts	• To be decommissioned and made safe and stable. • Retain habitat for threatened species (eg bats), where practicable.

Feature	Objective
Other land affected by the development	• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of; - local native plant species (unless the Executive Director Mineral Resources agrees otherwise); and - a landform consistent with the surrounding environment
Built features damaged by mining operations	• Repair to pre-mining condition or equivalent unless: - the owner agrees otherwise; or - the damage is fully restored, repaired or compensated under the *Mine Subsidence Compensation Act 1961.*
Community	• Ensure public safety. • Minimise the adverse socio-economic effects associated with mine closure.

Notes:

- *These rehabilitation objectives apply to all subsidence impacts and environmental consequences caused by mining taking place after the granting of project approval MP 10_0161, and to all development surface infrastructure part of the development, whether constructed prior to or following the date of this consent.*
- *Rehabilitation of subsidence impacts and environmental consequences caused by mining which took place prior to the date of project approval (MP 10_0161) may be subject to the requirements of other approvals (eg under a mining lease or a Subsidence Management Plan approval).*

4.4 Final Rehabilitation Planning Criteria & Performance Measures

The main planning considerations for rehabilitation prior to mine closure are:

- consideration of the success and practicalities of previously implemented revegetation techniques;
- issues relating to soil contamination and the burial and/or removal from site of the building debris;
- the sealing of any unsealed boreholes and mine shafts in accordance with the guidelines and standards that pertain at the time;
- the rehabilitation of existing and historically used sediment and water control dams in relation to the decanting of existing water, removal of contaminated material, mixing of sediment and non-contaminated material, filling and capping of the areas and establishment of a stable surface;
- management of existing weed populations, with particular emphasis on the reduction of Lantana (*Lantana camara*) and Bitou Bush (*Chrysanthemoides monilifera*);
- control of unauthorised access, particularly motor bikes and 4wd vehicles and rubbish dumping;
- mitigation of socio-economic impacts related to mine closure;
- ensuring public safety;
- management of the Colliery site rehabilitation while still facilitating access for bushfire fighting;
- suitable locations for the burial of “clean” material;
- removal of residual coal from stockpiles;
- availability of suitable capping material for disturbed areas such as dams and coal stockpiles;
- availability of seed, and brush material to assist with the revegetation of the Colliery site; and

- reshaping, burial and removal of hardstand area material that includes bitumen, concrete and building rubble.

Table 4 details the specific closure objectives, completion criteria and performance measures to be applied during the mine closure process.

Table 4: Rehabilitation Completion Criteria and Performance Measures

Phase	Objective	Completion criteria	Performance measures
Decommissioning	No risk to public safety - All plant and equipment removed	All mining related plant and equipment removed from site (unless approved to remain, e.g. for heritage purposes).	Visual inspection and photos of site confirm plant and equipment has been removed. Photos included within Closure Report.
	No risk to public safety - All buildings and structures removed	Buildings and structures removed (unless approved to remain).	Visual inspection and photos of site confirm buildings have been removed. Photos included within Closure Report.
	No risk to public safety - All underground infrastructure (protruding above ground surface) removed.	Visible surface components of buried infrastructure removed (unless approved to remain).	Visual inspection and photos of site confirm infrastructure has been removed. Photos included within Closure Report.
	No risk to public safety - Access to former workings prevented	All surface entries to mine are sealed in accordance with MDG 6001 (Guidelines for the Permanent Filling and Capping of Surface Entries to Coal Seams). Note: currently MDG 6001 guidelines suggest that the void from the inbye bulkhead (at a 15 depth of cover to solid rock strata) to the drift entrance of the mine should be completely filled, and a substantial bulkhead seal erected at the portal mouth, such as would not permit retention of habitat for threatened species.	Engineer provides certification that bulkheads were constructed in accordance with the design. Copy of certification to be included within Closure Report As constructed drawings are provided to the Chief Inspector for inclusion with the abandonment file for the mine.
	No risk to public safety - All borehole connectivity to former workings sealed	All boreholes to the mine are sealed in accordance with EDG01 (Borehole Sealing Requirements on Land: Coal Exploration).	Closure report includes evidence that sealing has been completed to EDG01.
	Non-polluting - clean-up of potential/actual contamination.	Hydrocarbons less than assessment criteria. Heavy metals less than assessment criteria. No asbestos remains (unless bonded within buildings approved to remain)	Environmental Site Assessment report completed and identifies any levels of contamination is below acceptable levels. Environmental Site Assessment appended to Closure Report.
Landform establishment	Slopes are stable.	Re-profiled areas are stable with slopes not exceeding 10°.	No evidence of slumping of slopes. Survey pick up of rehabilitated site confirms no slopes exceed 10°. Final landform survey detail included within

Phase	Objective	Completion criteria	Performance measures
			Closure Report.
	Growth medium replacement to permit vegetation establishment	Depth - ≥ 0.1 m.	Sampling / testing regime following placement and spreading of material to confirm depths. Revegetation becomes established
	Land use compatible with surrounds	Majority of established rehabilitation species are present in surrounding communities	Visual inspection and photos of rehabilitation confirm species established. Photos included within Closure Report.
Landform establishment (surface water)	Mine water discharges discontinued.	No discharge of underground mine water / water impacted by mining operations	Discharge water flow monitoring and reporting. Pipes that deliver water from underground to surface are disconnected Environment Protection Licence surrendered
	Appropriate management of surface water.	Diversion channels/drains to remain are stable and non-eroding. Remaining dams are stable and non-eroding	Visual inspection and photos of dams/drains to confirm non-eroding. Photos included within Closure Report.
	Non-polluting	Not contributing excess sediment load to downstream watercourses.	Surface water monitoring and reporting for upstream and downstream locations in unnamed creek.
Ecosystem / land use establishment.	Establishment of vegetation communities.	Clear trend of increasing species diversity.	Monitoring and comparison to adjacent control sites. Details of monitoring included within Closure Report.
		Number of weeds species and surface area cover ≤ adjacent control sites.	Monitoring and comparison to adjacent control sites Details of monitoring included within Closure Report.
		Self-propagation in revegetated areas.	Visual inspection and photos of species self-propagation. Photos included within Closure Report.
	Vegetation cover to minimise erosion.	Clear trend of increasing density with no significant erosion.	Monitoring and comparison to adjacent control sites Details of monitoring included within Closure Report.
		Clear trend of increasing foliage cover.	Monitoring and comparison to adjacent control sites Details of monitoring included within Closure Report.
Sustainable ecosystem / land use.	Landform generally blends in with surrounding landscape and is stable	Absence of gullies >300mm wide or deep and gullies stable.	Monitoring and details of monitoring included within Closure Report.
		Landscape function analysis (or other methodology) shows continued ecosystem function improvements	Monitoring and details of monitoring included within Closure Report.
	Weeds invasion adequately controlled by ecosystem	Stable or reducing weed presence (i.e. weed presence not increasing)	Monitoring and comparison to adjacent control sites and/or prior monitoring. Details of monitoring included within Closure Report.

4.5 Interaction with Other Environmental Management Plans

As indicated in **Section 1**, this RMP is one plan in a series of plans that sit under CVC's EMS. As the time approaches to prepare the mine closure plan, the latest version of the RMP is expected to inform the mine closure plan. Additionally, other environmental management plans, specifically the Biodiversity Management Plan, Water Management Plan, Benthic Communities Management Plan, Seagrass Management Plan and Heritage Management Plan could be used to inform the RMP. For example the Biodiversity Management Plan might indicate what endemic species may be used in the rehabilitation seed mix / tube stock to meet the needs of surrounding fauna communities and what weeds may be targeted during closure works. The Water Management Plan might give direction on how watering needs for rehabilitation might be met post closure, such as the retention of the potable water supply until vegetation establishment is complete.

4.6 Progressive Rehabilitation

Wherever possible, DC would undertake rehabilitation on a progressive basis throughout the life of the mine. Opportunities for rehabilitation are, however, considered limited due to the surface disturbance being restricted to areas required for operational activities. Notwithstanding, should opportunities arise which allow areas of the site to be rehabilitated, then the rehabilitation activities these would be planned, undertaken and reported in the Annual Review.

Preparation for rehabilitation may also be able to be undertaken once a decision for mine closure has been made, but prior to the completion of the detailed mine closure plan. This preparation would include undertaking longer lead time requirements that will come from the detailed mine closure plan, but are already known, such as native seed collection and propagation of species specifically to be used in the rehabilitation.

Seed would be collected only from native species in the vicinity of the site, in line with the closure objectives. A number of these species are detailed in the Biodiversity Management Plan, however a species list for seed collection is not provided here as it should not be limited to specific dominant species within the surrounding vegetation communities (although these likely form a significant component of the collection). Rather, the collection should be completed by suitably competent personnel experienced in native seed collection for use in rehabilitation, which will then inform the detailed mine closure plan to the extent that the species list can be commensurate with the availability of seed from endemic species in the vicinity of the site.

4.7 Final Rehabilitation Proposals

The following sub-sections provide a description of the elements of the final rehabilitation, as currently proposed.

4.7.1 Disturbed Land

DC proposes to progressively revegetate all disturbed land not required for future use to a vegetation type consistent or compatible with the surrounding vegetation communities and future land use. As with any revegetation program, the success will rely on the effectiveness of the methods utilised, which are currently expected to include a combination of revegetation methods, such as:

- growth medium development;
- direct seeding;
- the use of sterile cover crops;
- planting of tube stock; and
- hydro seeding for steeper slopes and batters (if required).

It is noted that due to the age of the mine and the lack of topsoil preservation, there is a limited amount of topsoil stockpiled that will be available for use in the final rehabilitation activities. While this will be a consideration as part of the detailed mine closure plan, there are a substantial number of recycled organics that have been successfully utilised in mine rehabilitation (Kelly, 2006). Recycled organics used successfully in rehabilitation include fly ash, a source of which is available from the VPPS.

A maintenance component to address items such as erosion, weed control and plant mortalities will also be essential for effective rehabilitation.

As the goal for the revegetation program is to return disturbed land to a native plant community aligned to the surrounding bushland the use of introduced and non-endemic species will be avoided in the revegetation program. Focus will be placed on the use of plant material grown from locally sourced species or, if possible, seed collection and propagation from the surrounding vegetation for use in rehabilitation activities. A portion of the pit top area, primarily in the vicinity of the existing sediment dams, has existing high voltage (330kV) transmission lines and an associated easement for the lines. Rehabilitation of the site within the easement boundary is proposed to be a grassland community only.

Consideration of bushfire risk and potential management measures will also need to be incorporated into the detailed mine closure plan.

4.7.2 Water Management

The removal of large areas of sealed surfaces and buildings at mine closure could result in increased sediment load in the runoff during the early stages of rehabilitation. Conversely, the removal of historically compacted surfaces will result in increased infiltration rates during the first few months of the rehabilitation program and reduce the amount of runoff going to the sediment dams. In addition, as mining operations would have ceased, including the pumping of groundwater into the dams, a significant volume of the water managed within these dams would have been removed.

The current water management system and sediment dams will be retained during the rehabilitation program. Once the primary earthworks and initial revegetation are completed, including the removal of the hardstand areas, then a program of consolidation of the dams will be undertaken.

Excavated or crushed inert material would be used to fill the dams, where appropriate. Once these are filled, the walls and batter will be used to cap the dams. These surfaces will then be stabilised using a cover crop consisting of a mixture of fast growing sterile species and native longer-lived seed.

Water quality will continue to be monitored at the licenced discharge point in accordance with the EPL. However, at a point in closure, likely after the groundwater pumping ceases and the majority of water management structures are rehabilitated, the EPL would be surrendered. The timing of the EPL surrender is expected to be driven by the monitoring results, rather than a specific point in rehabilitation progress. After this point no specific monitoring as required by the EPL would be undertaken. However, specific rehabilitation monitoring would be undertaken, which may include some water monitoring.

The detailed mine closure plan will also consider the potential retention and/or construction of small dams or ponds which could either continue to provide habitat or allow fauna to relocate to these areas when the main sediment dams are rehabilitated upon closure. Currently 3 dams are proposed to remain as part of the final rehabilitation design, however, this will be given further consideration during development of the detailed mine closure plan.

4.7.3 Rehabilitation Trials and Research

The proposed final rehabilitation program will be based on extensive experience of rehabilitation in coastal areas undertaken previously by DC, in addition to that undertaken by Councils and mineral sand mining companies and research on mine rehabilitation in the Hunter Valley. Given this, and the limited amount of area disturbed, major rehabilitation trials or research programs are not expected to be necessary.

4.7.4 Community

The aims of the RMP with respect to communities are public safety and the minimisation of adverse socio-economic effects from mine closure. However, the mine is not expected to be closing for a number of years. As the socio-economic environment of the local area, the region and indeed Australia will change in this period, it is not feasible to address socio-economic issues in detail in this RMP. Rather, they will addressed in detail closer to the time of mine closure in the mine closure plan. It is expected though that the following principles would be considered:

- the establishment of CVC has brought significant infrastructure to the mine site and the local community. Planning for mine closure could assist in mitigating the consequent reduction in access to useful infrastructure. With advanced and careful planning, it may be possible to develop capacity to maintain certain infrastructure facilities and services for future community or local government ownership or as part of future business development opportunities;
- an early and effective community engagement strategy should be established and the community engaged. This should occur as early as possible during the planning and design phase of the closure. The planning should consider how to minimise the adverse impacts of mine closure and to optimise the opportunities for the community; and
- planning for mine closure should ensure that the future public health and safety of the community is not compromised. The community's resilience to the adverse impacts of mine closure should be strengthened so that the community can maximise opportunities for subsequent land use and retain mining infrastructure of value to the community.

4.7.5 Remaining Features

Leading up to and during mine closure the following actions will be taken with respect to the buildings and structures associated with the mining, preparation and transport of the coal:

- preferentially any plant, structures, buildings or conveyors would be sold and/or relocated for reuse at another mining operation;
- the remaining coal bins, surface conveyor plant, buildings and build structures will be demolished or removed. All demolition is to occur in accordance with AS 2601-2001: The Demolition of Structures (or its latest version);
- concrete pads and footings will either be covered with at least 300 mm of growth medium or broken up and disposed of appropriately;
- roadways not required for access to the mine site or other purposes such as bushfire management will be rehabilitated; and
- below-grade structures such as concrete sumps will be filled and covered with growth medium.

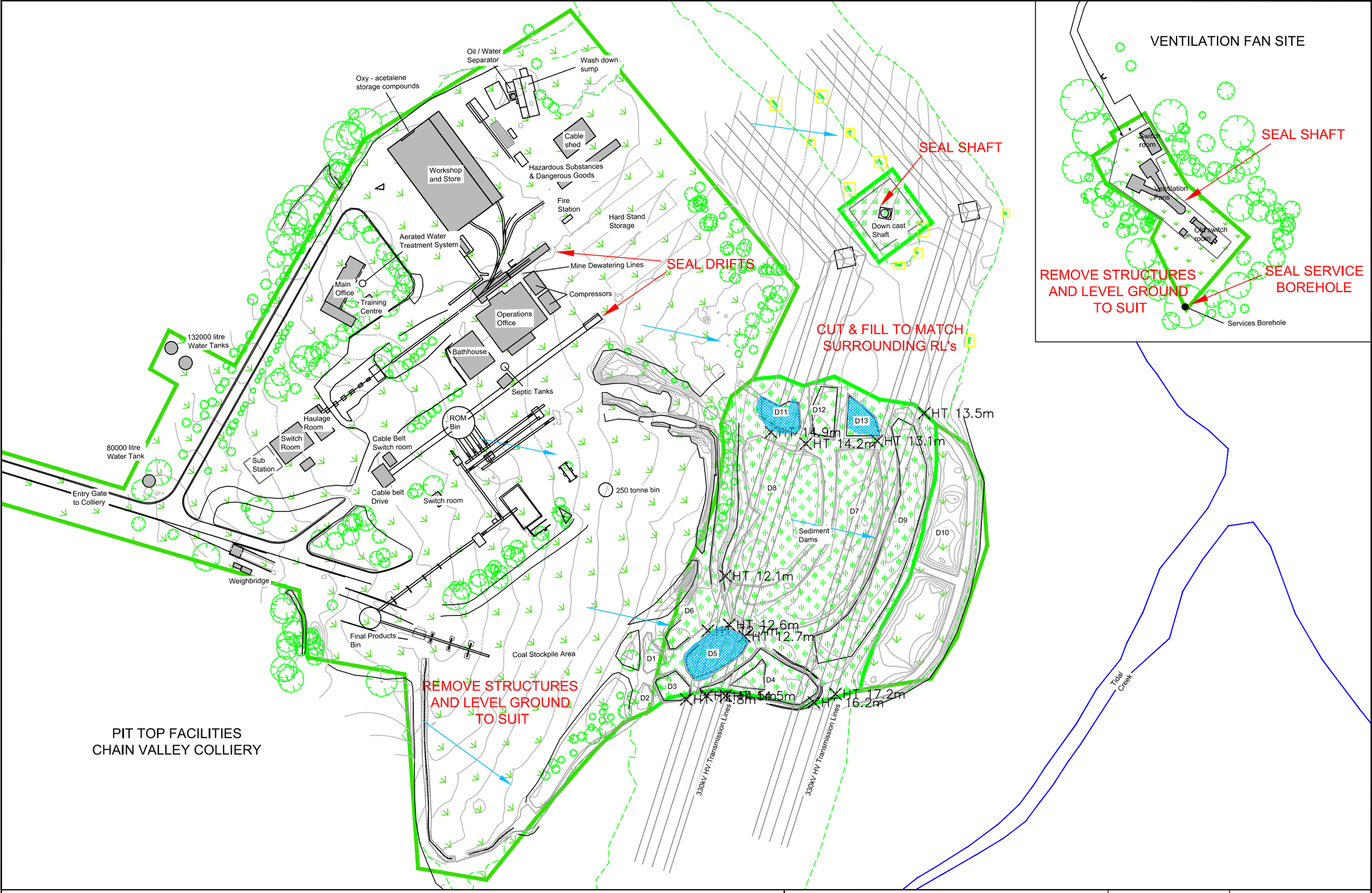
These proposals could be subject to change during the mine closure process depending on requests by the landowner.

4.7.6 Other Infrastructure and Services

CVC has numerous services such as electricity, water and communications – both above and underground. All services not required will be disconnected. Above ground infrastructure will be removed. Underground structures such as cables and pipes will be terminated at each end and remain buried. All areas where structures are removed will be decommissioned and rehabilitated to ensure public safety at mine closure and relinquishment.

4.8 Conceptual Site Land Works

Figure 3 shows the conceptual land works planned for CVC. Generally the western two thirds of the Colliery and the ventilation shaft site will be cleared of all infrastructure items that are not required post mine closure and the land levelled. The eastern one third will be cut and filled generally to the original land levels, as deemed appropriate to match with the surrounding levels. Established native trees will be retained wherever possible.



Rehabilitation - Bushland

Rehabilitation -Grassland

Rehabilitation - Surface Water Flow

Rehabilitation - Proposed Dams

DELTA COAL CHAIN VALLEY COLLIERY	SCALE: 1:2000	DATE: 1 October 2019	
	DRAWN: T Chisholm	DRG NO: C1S0154	
SITE SURFACE FACILITIES CONCEPTUAL FINAL REHABILITATION	CHECKED: K Weekes	REV NO: 2	Delta coal
		SIZE: A3	

5 Rehabilitation Monitoring

Detailed management and monitoring proposals for the final rehabilitation will be formulated closer to the time that the rehabilitation works will be required, currently estimated to be around 2027 (based on current Development Consent limits). The details will be included in both the MOP in force at the time and the mine closure plan which would be prepared at least one year prior to cessation of mining activities.

Detailed monitoring is likely to include monitoring of the following:

- decommissioning of infrastructure;
- landform;
- excessive erosion or sedimentation from areas with establishing vegetation cover;
- success of initial cover crop or grass cover establishment;
- success of tree and shrub plantings;
- extent of natural regeneration of native species;
- adequacy of drainage controls;
- general stability of rehabilitation areas;
- public safety of all rehabilitated areas; and
- socio-economic effects of closure.

In July 2019 a rehabilitation monitoring program was developed by EMM Consulting and submitted to DPIE-Resources Regulator for Chain Valley Colliery and Mannering Colliery. The program includes details about vegetation monitoring program (VMP), conducted the baseline monitoring and methods proposed to assess compliance with the rehabilitation objectives. The success of the rehabilitation will be compared against analogue sites in comparatively undisturbed areas of equivalent vegetation around the surface operation areas. The baseline data from the analogue sites provide relative benchmark for rehabilitation and act as a control against environmental variability throughout the monitoring program. The program also includes the baseline results from the initial survey of analogue sites.

Rehabilitation will be monitored to identify improvements that could be implemented to maximise the level of success for subsequent rehabilitation programs.

6 Financial Provisioning

The objective of financial provisioning is to ensure the cost of closure is adequately assessed and budgeted for by DC so that the community is not left with a liability.

The provision includes costs associated with the removal of infrastructure, sealing of all drifts, mine accesses and boreholes, rehabilitation and management of any contamination (if present) along with ongoing monitoring and statutory reporting obligations. Should any infrastructure be kept for specific purposes post mine closure provisions would be made to ensure these are safe and serviceable for the future owners.

These costs are determined on the basis of current costs and current legal requirements, over the life of the mine the costs will be reviewed and updated as required.

6.1 Planned Mine Closure

CVC has no planned mine closure date. Current operations are expected to continue under the current development consent (SSD-5465) into the future. Approval for continuation of mining within the Fassifern Seam exists until the 31st December 2027.

The main mechanism used to calculate (and recalculate) mine closure costs is ESG1: Rehabilitation Cost Estimate spreadsheet (DPE, 2017).

A rehabilitation cost estimate for CVC is required to be submitted by DC whenever a potential change in rehabilitation liabilities occurs. The rehabilitation cost estimate is used to assist in determining the amount of the security deposit. During this process DPIE will review the calculation. If rejected, the calculation needs to be recompleted until it is accepted. In line with the Rehabilitation Cost Estimate Guidelines (ESG1), security reviews may also be triggered by title renewals, audits, environmental incidents or other changes to rehabilitation liabilities.

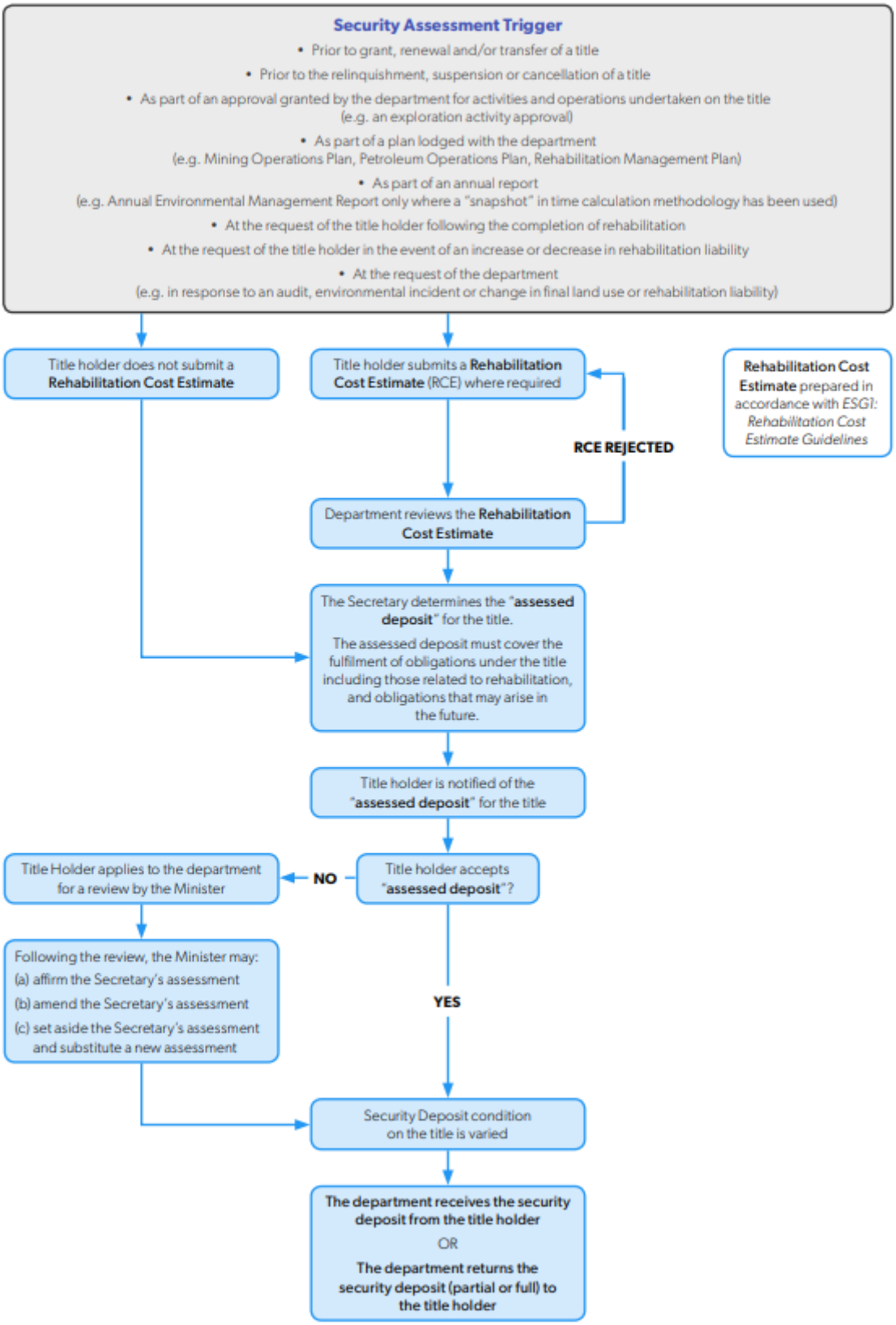
6.2 Unplanned Closure

In the event of unplanned closure and default by DC to undertake rehabilitation activities on the site, a comprehensive process has been put in place by DPIE to ensure that liabilities are not passed onto the community. This process is based on Policy EDP11 – Rehabilitation Security Deposits, and is underpinned by the *Mining Act (1992).* It ensures that, at all times, throughout the life of the mine a suitable security deposit is held by the NSW Government.

A security deposit must cover the Government's full costs in undertaking rehabilitation in the event of default by the authorisation / title holder. This requirement is intended to minimise potential liabilities to the State in the event that the authorisation/title holder defaults on their rehabilitation obligations. The security review process is shown in **Figure 4**.

6.3 Temporary Closure (care and maintenance)

The financial provisions for management during temporary closure in the event of CVC entering care and maintenance status will be provided by DC for the duration of the care and maintenance phase.



Source: ESG1: Rehabilitation Cost Estimate Guidelines (2017)

Figure 4: Security Review Process

7 Risk Management

Closure risk management will be undertaken prior to CVC being placed on care and maintenance or closing permanently. The purpose of closure risk management is to reduce the likelihood and/or consequence of events related to the closure to levels deemed as low as reasonably practicable by the selected risk assessment team.

The closure risk assessment to be conducted for CVC may include the following issues depending upon relevance at the time of closure (or temporary closure):

- rehabilitation provisioning;
- environmental baseline data availability;
- legal obligations;
- stakeholder involvement;
- potential risk legacies;
- surface water and groundwater;
- acid sulfate soils;
- spontaneous combustion;
- rehabilitation management (including bushfire, pests and disease/pathogens);
- employees and workforce;
- ongoing resource requirements;
- compensation cases;
- closure plan adequacy; and
- DPIE approval.

7.1 Residual Risk Register

A formal risk assessment will be undertaken approximately one year prior to planned mine closure to best determine levels of residual risks posed upon potential end land users and relevant stakeholders. This risk assessment would take into account all relevant issues listed above.

8 Reporting

8.1 Annual Review

The results of any monitoring will be summarised in the relevant Annual Review. The Annual Review will also include a description of any actions being implemented or planned with respect to rehabilitation.

Annual Review will be forwarded to members of the Community Consultative Committee, local Councils (Central Coast and Lake Macquarie), DPIE, Resource Regulator and be placed on the company's website.

Once closure has commenced, annual rehabilitation monitoring and reporting will be undertaken to assess the overall rehabilitation success against the established rehabilitation planning criteria and other commitments made within the MOP.

8.2 Incident or Non-compliance Reporting

When rehabilitation commences, implementation and success will be reviewed at minimum on an annual basis to confirm compliance with the relevant Development Consent. Corrective action will be implemented where results or trends indicate risk of future non-compliance or environmental risk.

The current MOP identifies and ranks risks for rehabilitation activities. These risks will be managed during the closure process in accordance with the risk assessment for closure activities to be completed prior to commencement of closure works.

If monitoring reveals that rehabilitation actions by CVC have resulted in an environmental issue or that there has been non-compliance in relation to rehabilitation, then DC will conduct an investigation into the cause of the non-compliance.

The report will:

- describe the date, time and nature of the observation;
- identify the cause (or likely cause) of the damage/incident;
- describe what action has been taken to date; and
- describe the proposed measures to address the incident and prevent further such occurrences.

9 Stakeholder Management and Response

Stakeholder management and response will not be an issue until the final rehabilitation begins, planned to be around 2027 (dependent on the approval of the proposed mining extension). Detailed stakeholder management and response will be planned closer to the mine closure date and will be incorporated in the mine closure plan.

9.1 Mine Closure and Rehabilitation

Relevant stakeholders at the time of preparing this plan are listed below, the below list should be reviewed and if necessary revised closer to mine closure, to ensure all relevant future stakeholders are identified and considered and where necessary consulted as part of the mine closure planning process. Relevant stakeholders include;

- Chain Valley Colliery
  - DC employees
  - Contractors and suppliers
  - Community Consultative Committee
- Community
  - Neighbours and local community members
  - Delta Electricity (VPPS)
  - Local indigenous groups and land councils
  - Local progress associations and precinct committees
  - Rural Fire Service
- Local Councils
  - Lake Macquarie City Council
  - Central Coast Council
- Regulators
  - Department of Planning, Industry and Environment
    - Environment Protection Authority
    - Office of Environment and Heritage
    - Resource Regulator
  - Department of Industry
  - Transport for NSW/Roads and Maritime Services

9.2 Complaints Handling

DC has a 24-hour telephone hotline (1800 687 260) through which members of the public can lodge complaints, concerns, or to raise issues associated with the operation. This service aims to promptly and effectively address community concerns and environmental matters.

All complaints are recorded and responded to and if, for some reason, no action is taken then the reason why is recorded. The information recorded in the complaint register includes:

- date and time the complaint was lodged;
- personal details provided by the complainant;
- nature of the complaint;
- action taken or, if no action was taken, the reason why; and
- follow up contact with the complainant.

1.1 Independent Review

As detailed in Condition 2, Schedule 5 of SSD-5465, an Independent Review can be requested by a landowner who "*considers the development to be exceeding the relevant criteria in Schedule 3".*

If the Secretary is satisfied that an independent review is warranted, then within 2 months of the Secretary's decision the Applicant shall:

(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to:

- *consult with the landowner to determine his/her concerns;*
- *conduct monitoring to determine whether the development is complying with the relevant criteria in Schedule 3; and*
- *if the development is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and*

(b) give the Secretary and landowner a copy of the independent review

1.2 Dispute Resolution

If any disputes are not adequately addressed by the complaints handling process then they will be handled by the Environment and Community Coordinator. If the response of CVC is not considered to satisfactorily address the concern of the complainant, a meeting may be convened with the complainant, Mine Manager together with the Environment and Community Coordinator to determine any further options to reduce potential impacts.

Any actions agreed from the meeting will be implemented by CVC. After implementation of the proposed actions the complainant will be contacted and advice sought as to the satisfaction or otherwise with the measures taken.

If no agreed outcome is determined or the complainant is still not satisfied by the action taken, then an Independent Review may be requested by the complainant. If determined to be warranted by the Secretary, an independent review will be undertaken in accordance with the process identified in Schedule 5 of SSD-5465.

10 Audit and Review

The RMP will be kept up to date through DC's standard audit and review process, however it is noted that significant planning for the detailed mine closure plan is not expected until around 2026. Current site audit and review arrangements are set out below.

10.1 Review

This document will be reviewed, and if necessary revised, within three months of the following;

- The submission of an Annual Review;
- The submission of a related incident report;
- The submission of an independent environmental audit; and
- Following any modification to the project approval.

Internal and external audits of this document will be carried out as described below. If possible, internal and external audits will be objective and be conducted by a person or organisation independent of the document being audited.

Audits will be carried out by personnel who have the necessary qualifications and experience to make an objective assessment of the issues. The extent of the audit, although pre-determined, may be extended if a potentially serious deviation from this document is detected.

Any audit non-conformances and/or improvement opportunities will have corrective and preventative actions implemented to avoid recurrence, these actions will be loaded into the Colliery Incident Database to ensure the actions are assigned to the relevant people and completed.

10.2 Auditing

The objectives of an audit are to maintain compliance with the RMP. Audits shall be carried out by personnel who have the necessary qualifications and experience to make an objective assessment of the issues. The extent of the audit, although pre-determined, may be extended if a potentially serious deviation from this document is detected.

Any audit non-conformances and/or improvement opportunities will have corrective and preventative actions implemented to avoid recurrence, these actions will be loaded into the site Incident Database to ensure the actions are assigned to the relevant people and completed.

External audits will be conducted utilising external specialists and will consider this document and related documents. External auditors shall be determined based on skills and experience and upon what is to be accomplished.

An Independent Environmental Audit (IEA) was undertaken during June 2019. In accordance with SSD-5465 Schedule 6, Condition 9, IEA's will be scheduled for every three years thereafter (unless the Secretary directs otherwise) by an audit team whose appointment has been endorsed by the Secretary.

11 Records and Document Control

11.1 Records

Generally, the Environment and Community Coordinator will maintain all Environmental Management System records which are not of a confidential nature. Records that will be maintained include:

- monitoring data;
- environmental inspections and auditing results;
- environmental incident reports;
- the complaints register; and
- licences and permits.

All records will be stored so that they are legible, readily retrievable and protected against damage, deterioration and loss. Records will be maintained for a minimum of 4 years or as otherwise required under any legislation, licence, lease, permit or approval.

11.2 Document Control

This document and all others associated with the Environmental Management System shall be maintained in a document control system which is in compliance with the site Document Control Standard which is available to all site personnel. Any proposed change to this document will be via the Environment and Community Coordinator.

A copy of this document is available on the DC website. Details on document revisions are provided in **Table 5**.

Table 5: Document Revision Details

Version	Date	Details of Revision	Company	Reviewed by/ Authorised by
1	06/03/2013	Original RMP	LakeCoal	Peter Stewart Chris Ellis Ben Johnston
2	07/01/2014	Review	LakeCoal	Chris Ellis
3	05/12/2014	Review	LakeCoal	Chris Ellis
4	01/03/2019	Review	LakeCoal	Chris Armit Wade Covey
	17/11/2019	Draft for comment - Updated to Delta Coal format	EMM Consulting Delta Coal	Katie Weekes Chris Armit
5	10/03/2019	Addition of consultation from 17/11/2019	EMM Consulting Delta Coal	Katie Weekes Chris Armit

12 Roles and Responsibilities

Roles and responsibilities specific to completing the requirements of the RMP are identified in **Table 6**.

Table 6: Roles and responsibilities for rehabilitation management

Role	Responsibilities
General Manager	• Ensure that adequate financial and personnel resources are made available for the implementation of the RMP. Including rehabilitation activities and security deposits.
Environment and Community Coordinator	• Coordinate socio-economic mitigation measures prior to mine closure in accordance with the MOP. • Compile the Annual Review. • Follow up complaints or disputes. • Complete environmental monitoring data summaries and place on the company's website. • Respond to any potential or actual non-compliances and report these as required to regulatory bodies and other stakeholders. • Undertake reviews of this document as per Section 11. • Undertake or coordinate the required audits of this document, in accordance with Section 11. • Complete notification process for any noncompliance or incident. • Coordinate the closure risk assessment process. • Coordinate the development of a detailed mine closure plan. • Consult Delta Electricity (or future owners) of the VPPS in relation to preserving or representing the historic linkage between CVC and the power station during the development of the mine closure plan • Ensure acid sulfate soil risks are considered during the mine closure plan development • Consider Endangered Ecological Communities and habitat they provide to protected fauna during the development of the mine closure plan • Consideration of bushfire risk in the development of the mine closure plan • Coordinate stakeholder engagement during the development of the mine closure plan • Ensure established native trees are retained wherever possible during rehabilitation activities • Ensure that ongoing rehabilitation in accordance with the MOP is being implemented • Develop a care and maintenance plan for CVC should it be placed on care and maintenance
All employees and contractors	• Comply with the requirements of this RMP

13 References

Documents used in the preparation of this management plan are detailed in Error! Reference source not ound..

Table 7: References

Reference	Title
Standards	AS/NZS ISO 14001:2004 Environmental management systems – Requirements with guidance for use AS/NZS ISO 14004:2004 Environmental management systems – General guidelines on principles, systems and support techniques AS2601-2001: The demolition of structures
Legislation and Regulations	*Biodiversity Conservation Act 2016* *Biosecurity Act 2015* *Biosecurity Regulation 2017* Environment Protection Licence (EPL) 1770 *Environmental Planning and Assessment Act 1979 (EP&A Act)* *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* *Fisheries Management Act 1994* *Game and Feral Animal Control Act 2002* *Game and Feral Animal Control Regulation 2012* *Local Land Services Act 2013* *Mining Act 1992* *National Parks and Wildlife Act 1974* *Pesticides Act 1999* Development consent SSD-5465 (as modified) *Protection of the Environment Operations Act 1997 (POEO Act)* *Rural Fires Act 1997*
Delta Coal documents	EMS Environmental Management Strategy. Chain Valley Colliery Benthic Communities Management Plan, May 2018. Chain Valley Colliery Biodiversity Management Plan, July 2014. Chain Valley Colliery Heritage Management Plan, June 2014. Chain Valley Colliery Seagrass Management Plan, June 2019. Chain Valley Colliery Water Management Plan, July 2012. LakeCoal 2018, MC and CVC Mine Operations Plan 2018 - 2020. Delta Coal Permit to Clear or Disturb land.
External	Australian and New Zealand Minerals and Energy Council, and the Minerals Council of Australia, Strategic Framework for Mine Closure

Reference	Title
	AECOM, 2011, Environmental Assessment Chain Valley Colliery Domains 1 &2 Continuation Project, prepared for LakeCoal. Australian Government Weeds of National Significance, www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html, viewed 5 August 2019. Bureau of Meteorology (BOM) 2019, Map of Climate Zones of Australia. Cardno Ecology Lab, 2011, Mannering Colliery Extension of Mining – Aquatic Ecology Assessment, prepared for Centennial Coal. Commonwealth of Australia, September 2016, Mine Closure: Leading Practice Sustainable Development Program for the Mining Industry. EMM, June 2015, Chain Valley Colliery Modification 2 - Statement of Environmental Effects – Section 96 Modification to SSD-5465, prepared for LakeCoal Pty Limited. EMM, July 2019, Chain Valley Colliery and Mannering Colliery Rehabilitation Monitoring Program Kelly, G.L., 2006, Recycled Organics in Mine Site Rehabilitation - A review of scientific literature, prepared for the Department of Environment and Conservation NSW. Kleinfelder 2016, Weed Action Plan - Mannering Colliery and Chain Valley Colliery. NSW Minerals Council Improving Mine Rehabilitation Discussion Paper, February 2018. NSW Office of Environment & Heritage (OEH) 2014, BioBanking Assessment Methodology 2014. Office of Environment and Heritage for the NSW Government, Sydney. NSW Rural Fire Service (RFS) 2006, Planning for bush fire protection: a guide for councils, planners, fire authorities and developers. NSW Government. NSW Department of Trade and Investment, EDG 01: Borehole Sealing Requirements on Land, April 2012. NSW Department of Planning and Environment (DPE), 2017, ESG1 Rehabilitation Cost Estimate Guidelines, June 2017. NSW Department of Trade and Investment, 2013, ESG3 Mining Operations Plan (MOP) Guidelines, September 2013. Olsen Consulting Group, 2009, Review of Environmental Factors: Dendrobium Portals Sealing. Scobie Architects (2010) Wyong Shire-wide Heritage Review, prepared for Wyong Shire Council. Watterson, E.K., Burston, J.M., Stevens, H. and Messiter, D.J., 2011, The hydraulic and morphological response of a large coastal lake to rising sea levels. Worley Parsons. pp 1-14.

14 Definitions

CCC Central Coast Council

DC Delta Coal

DP&E Department of Planning & Environment

DPIE Department of Planning, Industry and Environment

DPI Department of Primary Industries

EA Environmental Assessment

EMS Environmental Management System

EPA NSW Environment Protection Authority

EPL Environmental Protection License

EP&A Act *Environmental Planning and Assessment Act 1979*

LMCC Lake Macquarie City Council

MC Mannering Colliery

MOP Mine Operations Plan

MP 10_161 Project Approval for CVC Domains 1 & 2 Continuation Project, referred to in Schedule 3, Condition 25 of SSD-5465

MSDS Material Safety Data Sheet

NSW New South Wales

OEH NSW Office of Environment and Heritage

POEO Act *Protection of the Environment Operations Act 1997*

RFS NSW Rural Fire Service

RMP Rehabilitation Management Plan

ROM Run of mine

Secretary Secretary of the Department, or nominee

VPPS Vales Point Power Station

WoNS Weeds of National Significance

Appendix 1: Consultation

From: Chris Armit <CArmit@deltacoal.com.au>
Sent: Tuesday, 19 November 2019 5:35 AM
To: Ray Ramage <ray.ramage@planning.nsw.gov.au>; Karen Mason <kmason@lakemac.nsw.gov.au>; OEH ROD Hunter Central Coast Mailbox <rog.hcc@environment.nsw.gov.au>; Margaret MacDonald-Hill <mmacdonald-hill@bigpond.com>
Cc: DPE PSVC Compliance Mailbox <compliance@planning.nsw.gov.au>; Katie Weekes <KWeekes@deltacoal.com.au>; Colin Phillips <Colin.Phillips@planning.nsw.gov.au>; Chris Nicholas <CNicholas@deltacoal.com.au>
Subject: Chain Valley Colliery - Rehabilitation Management Plan for comment

Hi All,
Please find attached a review of the Chain Valley Colliery Rehabilitation Management Plan for your comment.

Margaret,
If you could email through this management plan revision to the Community Consultative Committee members for their comment it would be greatly appreciated.
You can email it together with last week's minutes when I send them through today.

regards,
Chris

Delta coal

Chris Armit
Environmental and Community Coordinator
Phone: 02 4358 0800
Mobile: 0409 070 233
Chain Valley Colliery

From: Geoffrey Keech [mailto:gkeech@lakemac.nsw.gov.au]
Sent: Thursday, 12 December 2019 3:41 PM
To: Chris Armit
Cc: Melissa Sawatske
Subject: LMCC response to Delta Coal Mannering Colliery and Chain Valley Colliery management plans consultation

Hi Chris,

Thankyou for providing Council the opportunity to comment on your management plans. I provide the following feedback:

CVC Rehabilitation Management Plan	Any infrastructure (slabs, pits, pipes, etc.) that is to be abandoned and covered over should be mapped and this map made available to any future user or purchaser of the site. Spelling mistake "mircobat"

For future iterations of these plans, could you please send the plans to Council@lakemac.nsw.gov.au addressed to "Development Assessment and Certification officer." The plans will be allocated to a DAC officer to coordinate comments from the relevant sections of Council. It would help us if you can include a note about the purpose of the consultation (as per the "Audit and Review" section of the management plans), and ideally send a copy that has been marked up with the changes that have occurred, as this allows us to focus quickly on the relevant changes.

Geoffrey Keech
Development Planner

LAKE MACQUARIE CITY

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E gkeech@lakemac.nsw.gov.au
lakemac.com.au

Our ref: DOC19/1013209-1
Your ref: SSD-5465 (MOD 2)

Chris Armit

Environmental and Community Coordinator
Chain Valley Colliery
Delta Coal
Off Construction Road (Off Ruttleys Road)
MANNERING PARK NSW 2259
CArmit@deltacoal.com.au

Dear Mr Armit

Chain Valley Colliery (SSD-5465 MOD 2) – review of the Benthic Communities Management Plan, Seagrass Management Plan and Rehabilitation Management Plan

I refer to your e-mails dated 14, 17, and 19 November 2019 in which the Delta Coal provided the Biodiversity and Conservation Division (BCD) of Department of Planning, Industry and Environment (The Department) with copies of three updated management plans for the Chain Valley Colliery. These management plans must be prepared '…in consultation with…' BCD to meet Schedule 3, Condition 27; Schedule 4, Condition 7(h & i); and Table 8 of the current consent for the mine (SSD-5465 MOD 2). The management plans are the:

- *Chain Valley Colliery Benthic Communities Management Plan: Environmental Management Plan* (dated 14 November 2019)
- *Chain Valley Colliery Seagrass Management Plan: Environmental Management Plan* (dated 17 November 2019), and
- *Chain Valley Colliery Rehabilitation Management Plan* (dated 19 November 2019)

BCD makes no comment on the *Chain Valley Colliery Benthic Communities Management Plan* or the *Chain Valley Colliery Seagrass Management Plan*. However, in relation to the *Chain Valley Colliery Rehabilitation Management Plan* BCD makes one recommendation: that the bushland rehabilitation is targeted to create recognisable Plant Community Types from the local or adjoining Interim Biogeographical Regionalisation of Australia region. This will further refine the completion criteria for species diversity, plant density and plant cover; contained in Table 4 of the plan.

If you require any further information regarding this matter, please contact Robert Gibson, Regional Biodiversity Conservation Officer, on 4927 3154 or via email at rog.hcc@environment.nsw.gov.au

Yours sincerely

N Davis

NICOLE DAVIS
A/Senior Team Leader Planning
Hunter Central Coast Branch
Biodiversity and Conservation Division
3 December 2019

Appendix 2: Development Consent Summary

Chain Valley Colliery Development Consent SSD-5465 Summary

Relevant sections of Development Consent SSD-5465 detail the requirements of the RMP and are reproduced in Table A1 below along with identification of where the requirements are addressed in this document.

Table A1: Requirements from Chain Valley Colliery Development Consent (SSD-5465)

Condition No.	Requirements	Relevant section of this document
	Schedule 2 Administrative Conditions	
18	***Updating and Staging Strategies, Plans or Programs*** *The Applicant must regularly review the strategies, plans and programs required under this consent and ensure that these documents are updated to incorporate measures to improve the environmental performance of the development and reflect current best practice in the mining industry. To facilitate these updates, the Applicant may at any time submit revised strategies, plans or programs for the approval of the Secretary. With the agreement of the Secretary, the Applicant may also submit any strategy, plan or program required by this consent on a staged basis.* *With the agreement of the Secretary, the Applicant must prepare a revision or stage of any strategy, plan or program required under this consent without undertaking consultation with all parties nominated under the applicable condition in this approval.* *Notes:* • *While any strategy, plan or program may be submitted on a staged basis, the Applicant must ensure that the existing operations on site are covered by suitable strategies, plans or programs at all times.* • *If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage to which the strategy, plan or program applies, the relationship of this stage to any future stages, and the trigger for updating the strategy, plan or program.*	**Section 10.1**

<table>
<tr><th>Condition No.</th><th>Requirements</th><th>Relevant section of this document</th></tr>
<tr><td></td><td>Schedule 3 Specific Environmental Conditions</td><td></td></tr>
<tr><td>25</td><td>REHABILITATION
Rehabilitation Objectives
The Applicant shall rehabilitate the site to the satisfaction of the DRE. This rehabilitation must be generally consistent with the proposed rehabilitation strategy described in the EIS, and comply with the objectives in Table 7.
Table 7: Rehabilitation Objectives
<table>
<tr><th>Feature</th><th>Objective</th></tr>
<tr><td>Mine site (as a whole)</td><td>• Safe, stable and non-polluting.
• Final land use compatible with surrounding land uses.</td></tr>
<tr><td>Rehabilitation materials</td><td>• Materials (including topsoils, substrates and seeds of the disturbed area) are recovered, appropriately managed and used effectively as resources in rehabilitation.</td></tr>
<tr><td>Surface infrastructure</td><td>• To be decommissioned and removed, unless the DRE agrees otherwise.</td></tr>
<tr><td>Portals and ventilation shafts</td><td>• To be decommissioned and made safe and stable.
• Retain habitat for threatened species (eg bats), where practicable.</td></tr>
<tr><td>Other land affected by the development</td><td>• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of:
– local native plant species (unless the DRE agrees otherwise); and
– a landform consistent with the surrounding environment.</td></tr>
<tr><td>Built features damaged by mining operations</td><td>• Repair to pre-mining condition or equivalent unless:
– the owner agrees otherwise; or
– the damage is fully restored, repaired or compensated under the Mine Subsidence Compensation Act 1961.</td></tr>
<tr><td>Community</td><td>• Ensure public safety.
• Minimise the adverse socio-economic effects associated with mine closure.</td></tr>
</table>
Notes:
• These rehabilitation objectives apply to all subsidence impacts and environmental consequences caused by underground mining taking place after the granting of project approval MP 10_0161, and to all development surface infrastructure that is part of the development, whether constructed prior to or following the date of this consent.
• Rehabilitation of subsidence impacts and environmental consequences caused by mining which took place prior to the date of project approval (MP 10_0161) may be subject to the requirements of other approvals (eg under a mining lease or a Subsidence Management Plan approval).</td><td>Section 4</td></tr>
<tr><td>26</td><td>Progressive Rehabilitation
The Applicant shall carry out the rehabilitation of the site progressively, that is, as soon as reasonably practicable following disturbance to the satisfaction of the Secretary and DRE.</td><td>Section 4</td></tr>
<tr><td>27</td><td>Rehabilitation Management Plan
The Applicant shall prepare a Rehabilitation Management Plan for the development, in consultation with OEH, DPI Water, WSC, LMCC, and the CCC, and to the satisfaction of the DRE.
This plan must:</td><td>This document</td></tr>
<tr><td></td><td>(a) be submitted to the Secretary and the DRE for approval within 12 months of the date of approval of this development consent;</td><td>Original version submitted for approval 6 March 2013</td></tr>
<tr><td></td><td>(b) be prepared in accordance with any relevant DRE guideline and be consistent with the rehabilitation objectives in the EIS and in Table 7;</td><td>Section 4</td></tr>
</table>

Condition No.	Requirements	Relevant section of this document
	(c) describe how the performance of the rehabilitation would be monitored and assessed against the objectives in Table 7;	**Section 4, 5**
	(d) describe the process whereby additional measures would be identified and implemented to ensure the rehabilitation objectives are achieved;	**Section 5**
	(e) provide for detailed mine closure planning, including measures to minimise socio-economic effects due to mine closure, to be conducted prior to the site being placed on care and maintenance; and	**Section 4, 5**
	(f) be integrated with the other management plans required under this consent.	**Section 4.5**
	The Applicant shall implement the approved management plan as approved from time to time by the Secretary. *Note: The Rehabilitation Management Plan should address all land impacted by the development whether prior to, or following, the date of this consent.*	**This Document**
	Statement of Commitments	
Rehabilitation and mine closure	*Rehabilitation will be undertaken in accordance with the Colliery's RMP and the MOP in force at the time. Detailed management and monitoring proposals for final rehabilitation will be included within a Mine Closure Plan to be prepared at least two years prior to cessation of mining activities.*	**Noted**

Appendix 13 Subsidence Monitoring Program

Delta coal	Doc Owner: **Mine Surveyor**

CHAIN VALLEY COLLIERY

Subsidence Monitoring Program

Miniwall S5 and Northern Mining Area Pillar Extraction

Author	Tim Chisholm Registered Mine Surveyor Delta Coal – Chain Valley Colliery
Authorised by:	 David Mclean Manager Mining Engineering Delta Coal – Chain Valley Colliery
Date:	20 Nov 2020

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1 Introduction

Chain Valley Colliery is an underground coal mine located on the southern end of Lake Macquarie, approximately 100km north of Sydney and 60km south of Newcastle, adjacent to the Vales Point Power Station, producing thermal coal for the domestic and export markets.

A formal Extraction Management Plan has been developed in order to manage the process of mining layout design and mitigate any subsidence impacts on surface infrastructure and/or stakeholders.

The Subsidence Monitoring Program is an element of the Chain Valley Colliery Extraction Management Plan, and has been developed to satisfy the requirements of Development Consent SSD-5465, condition 7(k) and Tables 8-9 in Schedule 4, which states:

"7. The Applicant shall prepare and implement an Extraction Plan for all second workings on site, to the satisfaction of the Director-General. Each Extraction Plan must:

(k) include a Subsidence Monitoring Program which has been prepared in consultation with DRE, which:

- Provides data to assist with the management of the risks associated with subsidence;
- Validates the subsidence predictions
- Analyses the relationship between the predicted and resulting subsidence effects and predicted and resulting impacts under the plan and any ensuing environmental consequences; and
- Informs the contingency plan and adaptive management process;

Condition 1, Schedule 4 of SSD5465 states:

"The Proponent shall ensure that vertical subsidence within the High Water Mark Subsidence Barrier and within Seagrass beds is limited to a maximum of 20 millimetres (mm)."

In addition to the above, Condition 2 within Schedule 4 of SSD-5465 also requires that:

"The Applicant shall ensure that the development does not cause any exceedance of the performance measures in Table 8 to the satisfaction of the Director-General."

The relevant subsidence monitoring requirements from Table 8 within Schedule 4 of the Development Consent, including the relevant notes, are recreated in Table 1.

Table 1 - Subsidence Impact Performance Measures - Natural and Heritage Features

Biodiversity	
Threatened species or endangered populations	Negligible environmental consequences
Seagrass beds	Negligible environmental consequences including: • Negligible changes in size and distribution of seagrass beds; • Negligible change in the function of seagrass beds; and • Negligible change to the composition or distribution of seagrass species within seagrass beds.

Benthic communities	Minor environmental consequences, including minor changes to species composition and/or distribution
Mine Workings	
First Workings under an approved Extraction Plan beneath any feature where performance measures in this table require negligible environmental consequences	To remain long term stable and non-subsiding
Second Workings	To be carried out only in accordance with and approved Extraction Plan.

Notes:

- *The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) for each of these performance measures in the various management plans that are required under this consent (see Condition 7 below).*

- *Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Secretary will be the final arbiter.*

- *The requirements of this condition only apply to the impacts and consequences of mining operations, construction or demolition undertaken following the date of approval of this consent*

Condition 4 within Schedule 4 of SSD-5465 also requires that:

"The Applicant shall ensure that the development does not cause any exceedances of the performance measures in Table 9, to the satisfaction of the Director-General.

The relevant subsidence monitoring requirements from Table 9 within Schedule 4 of the Development Consent, including the relevant notes (Table 2).

Table 2 - Subsidence Impact Performance Measures – Built Features

Built Features	
Trinity Point Marina Development Other built features	• Always safe • Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated • Damage must be fully compensated
Public Safety	
Public Safety	Negligible additional risk

Notes:

- *The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) for each of these performance measures in the various management plans that are required under this consent (see Condition 7 below).*

- *Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Secretary will be the final arbiter.*

- *The requirements of this condition only apply to the impacts and consequences of mining operations, construction or demolition undertaken following the date of approval of this consent.*
- *Requirement's regarding safety or serviceability do not preclude preventative actions or mitigation being taken prior to or during mining in order to achieve or maintain these outcomes.*
- *Requirement's under this condition may be met by measures undertaken in accordance with the Mine Subsidence Compensation Act 1961.*

2 Purpose

The purpose of this Subsidence Monitoring Program is to:

- define the subsidence monitoring scope;
- outline subsidence predictions;
- outline the methodology to be used to monitor subsidence impacts
- identify subsidence monitoring locations;
- identify reporting requirements;
- analyse the relationship between predicted and resulting subsidence effects;
- identify the requirements for incident or exceedances reporting.

3 Background

3.1 Operations

Chain Valley Colliery is an underground coal mine with current coal mining methods including development of roadways in the coal seam known as first workings and secondary extraction. These first workings develop panels to support the installation of a miniwall, a modern secondary coal extraction method.

Lake Macquarie is the largest saline lake in New South Wales. It lies on the central coast between Sydney and Newcastle within the local government areas of Wyong and Lake Macquarie. Lake Macquarie has a catchment of 700 square kilometers and a water surface area of 125 square kilometers (Bell & Edwards, 1980). The lake has a permanent entrance to coastal waters at Swansea and has an average depth of around 6 meters (Laxton, 2005).

The catchment of Lake Macquarie is largely rural with large areas of bush land and grazing land. The shoreline of Lake Macquarie is heavily urbanised, especially the eastern, western and northern shorelines. The region has a relatively long history of coal mining and power generation, with mining occurring since the late 1800s and the first power station at Lake Macquarie commencing operations in 1958.

The Chain Valley Colliery is situated on the southern shores of Lake Macquarie near Mannering Park, NSW. The mine has been operating since 1962. Mining is currently undertaken using miniwall methods with first workings to support the development in advance of each miniwall panel. All secondary extraction is currently occurring in the Fassifern seam, in line with Development Consent SSD–5465. The general layout of the Chain Valley Extension Project in respect to Lake Macquarie is shown on **Figure 1**.

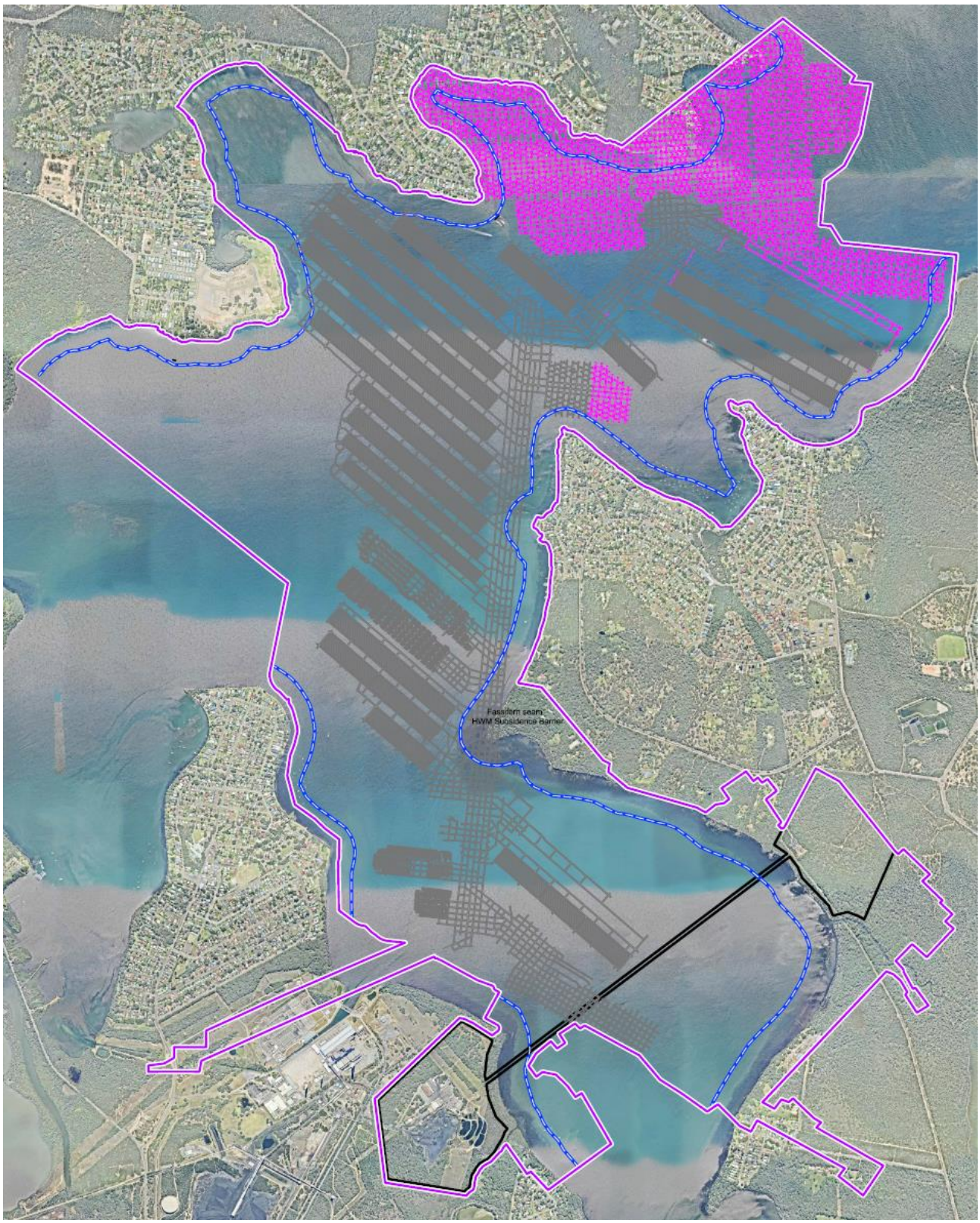


Figure 1: General Layout of the Chain Valley Northern Mining Domain (DC Plan C1P0003_rev8)

3.2 Subsidence Predictions

This management plan references reports completed by Mr David Hill of Strata2 Ground Control Consulting for Miniwall panels S2-S5.

- "*Geotechnical Aspects of S2 and S3 Panel Design"* Strata2 Report: CHV-006 (Hill, 2018)
- *"Geotechnical Aspects of S4 Panel Design"* Strata2 Report: CHV-010 (Hill, 2019)
- *"S5 Panel - Geotechnical Environment, Subsidence Estimates and Impacts"* Strata2 Report: CHV-019 (Hill, 2020)
- *"Miniwall S5 and the Adjacent Herringbone Panels of the Northern Mining Area (NMA) - Geotechnical Environment, Subsidence Estimates and Impacts"* Strata2 Report: CHV-024 (Hill, 2020)

Subsidence modelling has predicted up to approximately 500mm of subsidence to the Lake floor associated with the planned miniwall mining in S2 to S5 and adjacent pillar extraction **(Figure 2).**No additional subsidence is expected to occur within the seagrass or foreshore areas as a result of Fassifern extraction. *(Hill, 2018, 2019, 2020).* Areas where multiple pillar extraction panel are planned has been assessed at 400-500mm, against an approved maximum of 780mm (SSD 5465).

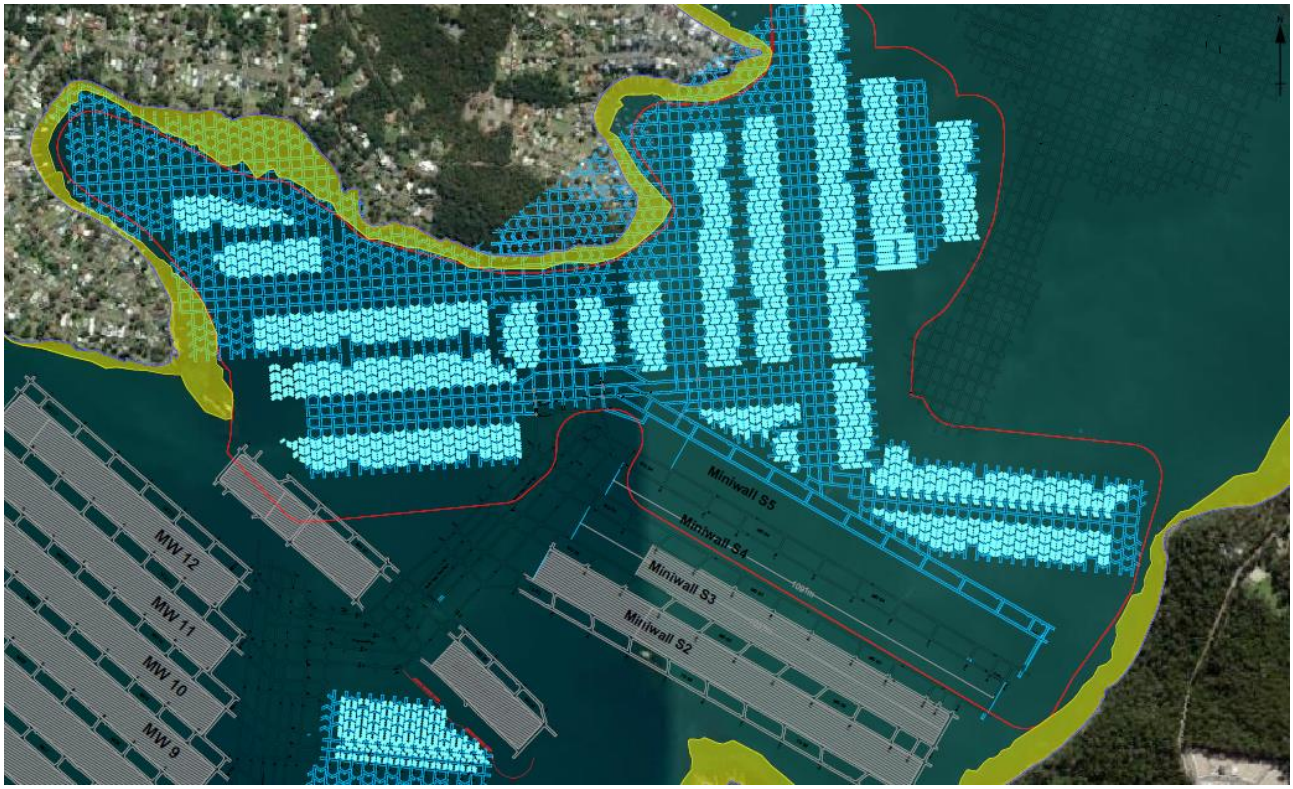


Figure 2 - Predicted Subsidence impact areas due to extraction of S2 - S5 panels and pillar secondary extraction (Hill, 2020)

Respective triggers points for additional monitoring and response are included in the Subsidence Management TARP.

3.3 Surface Monitoring - Scope

3.3.1 Shoreline (High Water Mark)

The shoreline of Lake Macquarie is protected under Mining Lease Conditions requiring Ministerial Approval to carry out mining operations within the High Water Mark Subsidence Barrier (HWMSB). The HWMSB is defined in the seam by a line defined by an angle of draw of 35° drawn lakewards from the high water level of Lake Macquarie, and on the land side, a line drawn from the 2.44m contour at 35° towards the land (Figure 5).

Condition 1, Schedule 4 of SSD5465 states:

"The Proponent shall ensure that vertical subsidence within the High Water Mark Subsidence Barrier and within Seagrass beds is limited to a maximum of 20 millimetres(mm)…."

A key objective of the mine design is to minimise vertical subsidence within the HWMSB and prevent additional subsidence above the high water mark. To ensure effectiveness of the mine design, monitoring of the shoreline is proposed via the installation and monitoring of fixed reference marks surveyed at regular intervals.

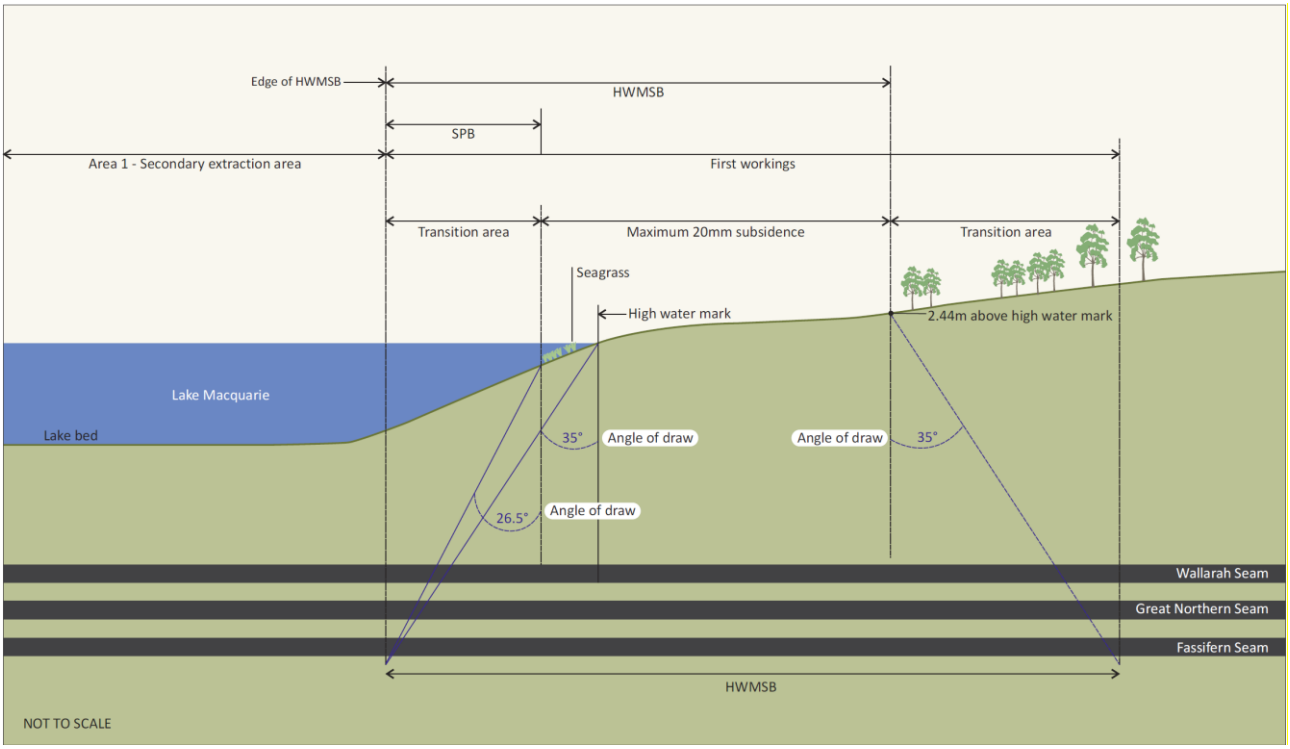


Figure 3 - High Water Mark Subsidence Barrier Typical Diagram

3.3.2 Seagrass

Condition 2, Schedule 4 of SSD-5465 specifies negligible environmental impacts on the species of seagrass found within the current area of mining operations as a condition of approval.

Seagrass distribution within estuaries is naturally influenced by light penetration, depth, salinity, nutrient status, bed stability, wave energy, estuary type, and the evolutionary stage of the estuary.

Surveys of the seagrass extents are undertaken in order to monitor impacts on the seagrass population. Delta Coal's *Seagrass Management Plan* outlines the methodology used to determine changes to composition and quantity of seagrass populations in Lake Macquarie.

A 26.5° line taken from the lake side of the mapped seagrass location projected to the Fassifern Seam has been defined as a protection barrier, and no miniwall extraction is to take place within this barrier.

Subsidence Monitoring of the lakebed is also proposed via bathymetric survey over the current mining area in order to validate the subsidence prediction model.

3.3.3 Benthic Communities

The basin is inhabited by a diverse number of marine organisms. Condition 2, Schedule 4 of SSD-5465 specifies minor environmental consequences on the Benthic communities, including minor changes to species composition and/or distribution as a condition of approval. Regular surveys of the lake bed are undertaken in order to monitor variations in the composition and density of benthos due to mining, environmental and/or other seasonal factors. Delta Coal's *Benthic Communities Management Plan* outlines the methodology used to determine changes to species diversity and abundance.

Subsidence monitoring of the lakebed is also proposed via bathymetric survey over the current mining area in order to validate the subsidence prediction model, and to determine approximate levels of subsidence on specific benthic sample locations.

4 Subsidence Monitoring

4.1 Subsidence Monitoring Methods

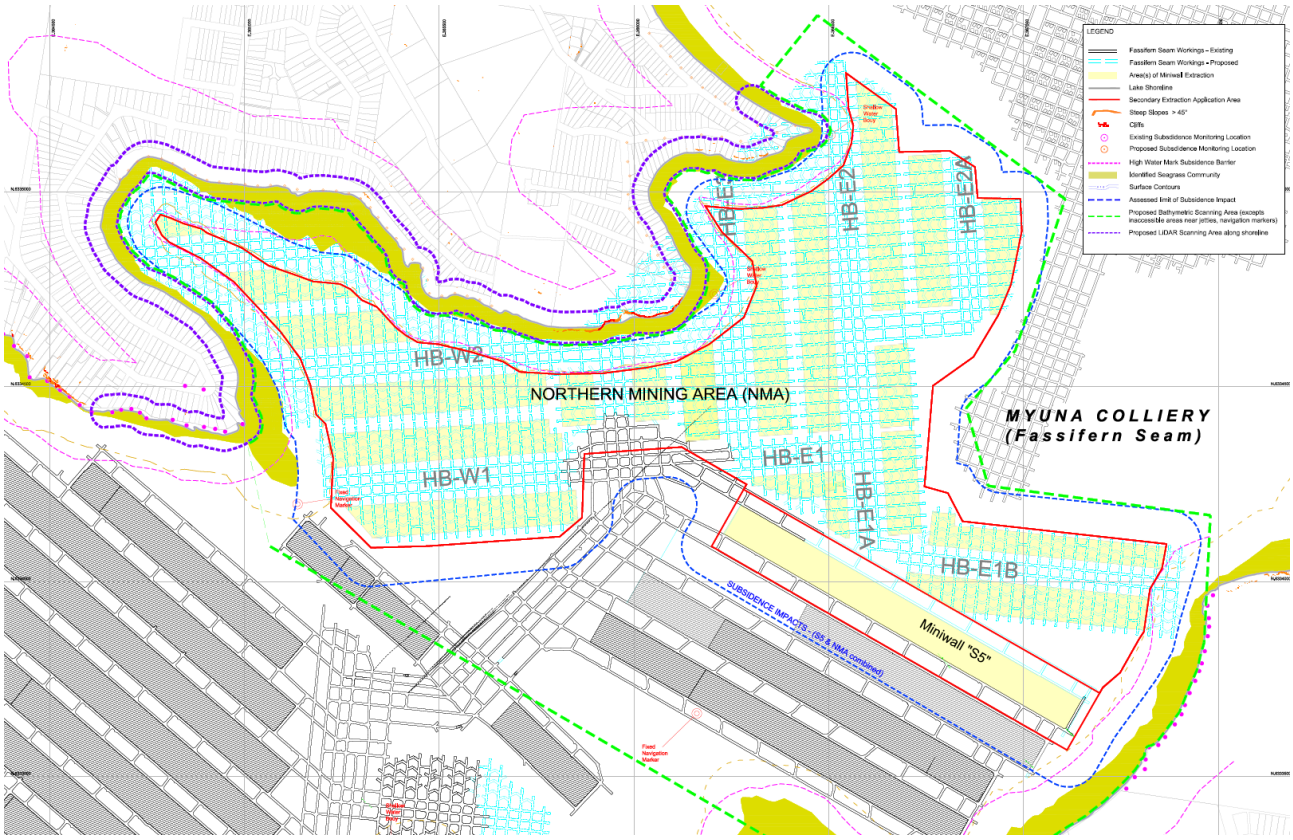


Figure 4 - Proposed Shoreline Subsidence Monitoring Locations, Summerland Point (Delta Coal Plan C4A0099_7)

4.1.1 Bathymetric Surveys

Bathymetric data from the NSW Office of Environment and Heritage (OEH) was obtained in draft format

during 2012. Delta Coal was granted a license to use this OEH data for the purposes of monitoring changes in the bed of Lake Macquarie, and acknowledges the OEH's data which has enabled the subsidence comparison to be undertaken based on this 2010 data and data subsequently obtained in 2012 by Delta Coal. OEH notes that the data was obtained via use of differential GPS and a 200 kHz echosounder, which is noted to provide general data accuracy of 0.1m.

Delta Coal commissioned Astute Surveying in 2012 to undertake a bathymetric survey annually over the areas of current and proposed workings. The primary purpose of this survey was to obtain accurate baseline data for future subsidence assessments and to enable comparison with the draft OEH data from 2010. Importantly, the ongoing surveys provided accurate details of the Lake depth within the proposed mining areas, which would enable future surveys to use as baseline data to monitor the future subsidence levels as a result of mining activities.

Comparative analysis of the surveys highlights some elevation changes which are unrelated to mining, generally however these appear to be minor movements, perhaps related to movement of sediment as a result of the wave climate in the Lake. The surveys have shown that subsidence from the miniwall mining can be monitored with a useful level of accuracy and annual surveys over the extraction area will be continued to cover future mining areas and areas where mining has been completed.

4.1.2 Fixed Foreshore Monitoring Surveys

Subsidence monitoring around Pt Wolstoncroft and Brightwaters peninsula have already been established due to previous mining operations to the immediate south of the extraction area (**Figure 4**). Additional monitoring points will be established along the foreshore in relevant locations at approximately 20-30m intervals and will be reestablished where missing. New monitoring locations will be subject to landholder access arrangements and permission.

The foreshore monitoring points will be monitored as follows:

- The points are to be established as per **Miniwall S5 & NMA Pillars Extraction Plan - Plan 7**.
- X and Y locations will be measured using GPS equipment for plotting purposes (±0.050m)
- AHD RL (Z) component will be leveled using Automatic or Digital levelling equipment to an accuracy of 5mm/km.
- Surveys are to be conducted at intervals prescribed in **Table 3**, during mining operations and after completion of a panel.
- The results are uploaded to DRE's online subsidence web portal within 14 days of survey.

4.1.3 Remote LiDAR Monitoring Methods

Due to the nature of the shoreline in the vicinity of the mine subsidence monitoring areas, it may at times not be practical to install fixed monitoring marks due to access arrangements, environmental/cultural sensitivity and worker safety concerns. It is planned to utilise airborne LiDAR (Light Ranging and Detection) techniques to monitor area of the shoreline where land access may not be available. Calibration, or 'ground-truthed' locations will be established and monitored with the same techniques utilised for the fixed foreshore monitoring surveys.

The remote scanning methodology would be carried out by:

- Utilising a survey ground crew to ground truth designated control sites
- LiDAR and imagery flown
- Low level drone imagery collected of the steep slope / cliff face areas
- Filtering drone imagery data and merge with LiDAR information

Areas to be monitored via these remote LiDAR techniques are shown on **Plan 7** of the **Miniwall S5 & NMA Pillars Extraction Plan** figures.

Results of the post mining monitoring will be provided to the DRE once surveys have been completed and all digital data processed.

4.1.4 Visual Inspection Methods

Additional as a part of the foreshore survey monitoring, observations will be made for visual impact or changes to public safety risk. A Subsidence Inspection Proforma will be completed with each survey. The proforma includes visual inspection of steep slopes, boulder or tree instability, ponding and other potential effects of mine subsidence.

4.2 Subsidence Monitoring Frequency Requirements

Due to the general locality of the mining subsidence monitoring areas, it may be at times not reasonably practical to install, maintain and access fixed monitoring points for shoreline monitoring, due to environmentally sensitive areas, landowner or physical access issues. Where fixed foreshore monitoring surveys cannot be carried out, bathymetric surveys are planned to be substituted to confirm nil impacts outside the proposed subsidence impact area. If fixed monitoring points are to be installed after commencement of extraction, a baseline survey of these points will be undertaken coinciding with a bathymetric monitoring survey to calibrate the monitoring results.

Based on the monitoring program outlined above, the following monitoring frequencies are to be established to validate model outcomes, enable early detection of subsidence trending to increased impact levels over that predicted, allow early application of containment, adaptive and contingency measures to prevent impact outside approved and particularly increased impact to the foreshore.

All evaluations are to be made against the criteria outlined in the Subsidence Monitoring TARP.

Table 3 - Subsidence Monitoring Frequencies (S2-S5, NMA Pillar extraction Panels)

	Areas	Pre-Extraction	During Extraction	Post Extraction
Bathymetric surveys	Area per Plan 7 of the Miniwall S5 & NMA Pillars Extraction Plan	Baseline survey prior to commencement of extraction	End of panel survey for S5 Annual surveys over areas of pillar extraction	Annual for 3 years unless TARP triggered
Terrestrial based subsidence monitoring	Points Plan 7 of the Miniwall S5 & NMA Pillars Extraction Plan, subject to land access	Baseline survey prior to commencement of extraction	End of panel survey for S5 Annual surveys during extraction unless TARP triggered	Annual for 3 years unless TARP triggered
Remote Sensing LiDAR	As per Plan 7 of the Miniwall S5 & NMA Pillars Extraction Plan	Baseline survey prior to commencement of pillar extraction	Annual surveys during extraction unless TARP triggered	Annual for 3 years unless TARP triggered

4.3 Subsidence Monitoring Review

Chain Valley Colliery will undertake a review of available subsidence monitoring data against predictions and expected outcomes annually within its Annual Review as required by SSD-5465.

4.4 Consultation

The Subsidence Monitoring Plan is required to be prepared in consultation with DRE. DRE have been consulted during the submission of the Extraction Plan and will also be consulted as a part of the High Risk Activity Notification for Miniwall S5 extraction.

Roads and Maritime Services Project Officer (North Area) has been contacted during the development of the Extraction Plan and referred the matter to the RMS asset team, with the monitoring program developed in consultation with RMS representatives.

The Community Consultative Committee (CCC) for the mine will be routinely updated on subsidence monitoring results and any change in impact or public safety concern.

5 Roles and Responsibilities

Roles, responsibilities specific to completing the requirements of this Subsidence Monitoring Program are identified in **Table 4**.

Table 4: Subsidence Monitoring Program Roles and Responsibilities

Role	Responsibilities
Mine Manager	• Ensure that adequate financial and personnel resources are made available for the implementation of the Subsidence Monitoring Program

Mine Surveyor	• Co-ordinate subsidence monitoring, through the use of bathymetric surveys, conventional surveys along foreshore and underground data collection.
	• Review subsidence monitoring results against Subsidence Management TARP triggers
	• Inform relevant stakeholders as to the subsidence monitoring results
	• Review, and if necessary revise this document:
	  ○ In the event of any exceedance in impact thresholds
	  ○ Following any modification to the development consent

Environment Compliance Coordinator	• Develop management actions in consultation with regulatory agencies as/if required from the monitoring results. • Respond to any potential or actual non-compliance and report these as required to regulatory bodies and other stakeholders. • Notify the relevant Government Agencies and other affected parties of any exceedances of the performance measures • Coordinate the meeting of the Subsidence Review Committee • Ensure complaint handling and response is undertaken, including determination of sources and potential remedial action to avoid recurrence.

Appendix 14 Graphical Plans

LEGEND

- Fassifern Seam Workings - Existing
- Fassifern Seam Workings - Proposed
- Area(s) of Proposed Extraction
- Lake Shoreline
- Application Area - Limit of Subsidence
- Previous Secondary Extraction Approval Area
- Wallarah Seam Workings - Existing

LAKE MACQUARIE

NORTHERN MINING AREA (NMA)

MYUNA COLLIERY
(Fassifern Seam)

HB-W2

HB-W1

HB-E1

HB-E1B

Miniwall "S5"

MANAGER OF MINING ENGINEERING
I certify that the information shown on this plan is a true indication of the proposed development.
SIGNED DATE 16.12.20

REGISTERED MINE SURVEYOR
I certify that the survey information shown in this plan is correctly represented, in accordance with the relevant legislative requirements.
SIGNED DATE 16.12.20

MINING HEIGHTS - 1ST WORKINGS 3.20m
2ND WORKINGS 3.50m

TYPICAL ROADWAY WIDTH 5.4m
MINIWALL INSTALLATION ROADWAY 7.9m-10.0m
MINIWALL PRE-DRIVEN TAKEOFF ROADWAY 6.5m

DELTA COAL - CHAIN VALLEY COLLIERY

EXTRACTION PLAN APPLICATION
MINIWALL S5 AND NMA SECONDARY PILLAR EXTRACTION
PLAN 1 - EXISTING & PROPOSED WORKINGS

SCALE:	1:3000 @ A0	DATE:	15 December 2020
DRAWN:	T Chisholm	DRG NO:	C4A0059_1
CHECKED:	D Mclean	REV NO:	0
APPROVED:	D Mclean	SIZE:	A0

Delta

LEGEND

- Fassifern Seam Workings - Existing
- Fassifern Seam Workings - Proposed
- Area(s) of Secondary Extraction
- Mine Subsidence District
- High Water Mark Subsidence Barrier
- Identified Seagrass Community
- Seagrass Protection Barrier
- Surface Contours
- Assessed limit of Subsidence Impact
- Application Area - Limit of Subsidence
- Minor Cliffs

NORTHERN MINING AREA (NMA)

MYUNA COLLIERY
(Fassifern Seam)

WEST LAKE MINE SUBSIDENCE DISTRICT

SWANSEA NORTH ENTRANCE MINE SUBSIDENCE DISTRICT

Miniwall "S5"

Shallow Water Buoy

Fixed Navigation Marker

Fixed Navigation Marker

Shallow Water Buoy

E.364500 E.365000 E.365500 E.366000 E.366500 E.367000 E.367500

N.6335000 N.6334500 N.6334000 N.6333500

MANAGER OF MINING ENGINEERING
I certify that the information shown on this plan is a true indication of the proposed development.
SIGNED DATE 9.3.21

REGISTERED MINE SURVEYOR
I certify that the survey information shown in this plan is correctly represented, in accordance with the relevant legislative requirements.
SIGNED DATE 9/03/21

DELTA COAL - CHAIN VALLEY COLLIERY	SCALE: 1:3000 @ A0	DATE: 15 December 2020	
EXTRACTION PLAN APPLICATION	DRAWN: T Chisholm	DRG NO: C4A0099_2	
MINIWALL S5 & NMA SECONDARY PILLAR EXTRACTION	CHECKED: D Mclean	REV NO: 1	Delta coal
PLAN 2 - SURFACE FEATURES	APPROVED: D Mclean	SIZE: A0	

LEGEND

- Fassifern Seam Workings - Existing
- Fassifern Seam Workings - Proposed
- Area(s) of Proposed Extraction
- Fassifern Seam Thickness
- Fassifern Seam Depth of Cover to Lake Bed
- Application Area - Limit of Subsidence
- Lake Shoreline
- Mapped Dykes
- Mapped / Projected Faults
- Exploration Borehole

EER32
EWG07
EWN7
EER34
JW33
JW35
JW36
HB-W2
HB-W1
HB-E1
HB-E1A
HB-E1B
HB-E2
HB-E3
HB-E4
NORTHERN MINING AREA (NMA)
MYUNA COLLIERY
(Fassifern Seam)
Miniwall "S5"

MANAGER OF MINING ENGINEERING
I certify that the information shown on this plan is a true indication of the proposed development.
SIGNED DATE 16.12.20

REGISTERED MINE SURVEYOR
I certify that the survey information shown in this plan is correctly represented, in accordance with the relevant legislative requirements.
SIGNED DATE 16.12.20

DELTA COAL - CHAIN VALLEY COLLIERY	SCALE: 1:3000 @ A0	DATE: 15 December 2020	
EXTRACTION PLAN APPLICATION MINIWALL S5 & NMA SECONDARY PILLAR EXTRACTION	DRAWN: T Chisholm	DRG NO: C4A0099_3	
PLAN 3 - GEOLOGICAL FEATURES	CHECKED: D Mclean	REV NO: 0	Delta
	APPROVED: D Mclean	SIZE: A0	

LEGEND

- Fassifern Seam Workings - Existing
- Fassifern Seam Workings - Proposed
- Area(s) of Proposed Extraction
- Application Area - Limit of Subsidence
- Wallarah Seam Workings - Existing
- Wallarah Seam Thickness
- Wallarah Seam Depth of Cover to Lake Bed
- Lake Shoreline
- Mapped Faults (all seams)
- Mapped Dykes (all seams)
- Exploration Borehole

EER32
EWG07
EWN7
EER34
JW33
JW35
JW36
HB-E2
HB-E4
HB-E3
HB-E1
HB-W2
HB-W1
HB-E1B
Miniwall "S5"
NORTHERN MINING AREA (NMA)
MYUNA COLLIERY
(Fassifern Seam)

E.364500 E.365000 E.365500 E.366000 E.366500 E.367000 E.367500
N.6335000 N.6334500 N.6334000 N.6333500

MANAGER OF MINING ENGINEERING
I certify that the information shown on this plan is a true indication of the proposed development.
SIGNED DATE 16.12.20

REGISTERED MINE SURVEYOR
I certify that the survey information shown in this plan is correctly represented, in accordance with the relevant legislative requirements.
SIGNED DATE 16.12.20

DELTA COAL - CHAIN VALLEY COLLIERY	SCALE: 1:3000 @ A0	DATE: 15 December 2020	
EXTRACTION PLAN APPLICATION	DRAWN: T Chisholm	DRG NO: C4A0099_4	
MINIWALL S5 & NMA SECONDARY PILLAR EXTRACTION	CHECKED: D Mclean	REV NO: 0	Delta coal
PLAN 4 - OVERLYING WORKINGS	APPROVED: D Mclean	SIZE: A0	

LEGEND

- Fassifern Seam Workings - Existing
- Fassifern Seam Workings - Proposed
- Area(s) of Proposed Extraction
- Lake Shoreline
- Application Area - Limit of Subsidence
- Cadastral Lot / DP Boundaries
- Mining Tenement Boundaries
- Privately owned land
- Crown / Public lands

ML1632

pt. ML1632 (sublease)

pt. ML1632 (sublease)

pt. ML1632 (sublease)

pt. ML1632 (sublease)

ML1051

pt. ML 1370 (sublease)

ML1632

CCL707

HB-W2

HB-W1

HB-E1

HB-E2

HB-E3

HB-E1A

HB-E1B

Miniwall "S5"

NORTHERN MINING AREA (NMA)

MYUNA COLLIERY
(Fassifern Seam)

E.364500 E.365000 E.365500 E.366000 E.366500 E.367000

N.6335000 N.6334500 N.6334000

Lease No	Area (total)	Particulars
CCL 721 (Sublease	2409 Ha	Expires 30/06/2022
ML 1051	259Ha	Expires 07/07/2022
ML1370 (Sublease)	112.7Ha	Expires 30/06/2022
ML 1632 (Sublease)	434 Ha	Expires 30/06/2022

MANAGER OF MINING ENGINEERING
I certify that the information shown on this plan is a true indication of the proposed development.
SIGNED DATE 16.12.20

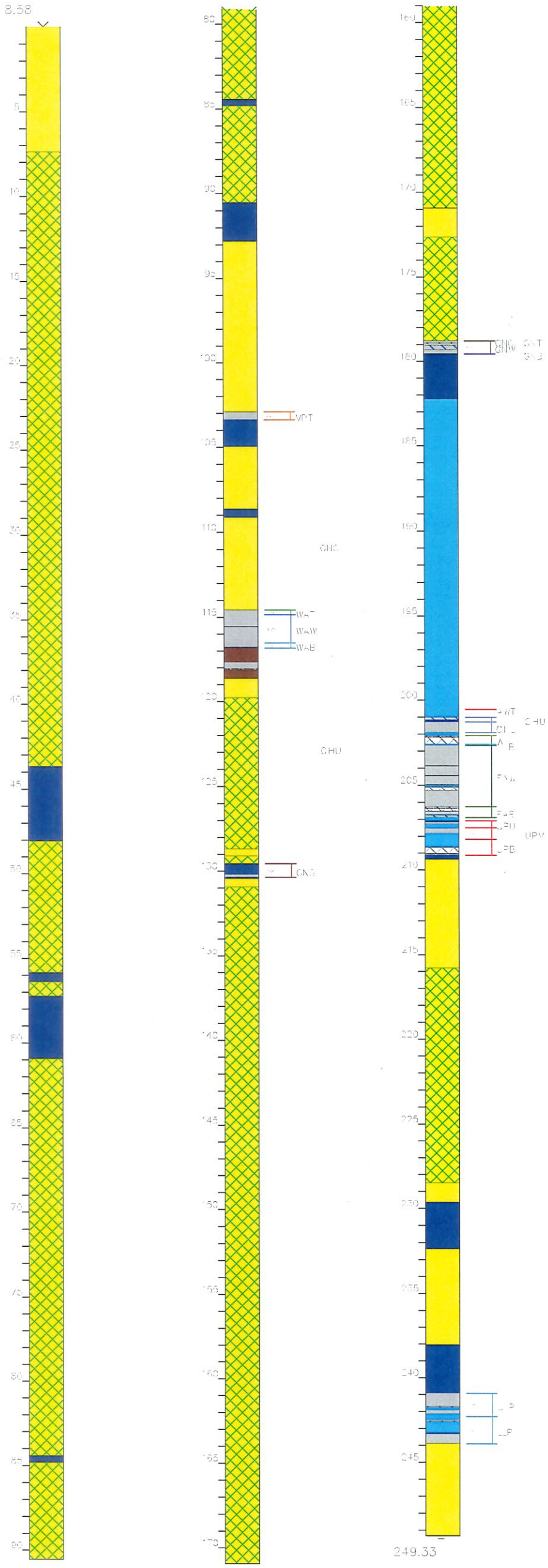
REGISTERED MINE SURVEYOR
I certify that the survey information shown in this plan is correctly represented, in accordance with the relevant legislative requirements.
SIGNED DATE 16.12.20

DELTA COAL - CHAIN VALLEY COLLIERY
EXTRACTION PLAN APPLICATION
MINIWALL S5 & NMA SECONDARY PILLAR EXTRACTION
PLAN 5 - TITLES

SCALE:	1:3000 @ A0	DATE	15 December 2020
DRAWN:	T Chisholm	DRG NO.	C4A0099_5
CHECKED:	D Mclean	REV NO.	0
APPROVED:	D Mclean	SIZE:	A0

Delta coal

JC V3



Legend

Lithology Reference

Seam Legend

Seam Expansion Reference

- VPT – Vales Point
- WAT – Wallaroo – roof
- WAW – Wallaroo – working secti
- WAB – Wallaroo – bottoms
- LWA – Wallaroo Lower / Tonsley
- TRC – Great Northern – conglom
- GNN – Great Northern – non-coa
- GNS – Great Northern – Split
- GNP – Great Northern
- GNT – Great Northern – Tops
- GNW – Great Northern – Working
- GNB – Great Northern – Bottoms
- AWT – Awaba Tuff
- CHU – Chain Valley Upper
- CHL – Chain Valley Lower
- FAT – Fassifern – Tops
- FA – Fassifern – A ply
- FB – Fassifern – B ply Stayet
- FAW – Fassifern – Working Seat
- FAB – Fassifern – Bottoms
- UPU – Upper Pilot Upper
- UPM – Upper Pilot Middle
- UPB – Upper Pilot Lower
- ULP – Lower Pilot Upper
- LLP – Lower Pilot Lower

DELTA COAL - CHAIN VALLEY COLLIERY		SCALE:	1:3000 @ A0	DATE:	15 December 2020
EXTRACTION PLAN APPLICATION MINIWALL S5 & NMA SECONDARY PILLAR EXTRACTION		DRAWN:	T Chisholm	DRG NO:	C4A0099_6
		CHECKED:	D Mclean	REV NO:	0
PLAN 6 - GEOLOGICAL INFORMATION		APPROVED:	D Mclean	SIZE:	A0

LEGEND

- Fassifern Seam Workings - Existing
- Fassifern Seam Workings - Proposed
- Area(s) of Miniwall Extraction
- Lake Shoreline
- Application Area - Limit of Subsidence
- Steep Slopes > 45°
- Cliffs
- Existing Subsidence Monitoring Location
- Proposed Subsidence Monitoring Location
- High Water Mark Subsidence Barrier
- Identified Seagrass Community
- Surface Contours
- Assessed limit of Subsidence Impact
- Proposed Bathymetric Scanning Area (excepts inaccessible areas near jetties, navigation markers)
- Proposed LiDAR Scanning Area along shoreline

HB-W2
HB-W1
HB-E1
HB-E1A
HB-E1B
HB-E1C
HB-E2A
NORTHERN MINING AREA (NMA)
MYUNA COLLIERY
(Fassifern Seam)
Miniwall "S5"
SUBSIDENCE IMPACTS - (S5 & NMA combined)
Shallow Water Buoy
Fixed Navigation Marker

MANAGER OF MINING ENGINEERING
I certify that the information shown on this plan is a true indication of the proposed development.
SIGNED DATE 16.12.20

REGISTERED MINE SURVEYOR
I certify that the survey information shown in this plan is correctly represented, in accordance with the relevant legislative requirements.
SIGNED DATE 16.12.20

DELTA COAL - CHAIN VALLEY COLLIERY	SCALE: 1:3000 @ A0	DATE: 15 December 2020	
EXTRACTION PLAN APPLICATION MINIWALL S5 & NMA SECONDARY PILLAR EXTRACTION PLAN 7 - SUBSIDENCE MONITORING PLAN	DRAWN: T Chisholm	DRG NO:	
	CHECKED: D Mclean	REV NO: 0	Delta
	APPROVED: D Mclean	SIZE: A0	

LEGEND

- Fassifern Seam Workings - Existing
- Fassifern Seam Workings - Proposed
- Area(s) of Miniwall Extraction
- Lake Shoreline
- Application Area - Limit of Subsidence
- Previous Secondary Extraction Approval Area
- Wallarah Seam Workings - Existing

HB-W2

HB-W1

NORTHERN MINING AREA (NMA)

HB-E3

HB-E2

HB-E2A

HB-E1

HB-E1A

HB-E1B

Miniwall "S5"

LAKE MACQUARIE

MYUNA COLLIERY
(Fassifern Seam)

LAKE MACQUARIE

MANAGER OF MINING ENGINEERING
I certify that the information shown on this plan is a true indication of the proposed development.
SIGNED DATE 16.12.20

REGISTERED MINE SURVEYOR
I certify that the survey information shown in this plan is correctly represented, in accordance with the relevant legislative requirements.
SIGNED DATE 16.12.20

MINING HEIGHTS - 1ST WORKINGS 3.20m
2ND WORKINGS 3.55m

TYPICAL ROADWAY WIDTH 5.4m
MINIWALL INSTALLATION ROADWAY 7.5m-10.0m
MINIWALL PRE-DRIVEN TAKEOFF ROADWAY 6.5m

DELTA COAL - CHAIN VALLEY COLLIERY

EXTRACTION PLAN APPLICATION
MINIWALL S5 & PILLAR SECONDARY EXTRACTION
PLAN 8 - EXTRACTION AREA PLAN

SCALE:	1:3000 @ A0	DATE:	15 December 2020
DRAWN:	T Chisholm	DRG NO:	C4A0099_8
CHECKED:	D Mclean	REV NO:	0
APPROVED:	D Mclean	SIZE:	A0

Delta

Appendix 15 Subsidence Prediction Report

STRATA2
Ground Control Consulting

LAKE COAL
CHAIN VALLEY COLLIERY

Miniwall S5 and the Adjacent Herringbone Panels of the Northern Mining Area (NMA): Geotechnical Environment, Subsidence Estimates and Impacts

DECEMBER 2020

Report No: CHV-024-Rev2

ABN 19 622 292 460
First Floor, Building B, Edgeworth Town Square
720 Main Road
Edgeworth NSW 2285

REPORT TO : Mr. D. McLean
Mine Manager
Chain Valley Colliery

REPORT ON : Miniwall S5 and the Adjacent Herringbone Panels of the Northern Mining Area (NMA): Geotechnical Environment, Subsidence Estimates and Impacts

REPORT NO : CHV-024-Rev2

REFERENCE : Purchase Order D115918

Rev	Date	Prepared	Status	Signature
A	09.10.2020	D. Hill	Draft	
0	08.12.2020	D. Hill	Final	
1	09.12.2020	D. Hill	Final, amended	
2	10.12.2020	D. Hill	Final, amended	

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Appendix A: Glossary of Terms

1.0 INTRODUCTION

This report addresses key geotechnical aspects of the design of the S5 miniwall panel (MW S5) and the adjacent "herringbone" bord and pillar panels to the north and north-west, in the Fassifern Seam workings at Chain Valley Colliery ("CVC"), including estimates of subsidence effects and impacts. The location of the workings, within the "Northern Mining Area" (NMA) is shown in **Figure 1**. Depth ranges from approximately 140m to 180m in the area of interest, generally increasing to the SE and SW, see **Figure 1**. Total seam thickness increases from 4.8m in the SE to 5.2m in the NW. The nominal height of extraction (miniwall and herringbone) will be 3.5m, leaving around 1.5m of top coal during extraction.

The area of interest covers a range of surface conditions and associated subsidence constraints, from lake floor with a currently approved subsidence limit of 780mm, to highly sensitive foreshore areas, within which negligible subsidence (≤ 20mm) is mandated.

This report builds on the following, earlier **Strata²** reports:

i) CHV-005-Rev0: **Geotechnical Aspects of Herringbone Design**.

ii) CHV-015-Rev0: **Geotechnical Aspects of Secondary Extraction of Herringbone Pillar Panels**.

iii) CHV-019-Rev0: **S5 Panel: Geotechnical Environment, Subsidence Estimates and Impacts**.

This report updates the previous state of knowledge where appropriate (for example, by reviewing the latest subsidence monitoring data following the extraction of MW S3) and brings the relevant information together into one document that addresses the entire area of interest, such that reference to the earlier reports is unnecessary.

Key aspects of the MW S5 layout are as follows, see **Figures 1** and **2**:

i) As per MWs S2-4, S5 Panel is orientated at 119°, rather than the 134° of earlier panels in the MW7-12 area. This orientation is more favourable with respect to the dominant 131° structural direction.

ii) The panel void width is 97m, consistent with recent CVC practice.

iii) Twin heading gate roads with typically 100m long (centres) pillars.

iv) 5.4m wide by 3.2m high roadways.

v) The maingate (MG) and tailgate (TG) S5 chain pillars are 32.6m and 40m wide (solid) respectively, to limit (a) subsidence over MW S2 to S5 Panels and (b) abutment load transfer to the herringbone workings to the north.

Key aspects of the herringbone layout are as follows, see **Figures 1** and **3**:

i) 30m long pillars (centres) for the sub-mains, as this maximises the free cut length at ~14m.

ii) Given that the sub-mains design is fixed on a length of 30m centres, the performance of the system in terms of stability and subsidence is governed by:

   a) Barrier pillar width (typically 40m to 70m).
   b) Sub-Mains pillar width (27m centres).
   c) Mining height, on development and extraction.
   d) Extraction width (span).
   e) Percentage recovery within the extraction area.

iii) Mining height will vary between 3.0m on development (the practicable lower limit for the equipment) and 3.5m on extraction (assuming that some top coal is taken in the lifts).

iv) The extraction span has a controlling influence on overburden caving and the magnitude of the abutment loads transferred to the sub-mains and barrier pillars. The proposed span averages 85m.

v) Percentage recovery within the extraction area is a function of both the herringbone pillar design and the secondary extraction process. Percentage extraction would be expected to range up to a maximum of 85%.

vi) There are no interaction issues between the planned herringbone workings and the previous mining operations of either CVC or Myuna Colliery to the north, see **Figure 1**. Specifically:

   a) The barrier between the proposed CVC herringbone workings and the Myuna Colliery Fassifern Seam workings is ≥ 51m, such that no stress transfer would occur at the depths involved.

   b) There are Myuna Colliery first workings in the overlying Wallarah Seam, but these are ≥ 102m beyond the northern limit of the planned CVC herringbone workings and >1km from MW S5.

   c) There are also some Myuna Colliery workings in the overlying GN Seam, but these are ≥ 847m beyond the northern limit of the planned CVC herringbone workings.

   d) There are CVC workings in the overlying Wallarah Seam in the vicinity of HB1 herringbone panel, but potential secondary extraction of HB1 Panel is excluded from the scope of this study.

The issues addressed herein are as follows:

A. The role of the geological and geotechnical environment.
B. Heights of connective fracturing.
C. Pillar stability on development and subsequent to extraction.
D. Subsidence estimates.
E. Subsidence impacts.

2.0 KEY ASPECTS OF THE GEOLOGICAL / GEOTECHNICAL ENVIRONMENT

The overburden consists of Triassic and Permian strata, comprising massive conglomerate beds (the Munmorah, Karignan, Teralba and Karingal Members), sandstone, carbonaceous shale, coal and claystone (**DGS, 2018**). From a geotechnical / subsidence perspective, the units of particular interest are the massive conglomerate beds in the overburden and the claystone in the floor of the Fassifern Seam, as both will tend to influence subsidence development. The closest boreholes that extend to the Fassifern Seam to the area of interest, **Figure 1**, are:

- JCV 13 in the south-east, (**Figure 4a**),
- JCV 3 in the south (**Figure 4b**),
- EWN 7 in the north-west (**Figure 4c**),
- EWN 2 in the east (**Figure 4d**) and
- EWO 2 in the north (**Figure 4e**).

The significance of the major conglomerates is that voussoir beam analysis suggests they are generally capable of spanning extraction void widths of up to 100m at thicknesses of >15m. This spanning ability begins to break down if the pillars yield and the effective span increases over multiple panels, resulting in increased subsidence.

Important features of the area of interest are:

- the Karingal Conglomerate, beneath the Great Northern (GN) Seam, thins from 39m in the NW to 6m in the SE, see **Figure 5**,
- the Teralba Conglomerate, immediately above the GN Seam, thins from 30m in the SE to 12m in the NW, see **Figure 6**,
- the interburden from the Fassifern Seam extraction horizon to the GN Seam floor thins from 62m in the NW to 44m in the south, see **Figure 7** and
- the other major unit in the overburden is the Munmorah Conglomerate, which is typically around 50m thick and 100m above the Fassifern Seam.

The Fassifern Seam floor includes interbedded coal / carbonaceous shale beds, plus moisture sensitive claystone. The individual claystone beds are 50mm to 300mm thick and the cumulative thickness of claystone in the first 2m of floor in the vicinity of MW S5 and the NMA Herringbone Panels is 0.9m to 1.2m, slightly thinner than that encountered in the MW7-12 area. The claystone typically has a strength of <5MPa and is considered weak.

The significance of the weak claystone floor is that:

a) It can be associated with pillar bearing failure and increased subsidence, if chain pillar stresses are high (critical average stresses are in the 15 to 20MPa range, depending on the pillar geometry).

b) Uncertainties with regard to the long-term mechanical properties and behaviour of weak claystone has favoured the utilisation of empirical design methods based on equivalent mining environments.

3.0 PILLAR DESIGN

From a pillar design perspective, a key issue is the reducing thickness of weak claystone layers within 2m of the working floor to the north and north-west. In previous studies, for areas to the south, “weak floor” has been defined as a total thickness of ≥ 1m of rock with a UCS of ≤ 5MPa, within 2m of the immediate floor. Accordingly, the Fassifern Seam floor has been categorised as “marginally weak” and a conservative pillar design approach has been applied.

In the north-west of the current area of interest, the total thickness of weak rock almost certainly reduces below 1m, suggesting that a more conventional (less conservative) design approach could be adopted. However, the data is currently limited and the approach adopted herein has therefore been to continue with the recent approach of linking the empirically derived pillar strength to a Lake Macquarie database of pillar performance in weak floor conditions.

3.1 Pillar Strength and Design Criteria

The empirical coal pillar design formulae applied herein were developed at the University of New South Wales (UNSW) (**Salamon *et al*, 1996**). These UNSW formulae are founded on extensively researched and broadly-based databases of mining experience. These formulae represent the culmination to-date of work commenced 60 years ago in South Africa after the 1960 Coalbrook disaster (**Salamon and Munro, 1967**). A combined Australian and South African database has been applied to the derivation of formulae that are considered widely applicable (**Hill, 2010).**

The range of parameters in the UNSW failed and intact pillar database can be summarised as follows:

- Depth: 20m to 510m
- Mining Height: 1.0m to 9.2m
- Smallest Pillar Dimension: 2m to 32m
- Bord Width: 3.7m to 15.0m
- Percentage Extraction: 30% to 90%
- Width to Height (w/h) Ratio: 0.9 to 11.2
- Time to Failure: 0 to >80 years

The strength formula for Australian coal pillars with w/h ratios of >5 is as follows:

$$\text{Strength, } \sigma_s = 27.63^{0.51}(0.29*((w_m/5h)^{2.5} - 1) + 1)/(w^{0.22} \times h^{0.11})$$

where:

w_m = minimum pillar width (m)
h = roadway height (m)

Factor of Safety (FoS) can be related to the nominal probability of failure of a panel. A probability of stability of 99.9% is attained at a FoS of 1.63, see **Figure 8**, and further increases in FoS have little

effect, as the probability of stability curve approaches 100% asymptotically. From a risk management perspective, increasing the FoS beyond 1.63 can only reduce the failure probability by <0.1%.

The consequences of collapse are a key consideration, as these determine the acceptable probability of failure, which in turn allows an appropriate FoS to be determined. For example, risk management suggests that the probability of failure for long-term workings under sensitive surface structures should be negligible. In Australia, long-life critical pillars (e.g. in main headings and for the protection of surface infrastructure) are often designed to an FoS of ≥ 2.11, which equates to a nominal failure probability of one panel in a million. This reduces the failure probability to a level that would be considered acceptable in other key fields of public interest.

It should be understood that the nominal probability of failure is related to the life-time of the pillar database underpinning the design methodology; currently the average is around 60 years (i.e. of the order of 120 years of history is available). The annualised probability of failure (a concept more commonly applied in engineering practice) is therefore about one-sixtieth of the nominal failure probability.

The South African and Australian databases from which the UNSW formulae were derived cover a broad range of roof and floor materials, including mudrocks, coal, siltstones and sandstones. Therefore, these materials and the variability in strength that may be associated with them are implicitly recognised and largely catered for in the FoS approach. Uncertainty associated with the natural variability in coal measures strata often prohibits design to low FoS values. Geological variability partly accounts for the scatter in the population of failed pillar cases and usually necessitates design to FoS values of >1.5, equivalent to low failure probabilities. Back analysis indicates that incidences of instability traditionally associated with weak floor, for example, can very often be explained in terms of 'conventional' empirical design criteria.

Similarly, the database encompasses pillars in a significant number of seams in different geotechnical environments; consequently, the existence of pillar weaknesses is very largely reflected and implicit within the variability in the failed and intact pillar cases, such that these weaknesses are again very largely catered for by adopting appropriate FoS values.

For subsidence estimation purposes, the design approach applied herein is calibrated to a database of 71 Lake Macquarie "weak floor" pillar case studies. These case studies encompass the Great Northern, Wallarah and Fassifern Seams, covering four decades of experience. This database incorporates the recent CVC miniwall subsidence experiences.

Figure 9a/b illustrates several key relationships within the Lake Macquarie database. In **Figure 9a**:

i) The 71 Lake Macquarie weak floor cases have initially been divided into nominally stable and failed on the basis of subsidence outcomes. 46 cases associated with ≤ 200mm of subsidence are classed as stable (i.e. strata deformation largely due to elastic system compression), whereas 25 cases that resulted in >200mm of subsidence are classed as failed (i.e. higher deformation, more typical of an overloaded system).

ii) The Lake Macquarie "failed" cases have Factors of Safety ranging from 0.55 to 2.66 and the "stable" cases have Factors of Safety ranging from 1.45 to 25.0.

iii) The failed cases involving high width to height (w/h) ratio pillars have high pillar stresses (e.g. miniwall chain pillars).
iv) The overlap between the failed and stable cases is largely a function of natural variability in the geotechnical properties of the strata (i.e. some failures are associated with particularly weak rock, whilst some of the stable cases are associated with relatively stronger strata).

In **Figure 9b**, cases involving average pillar stresses of >15MPa have been excluded. The failed case with the highest FoS of 2.66 involved 220mm of subsidence (i.e. marginal in terms of the 200mm failed / stable criterion). The associated data point is for CVC MG4 (Fassifern Seam).

In **Figure 9c**, cases involving average pillar stresses of >15MPa have again been excluded and the data is presented in FoS versus subsidence form. The trendline for the failed cases crosses the CVC 780mm extraction approval limit at a Factor of Safety of around 1.7.

Figures 10a/b reproduce the database in histogram form. **Figure 10a** includes all Lake Macquarie data and, most importantly, confirms that that the approved subsidence limit of 780mm can be met at a Factor of Safety of ≥ 2.11, irrespective of pillar stress.

Figure 10b excludes those cases involving average pillar stresses of >15MPa and indicates that a lower FoS range can meet the design criteria under controlled circumstances. At a Factor of Safety of ≥ 1.8, but <2.2, subsidence averages 202mm, with a maximum value of 700mm, the latter being unacceptably close to the approval limit. However, the maximum value involves a chain pillar with an average pillar stress of 14.1MPa. If this value is excluded, the average reduces to 102mm, with a maximum value of 200mm.

Having reviewed the interrelationships within the database, the design matrix summarised in **Table 1** is recommended for:

- miniwall chain pillars and
- the barriers and sub-mains pillars of the herringbone pillar layout,

in secondary extraction situations requiring limited and predictable subsidence (i.e. <500mm), related largely to elastic system compression (noting that the detailed subsidence analysis is summarised in **Section 5.0**).

Table 1: Pillar Design Matrix for Subsidence Controlled to <0.5m

FoS Range	Pillar Stress (MPa)
≥ 1.8, <1.9	≤ 13
≥ 1.9, <2.0	≤ 14
≥ 2.0, <2.1	≤ 15
≥ 2.11	Practically unlimited

Furthermore, for the first workings in areas requiring negligible subsidence (i.e. ≤ 20mm), the following criteria are recommended:

- **average final pillar stresses of <12MPa and**
- **Factors of Safety of ≥ 2.3.**

3.2 Pillar Loading

The key aspects of the pillar loading environment are as follows:

i) On development, tributary area theory provides a reasonable, often conservative estimate of pillar loading (**Salamon and Oravecz, 1976**).

ii) On extraction, caving is likely to be capped at the base of the Teralba Conglomerate (26-30m thick), some 40m to 50m above the extraction horizon (immediately above the Great Northern Seam. The average goaf stress is therefore lower than normal, at 1-2MPa. Conversely, pillar abutment loading is higher than normal.

iii) Final pillar loading for the extraction panels can therefore be conservatively estimated by ignoring caving above the Teralba Conglomerate, such that the effective abutment angle is ~36° for the 97m void width of MW S5 and 33° for the 85m void width of the NMA Herringbone Panels.

iv) In the case of Maingate S5, there may be minor load transfer to the herringbone panels to the north. This component can be estimated using the Stress Reduction Factor, R (**Peng and Chiang, 1984, Mark, 1990**) and has also been modelled.

v) There is also load sharing between the sub-mains and final “dog kennel” pillars of the herringbone panels, noting that these have solid widths of 21.5m and 21.1m respectively (the latter being the average of 17.6m and 24.7m for the dog kennel pillars), see **Figure 11**. Again, the apportionment of the single abutment load between the pillars is estimated using the ‘R’ Factor.

3.3 Pillar Design Outcomes

A uniform roadway width of 5.4m is assumed for design purposes.

3.3.1 MW S5

The design outcomes for the MW S5 pillars are summarised in **Table 2**.

Table 2: Design Outcomes for the Chain Pillars of MW S5 Panel

Location	Loading Condition	Depth (m)	Pillar						Pillar FoS (Salamon)	R Value
			Height (m)	Width (m)	Length (m)	w/h Ratio	Stress (MPa)	Strength (MPa)		
TG S5 (I/B)	Double Abutment	178	3.2	40.0	94.6	12.5	14.9	45.9	3.1	N/A
TG S5 (O/B)		158					12.9		3.6	
MG S5 (I/B)	Single Abutment	177		32.6		10.2	10.0	33.6	3.4	0.91
MG S5 (O/B)		153					8.6		3.9	0.94
MG S5 (I/B)	Double Abutment	177					15.4		2.2	N/A
MG S5 (O/B)		153					12.9		2.6	

The following comments are made regarding these results:

i) The chain pillars are all long-term stable in their final condition, with FoS values of ≥ 2.2.

ii) Stress transfer from the MG S5 chain pillar to the northern area, including the herringbone workings, would be negligible (i.e., the R value is >0.9).

iii) Under single abutment loading (i.e., prior to the herringbone workings), the MG S5 chain pillar FoS is ≥ 3.4, which is indicative of negligible subsidence.

iv) Under (localised) double abutment loading due to subsequent herringbone extraction to the north, the MG S5 chain pillars would remain long-term stable (i.e., FoS values of ≥ 2.2, with <0.5m of associated subsidence).

3.3.2 NMA Herringbone Panels

A uniform roadway and stub width of 5.5m is assumed for design purposes.

3.3.2.1 First Workings – Run-out Pillars

The design outcomes for the run-out pillars are summarised in **Table 3**.

Table 3: Design Outcomes for the Run-out Herringbone Pillars

Depth (m)	Pillar						Stub		Pillar FoS (Salamon)
	Height (m)	Width (m)	Length (m)	w/h Ratio	Stress	Strength (MPa)	Interval (m)	Length (m)	
≤ 150	3.1	16.5	24.5	5.3	6.1	14.8	19.1	14.1	2.4
160		17.0		5.5	6.5	15.1	19.6		2.3
170		18.0		5.8	6.8	15.6	20.8		2.3
180		19.5		6.3	7.1	16.4	22.5		2.3

All of the run-out pillars would be consistent with ≤ 20mm of subsidence in a "first workings" scenario, with no reliance on stress transfer to any of the larger sub-mains or barrier pillars.

3.3.2.2 Secondary Extraction

The design outcomes for the three-heading, sub-mains pillars at depths of cover of between 140m and 180m are summarised in **Table 4**. A mining height of 3.1m is assumed, implying no secondary bottom coaling of the sub-mains pillars.

Table 4: Herringbone Sub-Mains Pillar Design Outcomes

Loading Condition	Extraction Width (centres, m)	Depth (m)	Pillar						Pillar Fos
			Height (m)	Width (m)	Length (m)	w/h Ratio	Stress (MPa)	Strength (MPa)	
First Workings	N/A	140	3.1	21.5	24.5	6.9	5.4	17.5	3.2
		160					6.2		2.8
		180					6.9		2.5
Post-Extraction (Single Abutment Loading)	80	140					6.5		2.7
		160					7.7		2.3
		180					8.9		2.0

The following comments are made regarding these results:

i) First workings Factors of Safety are very high, at ≥ 2.5.

ii) Post-extraction pillar stresses are moderate (<9MPa), consistent with the design criteria.

iii) Post-extraction, Factors of Safety remain high at ≥ 2.0, also as per the design criteria.

iv) Accordingly, <0.5m of subsidence would be expected, across the expected depth range of 140m to 180m, following extraction.

With regard to the barriers, the key assumptions are as follows:

i) Final pillar load equals the initial tributary area load, plus the double abutment load, see **Figure 11**.

ii) The mining height is increased to 3.5m, due to potential removal of top coal within the extraction area.

iii) The geometry is irregular, see **Figure 12**, and the average or "effective" width has been calculated.

iv) Previous analyses indicated that an effective width of 35m would suffice. However, reference to the mine plan, **Figure 1**, indicates that actual effective widths are >40m and typically >50m. Therefore, further analyses have been performed with regard to both the theoretical minimum (35m) and the representative minimum (40m) and the results are summarised in **Tables 5a** and **5b** respectively.

Table 5a: Theoretical Minimum (35m) Barrier Design Outcomes

Loading Condition	Extraction Width (centres, m)	Depth (m)	Pillar					Pillar FoS
			Height (m)	Width (solid, m)	w/h Ratio	Stress (MPa)	Strength (MPa)	
First Workings	N/A	140	3.5	35.0	10.0	4.3	31.4	7.3
		160				4.9		6.4
		180				5.5		5.7
Post-Extraction (Double Abutment Loading)	80	140				10.9		2.9
		160				12.7		2.5
		180				14.5		2.2

Table 5b: Representative Minimum (40m) Barrier Design Outcomes

Loading Condition	Extraction Width (centres, m)	Depth (m)	Pillar					Pillar FoS
			Height (m)	Width (solid, m)	w/h Ratio	Stress (MPa)	Strength (MPa)	
First Workings	N/A	140	3.5	40.0	11.4	4.2	38.2	9.1
		160				4.8		7.9
		180				5.4		7.0
Post-Extraction (Double Abutment Loading)	80	140				10.0		3.8
		160				11.7		3.3
		180				13.3		2.9

The following comments are made regarding these results:

i) The analysis confirms that the theoretical effective solid width of 35m would be adequate, with a FoS of ≥ 2.2, see **Table 5a**.

ii) The analysis confirms that the representative effective solid width of 40m would be conservative, with a FoS of ≥ 2.9, see **Table 5b**.

iii) Accordingly, <0.5m of subsidence would be expected across the expected depth range of 140m to 180m, following extraction.

4.0 HEIGHT OF CONNECTIVE FRACTURING

4.1 Connective Fracturing Theory

The strata above an extracted area forms a goaf made of a number of zones, as presented in the **Forster and Enever (1992)** longwall model, which is shown in **Figure 13a**; the approximate location of the overlying Great Northern Seam, Karingal, Teralba and Munmorah Conglomerates in the overburden profile are shown in **Figure 13b**. Note that there are no overlying workings in this case.

Commencing at the extraction horizon, the first zone is the "Caved Zone", which comprises loose blocks of detached rock occupying the cavity created by mining. This typically extends to a height above the seam of 5 to 10 times the extraction height, or between 17.5m and 35m for a Fassifern Seam mining height of 3.5m. In this case, the Caved Zone is expected to be arrested at the base of the Teralba Conglomerate, 45m to 50m above the extraction horizon (see **Section 4.4**).

Above this is the "Fractured Zone", in which the rock sags, with significant bending, fracturing, joint dilation and bed separation. **Forster's** model suggests that the combined height of the caved and fractured zones extends to between 21 and 33 times the extracted height for super-critical longwall panels (or between 73.5 and 115.5m for an extraction height of 3.5m). A similar outcome is predicted by the **Kendorski (1993)** longwall model. Within this combined caved and fractured zone, very large increases in bulk horizontal and vertical permeability are expected (termed "connective cracking").

Above the Fractured Zone is the "Constrained Zone" (**Forster**) or "Dilated Zone" (**Kendorski**). This zone is characterised by bedding dilation and discontinuous fracturing. This results in an increase in the horizontal permeability and associated drawdown in groundwater levels, which recover over time. Based on the Wyee longwall experience, **Forster (1995)** suggests the minimum thickness of the Constrained Zone should equate to "12T" for longwall mining, assuming no significant geological structure within the zone. At an extraction height of 3.5m, this equals 42m.

Other Australian workers (e.g. **MSEC, 2005**) have related the height of the combined Caved plus Fractured Zones solely to the mined panel width. Such approximations are probably appropriate for longwall mining at typical Australian extraction heights of around 3m to 3.5m. Other workers have also noted that the upward extent of fracturing is a function of the extracted span (**Mills and O'Grady, 1998**).

British researchers (**Whittaker and Reddish, 1989; Follington and Isaac, 1990**) considered the influence of both panel span and mining height on sub-surface fracture heights. Physical modelling suggested that sub-surface fracture heights could be estimated from the predicted maximum surface tensile strain ($+E_{max}$) values (**Whittaker and Reddish, 1989**); thereby linking sub-surface fracturing to the overall geometry. **Follington and Isaac** found that the failure height increased relative to the mining height, as panel width increased, see **Figure 14**. As panel width increased from 80m to 120m, the failure height increased from 18 to 25 times the mining height (i.e. close to **Forster's** lower bound value of 21 times the mining height).

More recently, Australian workers have sought to assess the combined effect of panel width and mining height on sub-surface fracturing (**Tammetta, 2013**; **Ditton and Merrick, 2014**).

The **Tammetta (2013)** method appears to relate to the height of the Constrained / Dilated Zone (i.e. all appreciable fracturing and bedding / joint dilation). The **Tammetta** equation defines H, the "Complete Height of Groundwater Drainage" (CHGD) as follows:

$H = 1{,}438\ ln(4.315 \times 10^{-5}u + 0.9818) + 26$

where $u = wt^{1.4}d^{0.2}$
and w = void width (m)
t = extraction height (m)
d = depth (m)

The extraction height is 3.5m for MW S5, but reduces to effectively 3.0m in the herringbone panels, allowing for the lower in-panel extraction (i.e. 3.5m x 85%).

The **Tammetta** equation generates "CHGD" values of:

- 93-96m for MW S5 (i.e. the equivalent of ~27T) and
- 65-69m for the herringbone panels (i.e. the equivalent of 22-23T).

Tammetta also suggests that an Upper 95% Confidence Limit can be defined by adding 37m to the mean value (e.g. producing a U95%CL value of 132m in the case of MW S5, the equivalent of ~38T). It should be noted that it is not rational for the U95%CL to be defined by adding a constant 37m; this value should bear some relationship to the geometry and the mean value (otherwise, in the extreme, a panel width of 0m would have an associated U95%CL value of 37m, which is not credible).

The **Ditton and Merrick** equations aim to define the height of the "A Zone", a term originally proposed by **Whittaker and Reddish** and analogous to the Fractured Zone. **Ditton and Merrick** derived two equations, one solely based on geometry and a second intended to reflect the positive impact (i.e. reduction in "A Zone" height) of a massive spanning bed within the overburden. The latter is considered by **Ditton** to be more relevant to the CVC geotechnical environment and the associated equation was applied successfully for the MW1-12 area, as well as more recently for MWs CVB1, S1-4 and N1.

The **Ditton and Merrick** geology equation is as follows:

$A = 1.52W'^{0.4}\ H^{0.535}T^{0.464}t^{0.4} \qquad +aW'$

Where W' = the minimum of actual panel void width and "critical" panel width (taken as 1.4H)
H = depth
T = extraction height
t = effective thickness of the massive unit (19m according to **Ditton** in this case)

The +aW' term defines an Upper 95% Confidence Limit or "U95%CL". For sub-critical panels, 'a' is 0.15.

The following comments are made regarding the results obtained with this equation, see also **Figure 15**:

i) The average fracture height for MW S5 varies between 77m and 83m (i.e. 22-24T) and the upper bound fracture height varies between 92m and 98m (i.e. 26-28T and almost the same as the mean values from the **Tammetta** equation).

ii) The average fracture height for the herringbone panels varies between 65m and 74m (i.e. 22-25T, similar to the Tammetta mean values) and the upper bound fracture height varies between 78m and 87m (i.e. 26-29T).

iii) The **Ditton and Merrick** equation is less conservative than the **Tammetta** equation at the miniwall void width of 97m. The two equations converge at the reduced panel width of 85m associated with the herringbone panels.

4.2 Local Experience

Table 6 summarises the key geometrical parameters and subsidence outcomes for the local (Wyee and CVC) database of 8 longwall and 18 miniwall panels on the Fassifern Seam.

Table 6: Wyee (Mannering) and Chain Valley Collieries - Longwall and Miniwall Panel Geometry and Subsidence Database

Case	Void Width (m)	Depth (m)	Mining Height (m)	Inter-Panel Chain Pillar Width (m)	Subsidence (m)	Comment
Wyee LW1	216	212	3.44	N/A	2.20	Multi-seam workings
Wyee LW17	130	174	3.2	45	0.45	3 adjacent panels
Wyee LW18	130	172	3.2		0.55	3 adjacent panels
Wyee LW19	130	170	3.2		0.65	3 adjacent panels
Wyee LW20	140	180	3.2	N/A	0.4	Isolated panel
Wyee LW21	140	175	3.2	N/A	0.45	Isolated panel
Wyee LW22	150	185	3.2	45	N/A	2 adjacent panels
Wyee LW23	150	195	3.2		0.50	2 adjacent panels
CVC MW4	97	196	3.4	40	0.22	3 adjacent panels
CVC MW5	97	200	3.4	30.6	0.46	3 adjacent panels
CVC MW5a	97	200	3.4		0.46	3 adjacent panels
CVC MW1	72	200	3.4	30.6	0.20	10 adjacent panels
CVC MW2	72	200	3.4	30.4	0.40	10 adjacent panels
CVC MW3	97	200	3.4	32.6	0.70	10 adjacent panels
CVC MW6	97	198	3.4		0.80	10 adjacent panels
CVC MW7	97	195	3.4		0.90	10 adjacent panels
CVC MW8	97	193	3.5		1.00	10 adjacent panels
CVC MW9	97	191	3.5		1.20	10 adjacent panels
CVC MW10	97	183	3.5		0.90	10 adjacent panels
CVC MW11	97	178	3.5		0.60	10 adjacent panels
CVC MW12	97	173	3.5	36.1	0.30	10 adjacent panels
CVC CVB1	97	225	3.5	N/A	0.45	Multi-seam workings
CVC MW S1	97	195	3.5	N/A	0.1	Isolated panel
CVC MW N1	97	170	3.5	N/A	<0.1	Isolated panel
CVC MW S2	97	176	3.5	N/A	<0.1	First panel
CVC MW S3	97	170	3.5	N/A	<0.15	2 adjacent panels

The following comments are made regarding this local database:

i) The panel void width range of 72m to 216m is large.

ii) The depth range of 162m to 225m is quite narrow. MW S5 is at the bottom of this range (i.e. depths of 162m to 171m). The herringbone panels extend into shallower areas, warranting the conservative design approach (i.e., reduced span).

iii) The extraction height range of 3.2m to 3.5m is narrow and consistent with the proposed workings (i.e., 3-3.5m).

iv) The Wyee panels were the subject of detailed geotechnical investigation, focusing on subsidence and the development and extent of sub-surface fracturing (**Holla, 1989; Li *et al*, 2006**).

v) The 45m (solid width) Wyee chain pillars all meet the criteria for long-term stability with limited subsidence discussed in **Section 3.1** (i.e. Factors of Safety of >2.11).

vi) The 40m chain pillar between CVC MWs 4 and 5 is long-term stable (FoS of 2.66) and a controlling influence with regard to the very limited subsidence over MW4 (i.e., 0.22m).

vii) The historical 30.4m to 32.6m wide CVC chain pillars (up to MG10) for did not meet the stipulated criteria for long-term pillar stability under double abutment loading (i.e. Factors of Safety of <2.11 with pillar stresses of >15MPa). Even then, subsidence only increases to >0.5m when >3 adjacent panels are mined and spanning / bridging of the overburden reduces.

viii) The chain pillar width was increased from 32.6m to 36.1m for MG11. This is considered to have been the major factor in the reduced subsidence experienced over MW12 (0.15-0.30m, at a pillar FoS of ~2.3).

ix) Multi-seam workings at both mines have been associated with increased subsidence magnitudes (Wyee LW1 and CVC CVB1).

x) No appreciable subsidence has been measured by bathometric survey above CVC MWs S1 and N1 to-date, and subsidence in the MW S2-S3 area is <0.15m, noting that individual survey accuracy is considered to be approximately 100mm (such that the error band for two surveys is 200mm).

Table 7 overleaf summarises the local database in the context of the theoretical outcomes of the **Ditton and Merrick (2014)** and **Tammetta (2013)** equations. Also included are the results for the planned MW S5 and herringbone panels.

The following comments are made regarding the outcomes:

i) **Tammetta's** equation is much less sensitive to depth than that of **Ditton and Merrick**.

ii) **Tammetta's** average values correlate very closely to the void width.

iii) The Wyee LW1 data point was the subject of detailed research **(Holla, 1989; Holla and Buizen, 1990)**, from which a Fractured Zone height of 126m was derived. **Ditton and Merrick** used this a calibration point for their model. The **Tammetta** equation suggests a CHGD of 208m to 245m (average and U95%CL), which is effectively to surface (i.e. H = 212m).

iv) The Wyee LW1 data point is also interesting in that it represents a multi-seam case, with remnant pillars in the overlying Great Northern Seam.

v) The **Tammetta** U95%CL results for Wyee LWs 17 to 23 range from 149m to 169m and would have been a cause for concern if they had been available at the time of mining, given that they suggest only 17m to 26m of super-incumbent cover to the lake floor (including <10m of rock). This was the area investigated by **Li *et al* (2006)**; no inflow / seepage issues were reported.

vi) It is concluded, on the basis of the local experience, that:

- the **Ditton and Merrick** values (average and U95%CL) are credible and
- the **Tammetta** average values are credible at panel widths of ≤ 150m.

Table 7: Theoretical Fractured Zone Heights for the Local Database

Case	Void Width (m)	Depth (m)	Mining Height (m)	Ditton & Merrick 'A' Zone Height		Tametta 'CHGD'	
				Average (m)	U95%CL (m)	Average (m)	U95%CL (m)
Wyee LW1	216	212	3.44	125	158	208	245
Wyee LW17	130	174	3.2	89	108	113	150
Wyee LW18	130	172	3.2	88	108	112	149
Wyee LW19	130	170	3.2	88	107	112	149
Wyee LW20	140	180	3.2	93	114	122	159
Wyee LW21	140	175	3.2	92	113	121	158
Wyee LW22	150	185	3.2	97	120	131	168
Wyee LW23	150	195	3.2	100	123	132	169
CVC MW1	72	200	3.4	78	89	71	108
CVC MW2	72	200	3.4	78	89	71	108
CVC MW3	97	200	3.4	88	102	95	132
CVC MW4	97	196	3.4	87	101	94	131
CVC MW5	97	200	3.4	88	102	95	132
CVC MW5a	97	200	3.4	88	102	95	132
CVC MW6	97	198	3.4	87	102	94	131
CVC MW7	97	195	3.4	86	101	94	131
CVC MW8	97	193	3.5	87	102	98	135
CVC MW9	97	191	3.5	87	101	97	134
CVC MW10	97	183	3.5	85	99	97	134
CVC MW11	97	178	3.5	83	98	96	133
CVC MW12	97	173	3.5	82	97	96	133
CVC MW CVB1	97	225	3.5	94	109	101	138
CVC MW S1	97	195	3.5	88	102	98	135
CVC MW N1	97	170	3.5	81	96	95	132
CVC S2	97	176	3.5	83	98	96	133
CVC S3	97	170	3.5	81	96	95	132
CVC S4 Inbye	97	178	3.5	83	98	96	132
CVC S4 Outbye	97	156	3.5	78	92	94	131
CVC S5 Inbye	97	178	3.5	83	98	96	132
CVC S5 Outbye	97	154	3.5	77	92	93	131
Herringbone Workings	85	180	3.0 (effective)	74	87	69	106
		140		65	78	65	102

4.3 SCT Surface Tensile Strain Approach

SCT (2008) used two-dimensional numerical (FLAC) modelling and field studies of overburden strata conductivity to compliment the historical database. They studied the relationships between surface tensile strain, subsidence, depth and groundwater inflow (consistent with the concept put forward by **Whittaker and Reddish, 1989**). SCT stated that no issues were associated with systematic strains of <4mm/m and that inflow became problematical at strains of >10mm/m (consistent with UK experience).

Table 8 summarises the tensile strain results for the Wyee / Mannering and CVC database, including the planned MW S5 and herringbone panels, based on the standard equation:

Strain, E = 1000k(Subsidence/Depth)

Where:

k is a constant dependent on coalfield geology (k = 0.4 for the Newcastle Coalfield).

Table 8: Systematic Tensile Strain Results for the Local Database

Panel	Subsidence Smax (m)	Depth, H (m)	Tensile Strain (mm/m)	
			E/k	E (k = 0.4)
Wyee LW1	2.20	212	10.4	4.2
Wyee LW17	0.45	175	2.6	1.0
Wyee LW18	0.55	175	3.1	1.3
Wyee LW19	0.65	175	3.7	1.5
Wyee LW20	0.40	180	2.2	0.9
Wyee LW21	0.45	175	2.6	1.0
Wyee LW23	0.50	185	2.7	1.1
CVC MW7-12	1.20	190	6.3	2.5
CVC MW4-5	0.22	200	1.1	0.4
CVC MW5-5A	0.46	210	2.2	0.9
CVC MW CVB1	0.45	225	2.0	0.8
CVC MW N1	0.00	160	0.0	0.0
CVC MW S1	0.10	190	0.5	0.2
CVC MW S2	0.15	176	0.9	0.3
CVC MW S3	0.15	170	0.9	0.4
CVC MW S4	0.30	162	1.9	0.7
CVC MW S5 (Inbye)	0.36	178	2.0	0.8
CVC MW S5 (Outbye)	0.36	154	2.3	0.9
CVC Herringbone	0.40	140	2.9	1.1
	0.50	180	2.8	1.1

Note that the S_{max} value for MWs S4 and S5, as well as the planned herringbone workings are the estimates derived from numerical modelling, as detailed in **Section 5**.

For the purpose of simple local comparison, it is not necessary to know the 'k' value; it is enough to compare E/k ratios, viz:

- Wyee LW1: 10.4
- Wyee LWs 17 to 23: 2.2 to 3.7
- Previous CVC Miniwalls: 0.0 to 6.3
- Planned CVC MW S5: 2.0-2.3
- Planned CVC Herringbone Workings: 2.8-2.9

Figure 16 is adapted from the **SCT ACARP** report; with respect to strain, it is noted that the local values generally plot in the range indicated as benign by **SCT**, with CVC MWs 7-12 plotting just below the "No Observed Water Inflow Issues" line. In particular, the planned MW S5 and herringbone workings plot well inside the "No Issues" zone. Also shown in the figure is the 7.5mm/m strain limit derived from the **Wardell Guidelines (1975)** and **Holla's** k value of 0.4 for the Newcastle Coalfield. This limit line is practically the same as the SCT 10mm/m line, which is based on a k value of 0.6.

4.4 Spanning of the Karingal and Teralba Conglomerates

A two-dimensional analytical beam model has been utilised to assess the spanning ability of both the Karingal and Teralba Conglomerates. Traditionally, such beam analyses have focussed primarily on the spanning ability of the latter, but in this case the significant thickening of the Karingal Conglomerate to the north means this unit is also of interest.

For the purpose of this study, there are four key units of interest, namely:

- the 12-30m thick Teralba Conglomerate above the Great Northern Seam,
- the approximately 47-65m of interburden from the Fassifern Seam working section to the base of the Teralba Conglomerate (i.e. including the GN Seam),
- the 6-39m thick Karingal Conglomerate below the Great Northern Seam and

- the approximately 23-44m of interburden from the Fassifern Seam working section to the base of the Karingal Conglomerate.

The model assesses potential modes of beam failure involving both linear elastic and voussoir arch (i.e. jointed rock mass) properties. A major advantage is that it allows the sensitivity of an outcome to various input parameters to be rapidly tested; this parametric analysis provides insight of roof behaviour. The model has been applied by Strata² geotechnical engineers in a variety of mining environments and situations for over 20 years.

A review of previous Chain Valley studies, laboratory tests, rock mass characterisation and *in situ* stress testing results indicates that the properties summarised in **Table 9** are appropriate inputs.

Table 9: Beam Analysis Inputs for MW S5 and the Herringbone Panels

Parameter	Interburden	Teralba Conglomerate	Karingal Conglomerate
Depth to Base (m)	144 - 180	100 - 130	126 - 142
$\sigma_1 : \sigma_V$ Ratio	2:1		
UCS (MPa)	30	50	
E (GPa)	5	12	
Beam Thickness (m)	2	12 - 30	6 – 39
Joint Friction Angle (°)	35	45	
Joint Dip Angle (°)	70 to 90 (70 conservatively selected)		

The important feature of the interburden is that it is expected to cave readily. For the purposes of this analysis, the main function of the interburden is to form a caving arch that reduces the effective span at the base of the overlying conglomerate units.

For example, assuming a moderately conservative 20° caving angle from the working horizon, it can be shown that over a minimum of:

- 47m of interburden to the Teralba Conglomerate, the span reduces by ~34m and
- 23m of interburden to the Karingal Conglomerate, the span reduces by ~17m.

It can also be shown that the probable initial mode of beam failure would be abutment crushing, with the roof sagging and overstressing the rock material at its margins. This would tend to be manifested by guttering, accompanied by buckling. In the analysis, “failure” (i.e. caving) is expected to initiate at a Factor of Safety (FoS) of 1, whereas long-term stability would be expected at FoS values of ≥ 2.

For this analysis, the simplest representation of the results takes the form of a schematic NW-SE cross-section, see **Figure 17**.

The results are summarised as follows:

i) In spite of thinning to the NW, the Teralba Conglomerate is long-term stable across the entire area of interest (i.e. FoS values of >2).

ii) The Karingal Conglomerate becomes long-term stable in the NW, but fails elsewhere.

4.5 Conclusions Regarding the Theoretical Height of Connective Cracking

The following conclusions are drawn from the preceding analysis:

i) **Forster’s** approach is for super-critical longwalls and is not applicable to the sub-critical MW S5 or the herringbone panels.

ii) The **Tammetta** equation is inconsistent with local experience at panel widths of >150m.

iii) The values derived using the **Ditton and Merrick (2014)** geology equation are consistent with local experience and this equation has been successfully applied at CVC in recent years. This approach suggests heights of connective fracturing of ≤ 81m for MW S5 and ≤ 74m for the herringbone panels.

iv) The **SCT (2008)** approach is considered the most rational, as it relates to the expected maximum values of strain, the latter being a key parameter for permeability. The approach suggests that the MW S5 and herringbone designs are conservative, from a "potential inflow" perspective.

v) In practice, the height of connective cracking would almost certainly be capped at the base of the Teralba Conglomerate, only around 47-65m above the workings.

4.6 Geological Structure

Most of the panels in the local database encountered geological structures, see **Table 10**.

Table 10: Major Structures Encountered by Wyee and CVC Panels

Case	Void Width (m)	Depth (m)	Mining Height (m)	Subsidence Smax (m)	Major Geological Structure
Wyee LW1	216	212	3.44	2.20	Dyke parallel with T/G; 35-55m disturbance zone
Wyee LW17	130	174	3.2	0.45	0.3m fault at inbye end of M/G
Wyee LW18	130	172	3.2	0.55	No major geological structure
Wyee LW19	130	170	3.2	0.65	Fault zone with 0.6-1.4m throw, inbye half of block
Wyee LW20	140	180	3.2	0.4	Minor 0.1-0.4m faults in block
Wyee LW21	140	175	3.2	0.45	0.8m fault in block; 3m fault in T/G
Wyee LW22	150	185	3.2	N/A	4m normal fault zone at inbye end of panel
Wyee LW23	150	195	3.2	0.50	4m normal fault zone at inbye end of panel
CVC MW4	97	196	3.4	0.22	1-2m normal fault through the entire block
CVC MW5	97	200	3.4	0.46	Locallised 0.1-0.2m normal faults in block; normal faults up to 2.7m in chain pillars
CVC MW5a	97	200	3.4	0.46	Normal faults up to 2.7m throughout the block and chain pillars
CVC MW1	72	200	3.4	0.20	0.4m normal fault in inbye quarter of TG1
CVC MW2	72	200	3.4	0.40	No major geological structure
CVC MW3	97	200	3.4	0.70	No major geological structure
CVC MW6	97	198	3.4	0.80	Dyke ~3m thick in outbye half of block; 2m normal fault zone in inbye half of M/G and extending into block
CVC MW7	97	195	3.4	0.90	0.25m dyke in outbye half of block; 2m normal fault in inbye half of block
CVC MW8	97	193	3.5	1.00	0.25m dyke mid-block
CVC MW9	97	191	3.5	1.20	1.8m normal fault, inbye quarter of block, trending into M/G chain pillar
CVC MW10	97	183	3.5	0.90	1-1.5m normal faults through three-quarters of the block
CVC MW11	97	178	3.5	0.60	1-1.5m normal faults through outbye half of the block
CVC MW12	97	173	3.5	0.30	No major geological structure
CVC CVB1	97	225	3.5	0.45	inbye third of the block
CVC MW S1	97	195	3.5	0.1	Minor 0.1-0.4m faults in block and gate roads
CVC MW N1	97	170	3.5	<0.1	Minor 0.1-0.3m faults in block and gate roads
CVC MW S2	97	176	3.5	<0.1	Minor 0.2m fault in block and tailgate
CVC MW S3	97	170	3.5	<0.15	1.5m fault in the inbye half of the block

The following comments are made regarding **Table 10**:

i) Two-thirds of the panels in the local database were directly impacted by significant geological structures (defined for this purpose as faults with throws of >0.5m or dykes).

ii) There is no obvious relationship between the subsidence magnitude and the presence or absence of major geological structure.

iii) One of the reasons why the faults do not impact on subsidence is that they are normal faults dipping at moderate to high angles (60° to 90°). As such, they have a reduced impact on beam stability and the spanning ability of the overburden, in comparison to low angle thrust faults, which have been associated with increased subsidence magnitudes elsewhere, such as Mandalong.

iv) However, there is local evidence that structures can be associated with strain concentrations at surface. Over Wyee LW1, measured maximum strain values varied between 2.5mm/m on the MG side and 8.1mm/m on the TG side, versus the predicted maximum tensile strain of 4.2mm/m. The maximum measured value coincided with the dyke zone adjacent to the tailgate. This is consistent with the findings of **Ditton and Frith (2003)**, who suggested that surface strain concentrations of 2 to 3 times the systematic strain could be associated with fracturing. However, the surface strain concentration does not seem to have translated into a height of fracturing increase over Wyee LW1.

v) Localised strain concentrations, due to geological structure (or any other factor) are implicit within empirical strain limit guidelines based on "systematic" strains (i.e. empirical limits / impact guidelines are an outcome of actual experiences that incorporate and reflect the vagaries of geology). Further, the presence of major geological structures is also implicit in the empirical models and equations for heights of fracturing, such as that of **Ditton and Merrick (2014)**.

vi) Nonetheless, even a strain multiple of 2 to 3 would have no material consequences for MW S5 or the herringbone panels.

vii) **Figure 18** shows the major structural features, based on in-seam drilling, mapping in adjacent areas / seams and exploration drilling results. The MW S2 to S5 panels are orientated at 119°, rather than the 134° of earlier CVC panels. This orientation is much more favourable, with respect to the dominant 131° structural direction. Similarly, the sub-mains and run-outs of the herringbone panels are orientated at favourably moderate angles to the major structural direction.

Given that:

- voussoir beam analysis suggests that the prevalent features would not appreciably impact on the spanning ability of the Teralba Conglomerate and
- the favourable experiences from previous extraction panels with exposure to major structures,

faults and dykes in the area of interest are considered to be of no material consequence.

Overall, the structural environment is considered to have no significant adverse implications for post-extraction subsidence and sub-surface fracturing.

4.7 Rock Cover Requirement

Figure 19 shows rock cover contours for the area of interest, based on the latest detailed survey results. Rock cover varies from 118m in the NE, to 130m in the NW and 166m in the SE. Rock cover therefore significantly exceeds the Fractured Zone height (≤ 96m at the SE / inbye end of MW S5 and <85m for the northern herringbone panels in the area of minimum rock cover).

5.0 SUBSIDENCE ESTIMATION

It was concluded in **Section 3 (Pillar Design)** that subsidence due to MW S5 extraction was expected to be limited in the long-term (<0.5m) due to the high final FoS of the MG S5 chain pillars, even under double abutment loading related to subsequent herringbone extraction to the north (FoS ≥ 2.2). To compliment this empirical subsidence estimate, numerical modelling has been conducted using the three-dimensional, displacement discontinuity code "LaModel" (**Heasley and Chekan, 1999**), which has been successfully applied by the author to a variety of situations at a number of NSW mines over the last decade.

5.1 Material Property Inputs and Assumptions

LaModel incorporates yielding elements in the coal seam properties enabling the yield zone, which is manifested in practice by rib spall and fracturing, to be simulated. The results of numerical codes are sensitive to the material parameters inputted and require calibration. In LaModel, the following material input parameters are important:

- Young's Modulus of the coal and overburden,
- Poisson's Ratio of the coal and overburden,
- overburden lamination thickness,
- goaf loading height and
- mass strength of coal at a width to height (w/h) ratio of 1.

LaModel incorporates default values for material properties, developed from simulations of a large number of case histories. However, the adoption of site-specific values determined via a calibration process is recommended, where the data is available. Calibration involves adjusting the modelled, site-specific mechanical properties to provide the best correlation between predicted and measured values of pillar stress and surface subsidence (**White and Hill, 2017**). For this study, the calibration developed for MW S5 has again been applied to the subsequent herringbone extraction operations (**Strata² 2020**). This primarily involved reference to geotechnical and subsidence data from Chain Valley and the adjacent Mannering Colliery. However, it has also drawn on the findings of equivalent miniwall / partial extraction studies, applying LaModel in other coalfields.

The model outcomes are relatively insensitive to the Poissons Ratio of the coal and overburden. The default values of 0.33 for coal and 0.25 for the overburden have been applied, noting that these are consistent with earlier studies for the mine **(DGS, 2017)**.

The default value for the overburden Young's Modulus is 20.7GPa, noting that modelled subsidence results are sensitive to this input value. Early studies for the mine applied this default value **(DGS, 2017)**, which is generally consistent with expected values of 15-20GPa for conglomerate material. However, experience indicates that lower values tend to calibrate better to actual subsidence behaviour. This is considered to reflect the influence of the weaker units within the overburden, as well as the role of discontinuities and the strength reduction associated with full-scale "rock mass" versus laboratory-scale "rock-material" mechanical behaviour.

Subsidence estimation with LaModel is also sensitive to the overburden lamination thickness. Earlier studies for the mine have varied the lamination thickness from 20m to 46m **(DGS, 2017)**. However, for sub-critical panels, experience indicates that the most accurate subsidence predictions are attained by adopting lamination thicknesses of 10m to 15m for mining operations involving caving (e.g. miniwall systems). These more conservative input values are considered to implicitly reflect the weakening effect of major discontinuities, such as faults and dykes, on overburden behaviour.

A sensitivity analysis was conducted, involving progressive reductions in the overburden modulus and lamination thickness and associated increases in the calculated subsidence values, until the results most closely matched the measured subsidence behaviour over the previous CVC miniwall panels and the Wyee (Mannering) longwall panels. The overburden properties that provided the most accurate calibration were:

- a Youngs Modulus of 10GPa,
- a lamination thickness of 15m for the first panel situation and
- a lamination thickness of 10m for multi-panel situations.

The default value at a w/h ratio of 1.0 for coal mass strength is 6.2MPa. Geomechanical testing of the Fassifern Seam at Chain Valley indicates a moderate uniaxial compressive strength (UCS) of typically 25 to 40MPa for laboratory sized specimens, with an average of 34MPa. Empirical methods and rock mass classification schemes suggest a coal mass strength of 6 to 8MPa and, in particular, a value of 7MPa derived using the approach of **Protodiakanov (1964)**. **Gale (1999)** suggested that coal mass strength varies between 5MPa, for weak coal with weak coal / strata contacts, to 9MPa for strong coal with strong coal / strata contacts. The Fassifern Seam contacts are considered weak. The specific issue

is the role of the claystone units in the floor, which has an average long-term strength of <5MPa. A second sensitivity analysis was therefore conducted, involving progressive reductions in the strength and stiffness properties of the seam and associated increases in the calculated subsidence magnitudes, until the results most closely matched long-term, measured subsidence behaviour. The seam properties that provided the most accurate calibration were:

- a seam strength of 3.5MPa and
- a Youngs Modulus of 1.05GPa.

Goaf properties are calculated using LaModel's "Gob Wizard" by inputting the maximum estimated goaf stress. In this case, the goaf stress is considered to be largely limited to the load due to the height of the caved material below the Teralba Conglomerate, with the majority of the load transferring to the chain pillars and adjacent abutments, refer to **Section 4.3**. Given a caving height of 50m from the Fassifern Seam working section to the base of the conglomerate, this suggests an average goaf stress of around 1.25 MPa.

For this study, an important consideration is the progressive increase in the overall mined-out area from sub-critical to super-critical. This reduces the overburden stiffness, resulting in increased final pillar loads and associated subsidence. The width (W) to depth (H) trend for MWs S2 to S5 is as follows:

- MW S2: W/H = 97/170 = 0.57 (sub-critical)
- MWs S2 and 3: W/H = 234/170 = 1.38 (close to super-critical)
- MWs S2 to 4: W/H = 371/170 = 2.18 (super-critical)
- MWs S2 to 5: W/H = 508/170 = 2.99 (super-critical)

Ordinarily, it would be assumed that the combined MW S2 and 3 span is super-critical, with maximum pillar loading. However, local experience and previous studies suggest that a W/H ratio of >2 is required to generate full loading and subsidence in this environment (i.e. a minimum of three consecutive MW panels). This is due to the significant spanning ability of the conglomerate beds. Therefore, this situation is only regarded as truly super-critical from MW S4 onwards.

At this stage, the subsequent herringbone panels are also considered to contribute to the overall super-critical extent of the extraction area, although this is likely to prove a very conservative assumption, given the panel configuration.

In LaModel, the change from sub- to super-critical is addressed using the "Free Surface" feature; switching Free Surface "on" increases the subsidence magnitude. By iteration, the following inputs provided the best calibration:

- MW S2: Lamination thickness = 15m and Free Surface "off"
- MWs S2 and 3: Lamination thickness = 10m and Free Surface "off"
- MW S4 onwards: Lamination thickness = 10m and Free Surface "on"

The outcomes of the LaModel calibration exercises are summarised in **Figure 20**, which plots modelled (i.e. predicted) versus measured subsidence. The correlation coefficient of 0.8 is a favourable outcome.

The material inputs are accordingly summarised in **Table 11**.

Table 11: Modelling Parameters for MW S5 and the NMA Herringbone Panels

Material Parameter	Values Modelled
Young's Modulus of Coal (GPa)	1.05
Poisson's Ratio of Coal	0.33
Young's Modulus of Overburden (GPa)	10
Poisson's Ratio of Overburden	0.25
Mass Strength of Coal (MPa)	3.5
Lamination Thickness (m)	10 and 15
Depth (m)	170
Mining Height (m)	3.5

5.2 Modelling Steps

The model was simulated in five steps, as follows:

- **Mining Step 1**: Miniwall Panel S2 extracted.
- **Mining Step 2**: Miniwall Panel S3 extracted.
- **Mining Step 3**: Miniwall Panel S4 extracted.
- **Mining Step 4**: Miniwall Panel S5 extracted.
- **Mining Step 5:** Herringbone Panels north and north-east of MW S5 extracted.

Mining Step 2 facilitates a comparison of the LaModel subsidence estimates with previous estimates of MW S2 and S3 subsidence obtained by MSEC using their Incremental Profile Method or "IPM" (**MSEC, 2018**), as well as actual subsidence to-date.

5.3 Grid Geometry

Examples of the LaModel grid are shown in **Figures 21** and **22**. Modelled element widths of 1m and 2m were applied, so that the geometry approximated very closely to the actual at both the first workings and secondary extraction stages.

5.4 Modelling Results

5.4.1 Miniwalls S2 to S5, plus Adjacent Herringbone Panel HB-E1B

The following comments are made regarding Step 1, following the extraction of MW S2, see **Figure 23**:

i) Maximum modelled subsidence is 0.12m. Measured subsidence following the completion of MW S2 was negligible. Given the estimated ±0.1m accuracy of the bathymetric survey method (such that the subsidence can be measured to within 0.2m), this is considered an acceptable level of agreement.

ii) Modelled angles of draw are <19°. However, measured subsidence at the Pelican Rock Navigation Marker, above Tailgate S2 and only 16m from the goaf edge, was only 10mm following MW S2 extraction. In practice, therefore, the measured AoD was <6°.

The following comments are made regarding Step 2, following the extraction of MWs S2 and S3:

i) Modelled maximum subsidence is 0.16m. This is lower than the **MSEC (2018)** prediction of 0.29m, but highly consistent with the latest bathymetric survey results (≤ 0.15m of subsidence), as well as the previous MW4-5 experience.

ii) Modelled tilt values are <3mm/m, see **Figure 24a**. This is less than the **MSEC** prediction of a maximum of 6mm/m.

iii) Modelled strain values are 1-1.5mm/m, see **Figure 24b**. This is slightly greater than the **MSEC** prediction of a maximum tensile strain of 1mm/m.

iv) Modelled angles of draw remain <19°.

v) Modelled subsidence at the Pelican Rock Navigation Marker is 60-70mm. This is slightly lower than the **MSEC** prediction of 90mm, noting that the actual subsidence, post-MW S3 is only 30mm.

The following comments are made regarding the results for Step 4, following the extraction of MWs S2 to S5 inclusive:

i) Modelled maximum subsidence is 0.36m.

ii) Tilt values remain < 5mm/m, see **Figure 25a**.

iii) Strain values remain < 2mm/m, see **Figure 25b**.

iv) Modelled angles of draw are ≤ 23°, reducing to ≤ 18° at the panel ends.

v) Subsidence at the Pelican Rock Navigation Marker is 145mm.

vi) The minimal change in the subsidence values following the mining of MW S5 reflects the controlling influence of the 40m wide chain pillars, once the overall span becomes super-critical.

The following comments are made regarding the results for final Step 5, following the extraction of the HB-E1B herringbone panel to the north:

i) Modelled maximum subsidence is 0.5m above HB-E1B Panel.

ii) Tilt values remain ≤ 5mm/m, see **Figure 26a**.

iii) Strain values remain ≤ 2mm/m, see **Figure 26b**.

iv) Final angles of draw are ≤ 23°, reducing to ≤ 18° at the panel ends.

v) Subsidence at the Pelican Rock Navigation Marker is 155mm.

5.4.2 Multiple Adjacent Herringbone Panels

A section of the model grid at Mining Step 2 is shown in **Figure 22**. Note that the extraction area is depicted as "clean" with no remnant stooks or fenders modelled. In practice, coal recovery during pillar extraction is typically of the order of 85%. Therefore, although a mining height of 3m has been applied (i.e. the approximate development height), eliminating the stooks when modelling has the effect of mimicking an increase in height to 3.5m in the extraction area (i.e. 3m = 3.5 x 0.85).

The following comments are made regarding the results, following the extraction of multiple herringbone panels:

i) Maximum subsidence (S_{max}) is 0.4m to 0.5m, increasing gradually with depth, see **Figure 27**.

ii) Subsidence reduces to 0.10m to 0.15m above the sub-mains pillars and 0.30m to 0.35m above the barriers, see **Figures 28** and **29a**.

iii) The numerical modelling results are reasonably consistent with the empirical estimates derived from the subsidence database.

iv) Tilt values are ≤ 6mm/m across the depth range, see **Figure 29b**.

v) Strain values are ≤ 2mm/m across the depth range, see **Figure 29c**.

5.5 Conclusions Regarding Subsidence Effects

Regarding MW S5, the empirical pillar database (**Section 3.2**) suggests <0.5m of subsidence following the subsequent herringbone extraction to the north, similar to the numerical modelling outcome (0.36m). Referring again to **Figure 23**, the modelling suggests around 0.2m of final subsidence above the chain pillars (slightly less in the case of MG S5), plus around 0.15m of sag between pillars. Accepting the bathymetric survey accuracy, only around 0.05m to 0.15m of subsidence has been recorded above MWs 2 to 4 to-date.

Apart from the ongoing MW S2 to S4 experience, it is also possible to draw on the previous experience from the MW1-12 area. The situation that corresponds most closely to the planned S2-5 geometry is that of MWs 4 and 5, where two 97m void width panels were also separated by a 40m (solid width) chain pillar, albeit at a greater depth of 196 to 200m. Eight years after mining, measured subsidence is of the order of 220mm, with no sign of ongoing movement / creep.

It is therefore concluded that maximum final subsidence associated with the extraction of MW S5 will be of the order of 0.2m to 0.4m. Given that the resolution of bathymetric survey techniques is understood

to be of the order of 0.2m, it is suggested that planning proceed on the basis of a nominal maximum of 0.4m of long-term subsidence.

With regard to the herringbone workings, the modelling suggests S_{max} values in the range of 0.4-0.5m, which is consistent with the empirical analyses.

6.0 SUBSIDENCE IMPACTS

The potential subsidence impacts on the following natural and built features are considered in turn:

- The lake bed
- Sea grass beds
- The foreshore, including minor cliffs
- Built features

6.1 The Lake Bed

The lake bed contours, derived from bathometric surveys from 2012 onwards, are shown in **Figure 30**. Given the gently sloping lake bed topography, the water depth of ≥ 4m over the extraction workings and the expected subsidence of ≤ 0.5m, it is considered very unlikely that there would be an adverse impact on the lake bed.

Further details on benthic communities are given in the Benthic Communities Management Plan, which is included as part of the Extraction Plan.

6.2 Sea Grass Beds

Sea grass beds exist along the foreshore, below the Low-Water Mark, see **Figures 31** and **32**. The Sea Grass Protection Barrier (SGPB) is defined by a 26.5° angle of draw from the mapped beds. Predicted vertical subsidence at the closest point of any of the extraction workings (i.e., MW S5 or herringbone) to the SGPB is <0.5m and predicted subsidence at the actual sea grass beds is <20mm. It is therefore considered practically impossible that there would be an adverse impact on the sea grass beds.

6.3 The Lake Foreshore

The foreshore and the High-Water Mark, defined by the RL 0.00m Australian Height Datum (AHD) contour, are also shown in **Figures 31** and **32**. The High-Water Mark Protection Barrier (HWMPB) is defined by a 35° angle of draw from the High-Water Mark, as shown in the example along the MW S5 centre-line, **Figure 33**, noting that the commencing end of MW S5 is located typically >50m outside the barrier.

A second cross-section, approximately north-south through the western side of herringbone panel HB-Mains (see **Figure 1** for panel location), is seen in **Figure 34**. Extraction ceases just south of the SGPB and HWMBP, which in this case are almost coincident. As discussed in **Section 5**, predicted subsidence at the HWMPB is <0.5m for all the extraction workings. It is therefore considered practically impossible that there would be any measurable change in the High-Water Mark due to the extraction operations (i.e. predicted subsidence at the High-Water Mark is <20mm).

6.4 Minor Cliffs

Along the southern edge of the Morisset Peninsula is an approximately 200m length of minor (i.e., ~8m high) cliffs formed in the Munmorah Conglomerate, with an overlying steep (typically 20-25°) slope, see **Figures 34** and **35a-b**. These cliffs are at the margin of the herringbone workings (specifically, the first workings associated with HB-Mains and HB-W2 Panels). Subsidence in this area is expected to be 0-20mm, with no impacts on the cliffs or slope.

6.5 Built Features

Built features relevant to the area of interest are shown in **Figures 35a** and **36a-c**.

The Pelican Rock Navigation Marker, **Figure 36b**, is located on a rock outcrop that extends into the lake from Summerland Point. It is evident from **Figure 23** that minor subsidence at the navigation marker is expected to continue until the extraction of herringbone panel HB-E1B is complete (155mm of modelled subsidence). There is a second navigation marker further west at Sugar Bay; given that the herringbone panels do not extend to that point, no subsidence is expected. There are also two low water buoys (063 and 064) in the Morisset Peninsula area; these buoys are located within the SGPB, such that <20mm of subsidence is expected.

The built features along the foreshore, including houses and jetties, do not extend beyond the mapped sea grass beds. Given that <20mm of subsidence is predicted, no measurable impacts are expected on the foreshore features.

Given the limited overburden caving and predicted vertical subsidence of <0.5m, it is unlikely that measurable horizontal movements will be experienced beyond an angle of draw of 26.5° from the extraction limits. However, NSW Spatial Services should be notified, so that any affected survey markers can be managed and re-established if necessary.

7.0 MONITORING

A key feature of the area of interest is that as mining progressively extends to the north, the focus of monitoring will shift from the existing activities centred on the Summerland Point area. The following specific comments are made:

i) Periodic surveying of the Pelican Rock Navigation Marker and bathymetric surveys of the MW S2 to S5 area should be maintained until herringbone Panel HB-E1B is extracted.

ii) Once HB-E1B Panel is extracted, periodic bathymetric surveys should continue from HB-E1B panel to the other herringbone extraction panels in the north and west.

iii) With regard to the minor cliffs along the south side of the Morisset Peninsula, negligible subsidence (i.e. <20mm) is expected. Conventional survey approaches are considered to be no value, noting in particular that cliffs are insensitive to tilt magnitudes of <6mm/m. However, it is considered likely that occasional falls of small, joint-bounded blocks from the cliff faces due to natural weathering processes will continue (note the fallen rocks in **Figures 35b-c**). Therefore, it is suggested that a video record of the cliff faces be created and periodically updated.

iv) Finally, it will almost certainly be considered necessary to confirm the absence of appreciable subsidence in the Fishery Point / Sunshine area and this is likely to necessitate the establishment of a local levelling line.

8.0 REFERENCES

DGS (2017). **Multi-Seam Mining Feasibility Study for the Proposed Miniwalls CVB1 to CVB4 at Chain Valley Colliery**. Report No. CHV-002/7 to LakeCoal Pty. Ltd.

Ditton, S. And Frith, R.C. (2003). **Review of Industry Subsidence Data in Relation to the Impact of Significant Variations in Overburden Lithology and Initial Assessment of Sub-Surface Fracturing on Groundwater**. End of Grant Report for ACARP Project No. C10023.

Ditton, S. and Merrick, N. (2014). **A New Sub-Surface Fracture Height Prediction Model for Longwall Mines in the NSW Coalfields**. Presentation to the Australian Earth Sciences Convention, Newcastle.

Follington, I. and Isaac, A.K. (1990). **Failure Zone Development above Longwall Panels**. Mining Science and Technology, Vol. 10, pp. 103-116

Forster, I. and Enever, J. (1992). **Study of the Hydrogeological Response of Overburden Strata to Underground Mining – Central Coast New South Wales**. Volume 1, Office of Energy, pp. 1-75.

Forster, I. (1995). **Impact of Underground Coal Mining on the Hydrogeological Regime, Central Coast, NSW**. Australian Geomechanics Society (AGS) Conference Proceedings, Engineering Geology of Newcastle – Gosford Region, University of Newcastle.

Gale W J (1999). **Experience of Field Measurement and Computer Simulation Methods for Pillar Design**. Proceedings of the Second International Workshop on Coal Pillar Mechanics and Design. NIOSH IC 9448.

Heasley, K.A. and Chekan, J. (1999). **Practical Boundary-Element Modelling for Mine Design**. Proceedings of the Second International Workshop on Coal Pillar Mechanics and Design. NIOSH IC 9448.

Hill, D.J. (2010). **Long-Term Stability of Bord and Pillar Workings**. Paper presented at the Third International Workshop on Coal Pillar Mechanics and Design, Morgantown, W. Va.

Holla, L. (1989). **Investigation into Sub-Surface Subsidence**. End of Grant Report No. 998 for NERDDC Project No. C0689.

Holla, L. and Buizen, M. (1990). **The Strata Movement and Changes in Bulk Permeability due to Longwall Mining under an Old Goaf**. Coal Journal, No. 28, pp. 17-27.

Kendorski, F.S. (1993). **Effect of Full Extraction Underground Mining on Ground and Surface Waters : A 25 Year Retrospective**. Proceedings of the 25th International Conference on Ground Control in Mining, Morgantown, W.Va.

Li, G., Forster, I., Fellowes, M. and Myors, A. (2006). **A Case Study on Longwall Mining under the Tidal Waters of Lake Macquarie**. Proceedings of the Coal Operators' Conference, AusIMM, Wollongong.

Mark, C. (1990). **Pillar Design Methods for Longwall Mining**. US Bureau of Mines Information Circular 9247.

Mills, K.W. and O'Grady, P. (1998). **Impact of Longwall Width on Overburden Behaviour**. Proceedings of Coal 1998: Coal Operators Conference, AusIMM, University of Wollongong.

MSEC (2005). **The Assessment of Sub-Surface Subsidence Movements along the Line of the Proposed Endeavour Drift**. Report No. MSEC224 to BHP.

MSEC (2018). **Subsidence Predictions and Impact Assessments for Natural and Built Features due to the Extraction of the Proposed Miniwalls S2 and S3 in Support of the Extraction Plan**. Report No. MSEC 979 Rev 2.

Peng, S.S. and Chiang, H.S. (1984). **Longwall Mining**. Wiley.

Protodiakanov, M.M. (1964). **Methods of Evaluation of Cracks and Strength of Rock Systems at Depth**. Proceedings of the 4th International Conference on Strata Control and Rock Mechanics, New York (presented in Russian). S.A. Council for Scientific and Industrial Research Translation No. 449.

Salamon, M.D.G. and Munro, A.H. (1967). **A Method of Designing Bord and Pillar Workings**. Journal of the South African Institute of Mining and Metallurgy, September 1967, Volume 68, no. 2, pp 68 - 78.

Salamon, M.D.G. and Oravecz, K.I. (1976). **Rock Mechanics in Coal Mining**. Chamber of Mines of South Africa.

Salamon, M.D.G., Galvin, J.M., Hocking, G. and Anderson, I. (1996). **Coal Pillar Strength from Back -Calculation. Strata Control for Coal Mine Design, UNSW**. Final Project Report, No: RP 1/96. Joint Coal Board.

SCT (2008). **Aquifer Inflow Prediction above Longwall Panels**. End of Grant Report for ACARP Project No. C13013.

Strata² (2019). **Geotechnical Aspects of Herringbone Pillar Layout Design**. Report No. CHV-005-RevD to Chain Valley Colliery.

Strata² (2020). **Geotechnical Aspects of Secondary Extraction of Herringbone Pillar Panels**. Report No. CHV-015-Rev0 to Chain Valley Colliery.

Strata² (2020). **S5 Panel: Geotechnical Environment, Subsidence Estimates and Impacts**. Report No. CHV-019-Rev0 to Chain Valley Colliery.

Tammetta, P. (2013). **Estimation of the Height of Complete Groundwater Drainage**. Ground-water Journal, Vol. 51, No. 5, pp. 122-129.

Wardell, K. and Partners (1975). **Mining under Tidal Waters**. Report to the Ministry of Mines and Power, NSW.

White, E. and Hill, D.J. (2017). **Progress in Partial Extraction Layout Design for Productivity, Safety and Subsidence Management at Clarence Colliery**. Proc. of 10th Triennial Conference on Mine Subsidence, MSTS, Pokolbin.

Whittaker, B.N. and Reddish, D.J. (1989). **Subsidence: Occurrence, Prediction and Control**. Development in Geotechnical Engineering Series, 56, Elsevier Science Publishing.

Appendix A: Glossary of Key Terms

Angle of Draw

The angle from the vertical of a line drawn between the limit of extraction at seam level (goaf edge) and the 20mm subsidence contour on surface, which is historically regarded as the practical limit of measurable subsidence.

Chain Pillar

The unmined block or pillar of coal left between extracted miniwall panels.

Cover Depth

The depth from surface to the top of the seam.

Critical Panel Width

The minimum width of extraction at which the maximum possible subsidence at a point on surface first occurs.

Far-Field Movements

Horizontal movements well beyond the panel boundaries, over solid unmined coal. Such movements tend to be *en masse* movements towards the extracted area, with very low levels of associated strain.

First Workings

Tunnels, roadways or “bords” driven by a continuous miner to provide access to extraction panels in a mine.

Goaf

The void created by the extraction of coal, into which the immediate roof layers collapse or “cave”.

Horizontal Displacement

The horizontal movement of a point on surface due to underlying coal extraction.

Mining Height

The height at which a coal seam is mined; this may not equal the seam thickness.

Panel

The plan area of coal extraction.

Panel Length

The longitudinal distance along a panel measured in the direction of mining, from the commencing rib to the finishing rib.

Panel Width

The transverse distance across a panel between chain pillars.

Secondary Extraction

The extraction of coal pillars or blocks, resulting in the formation of a goaf as the coal is removed.

Strain

The change in horizontal distance between two points, divided by the original horizontal distance between the points. Strain is dimensionless and can be expressed as a decimal or a percentage, but commonly as mm/m. **Tensile Strains** involve an increase in distance between two points, whereas **Compressive Strains** involve a reduction.

Sub-Critical Width

A panel width less than the critical width.

Subsidence

The difference between the pre and post-mining surface level at a point.

Subsidence Control

Reducing the impact of subsidence on a feature by reducing the amount of coal extracted.

Subsidence Effect

Vertical subsidence due to mining, including related parameters, such as horizontal displacement, tilt and strain.

Subsidence Impact

The change (most commonly damage) to a natural or built feature caused by subsidence effects.

Subsidence Mitigation / Amelioration

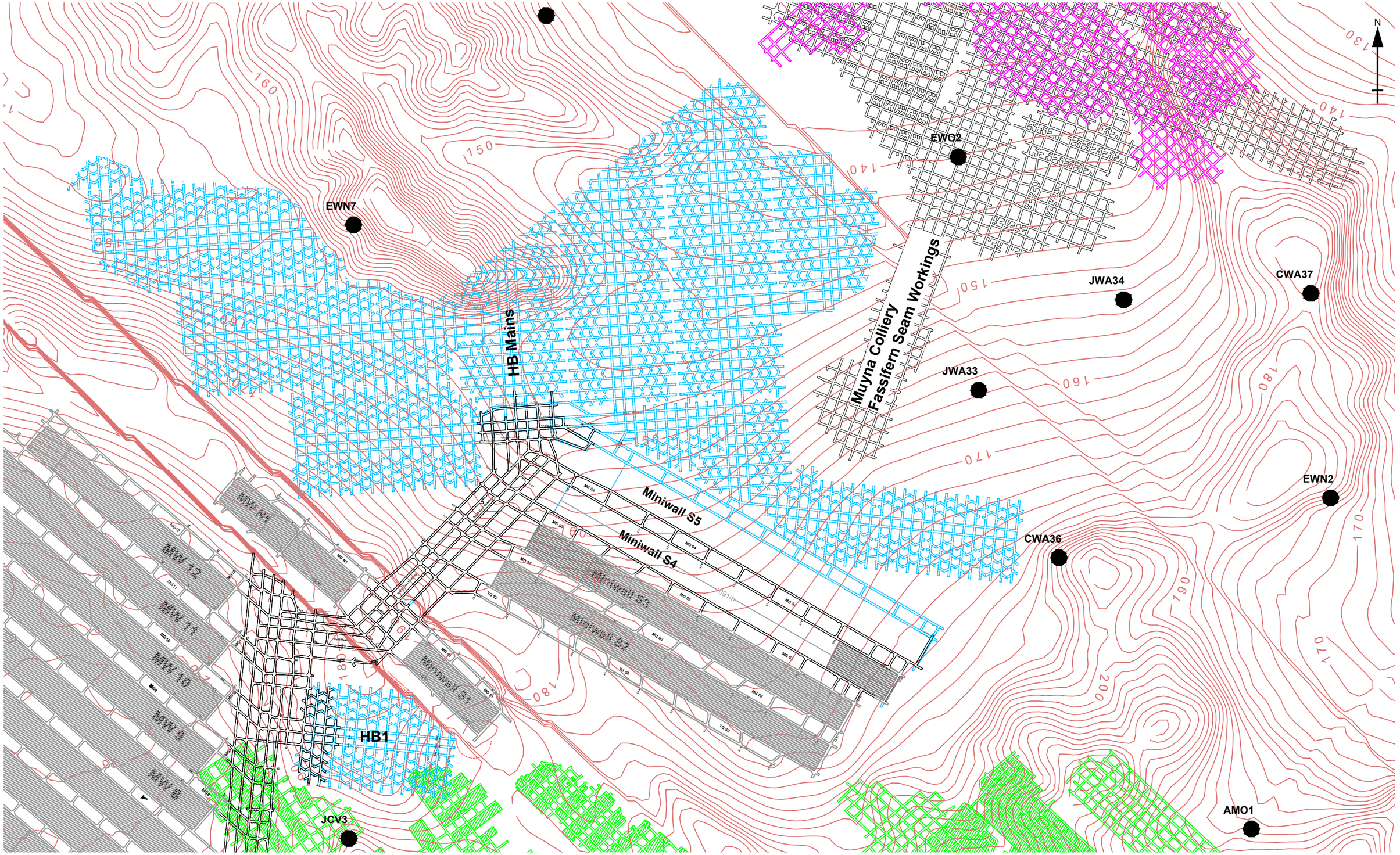
Modifying or reducing the impact of subsidence on a feature to within tolerable limits.

Super-Critical Area

A panel width greater than the critical width.

Tilt

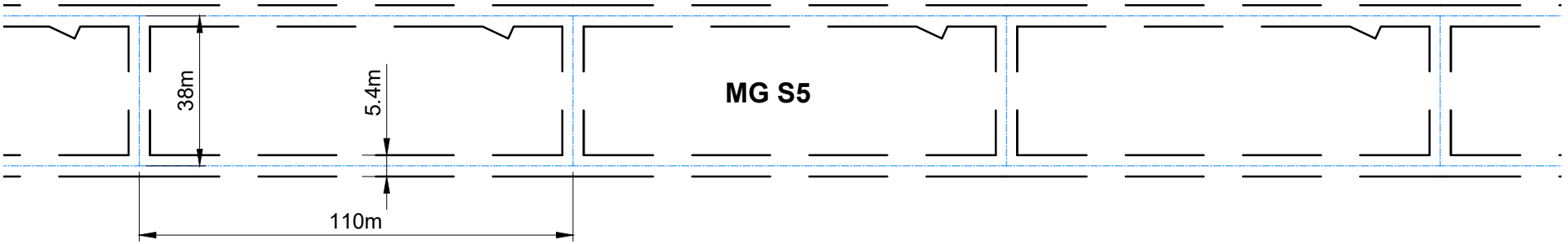
The rate of change of subsidence between two points a known distance apart, plotted at the mid-point and commonly expressed as mm/m.



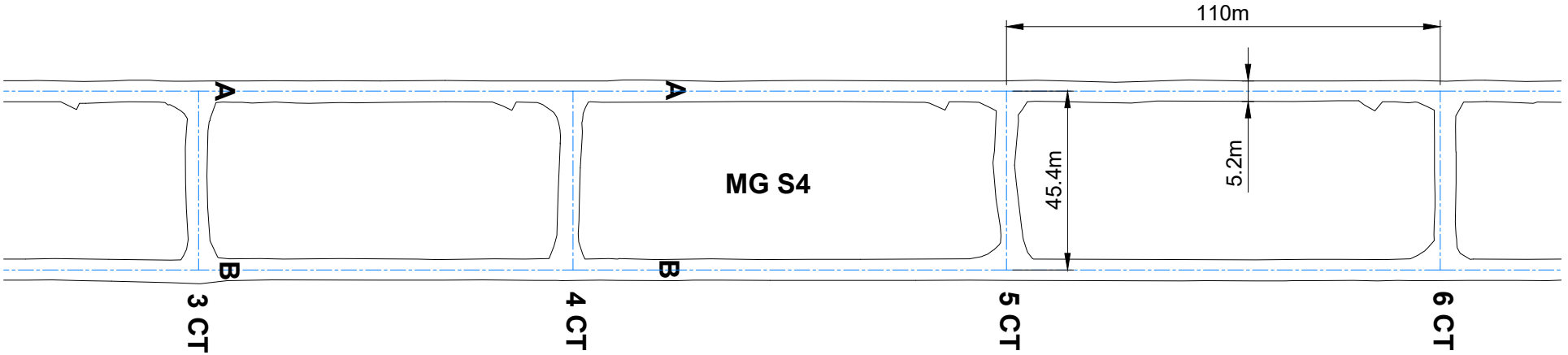
Key:

- Depth of Cover (m)
- CVC Wallarah Seam Workings
- CVC Planed Fassifern Seam Workings
- Muyna Wallarah Seam Workings

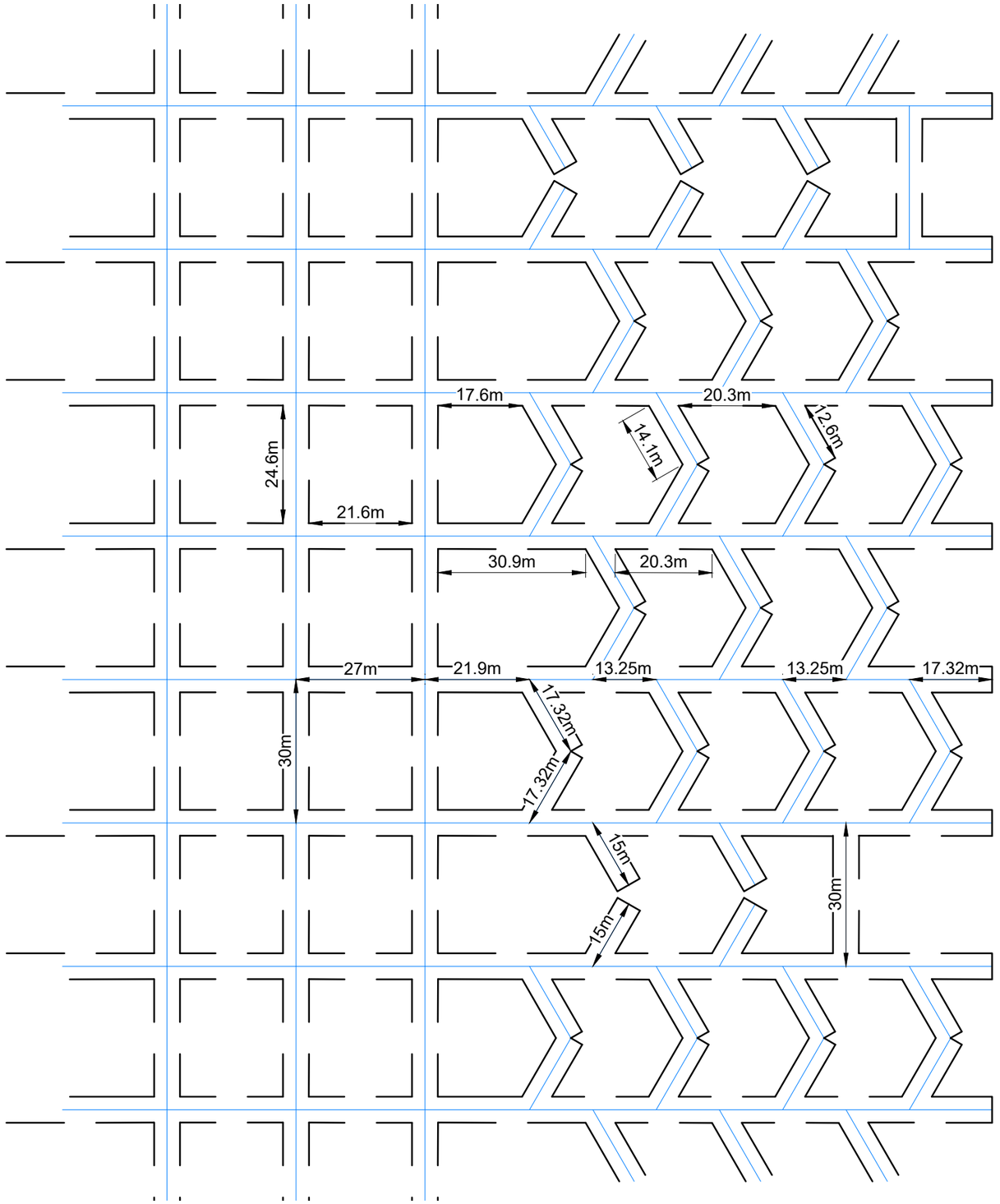
Engineer:	D. Hill	**Client:**	Chain Valley Colliery
Drawn:	R. de Laubadere	**Title:**	Location of Planned MW S5 and Herringbone Panels with Boreholes and Overburden Thickness Contours Including Lake Bed Sediment to FAW Working Section Roof (C Ply)
Date:	04.12.20		
	STRATA^2	**Ref:**	CHV-024
		Revision No:	2
		Scale:	NTS
		Figure No:	1



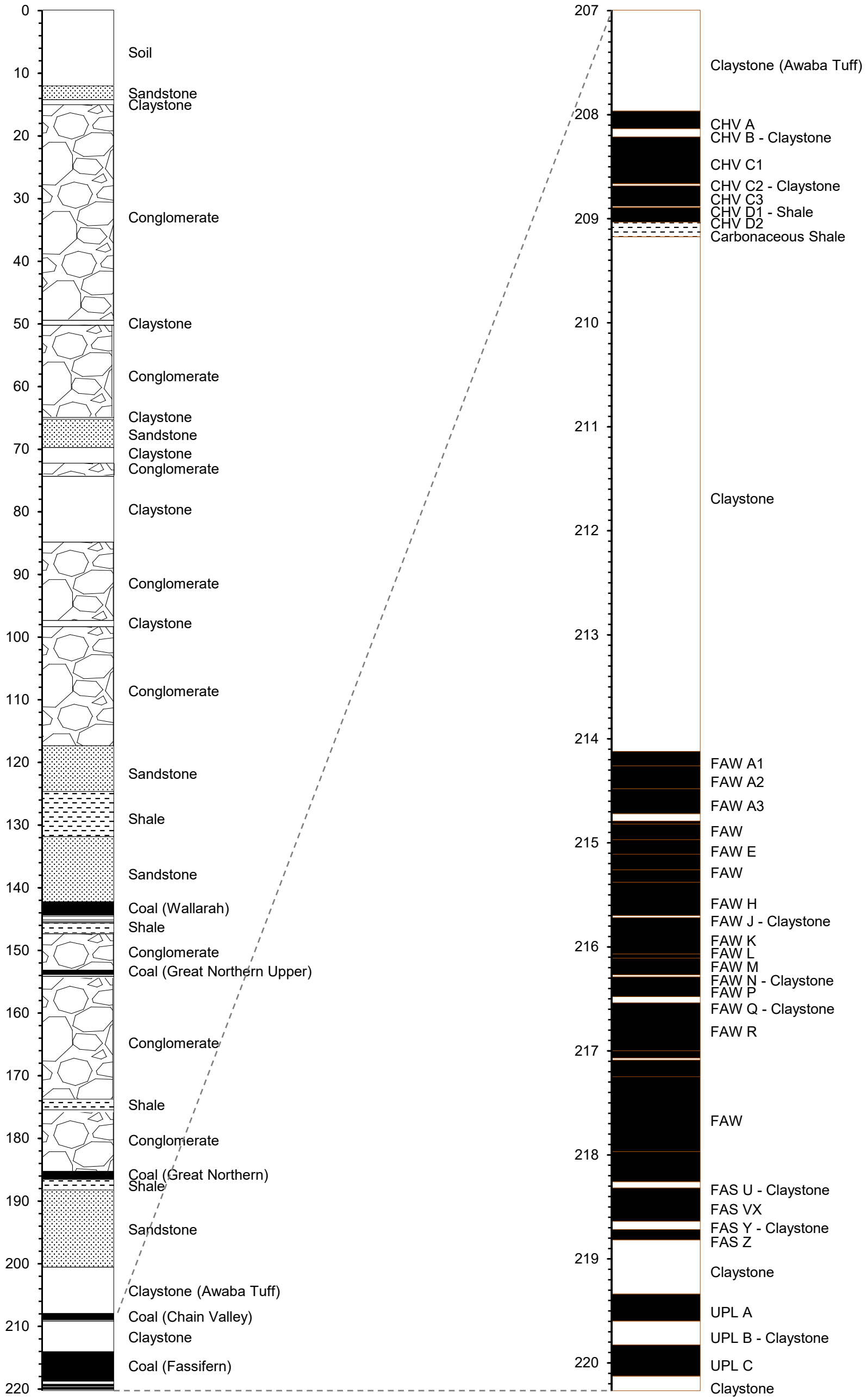
Miniwall S5



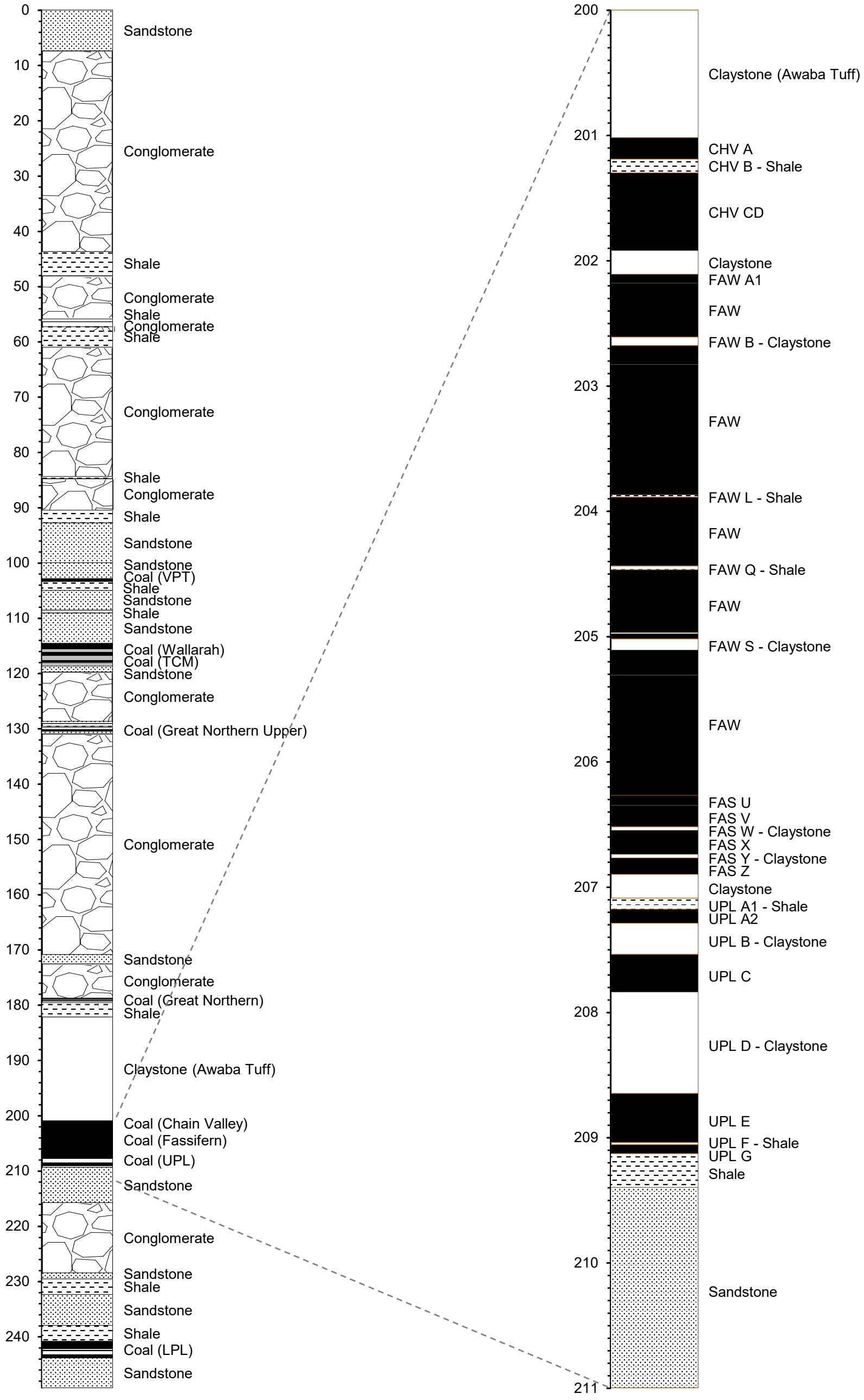
Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	I. Saliamon	**Title:**	Pillar Dimensions in Planned MW S5		
Date:	04.12.20				
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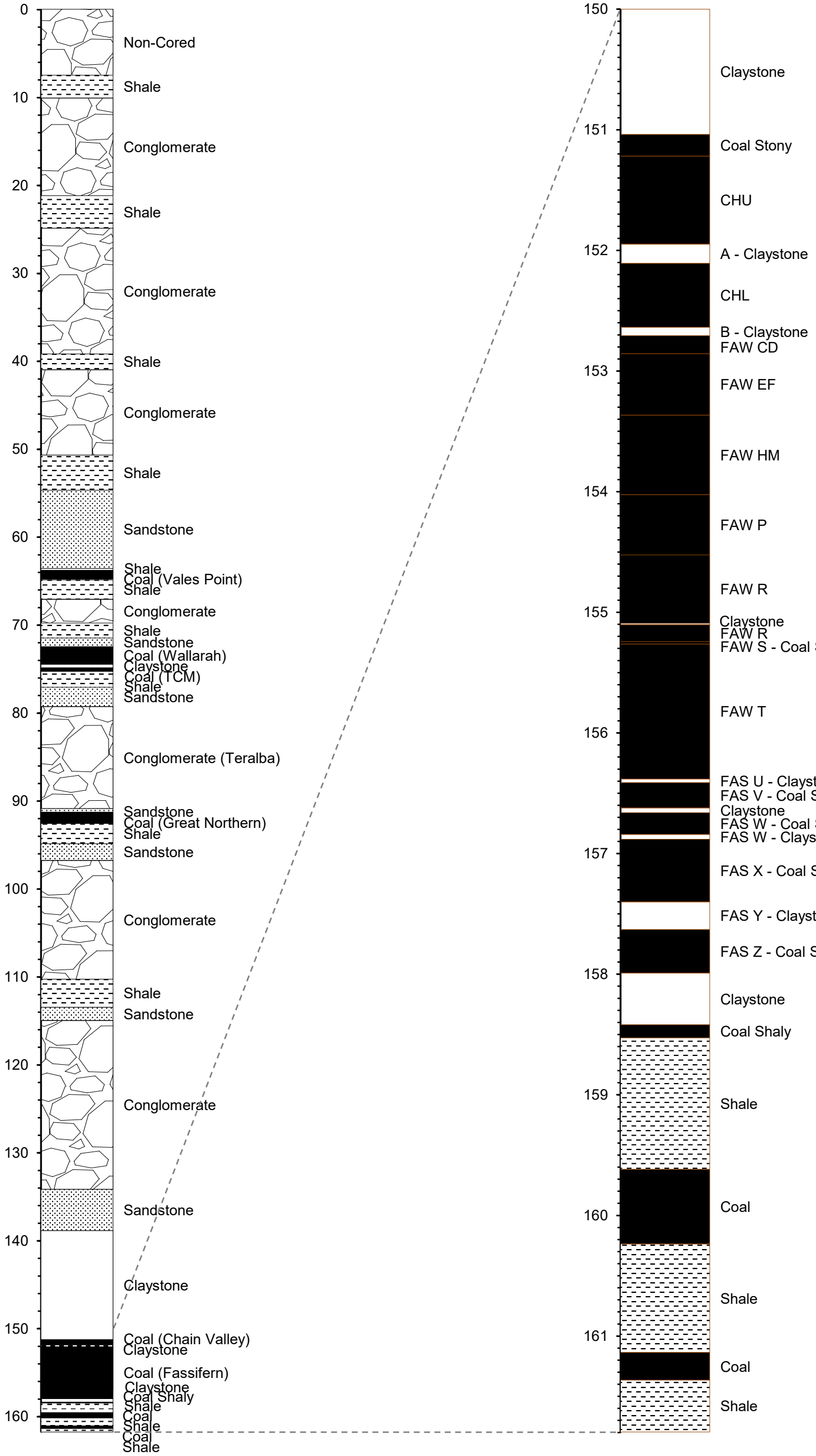
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Drawn:	R. de Laubadere	**Title:**	Schematic Showing Planned Herringbone Pillar Layout
Date:	04.12.20		
STRATA^2		**Ref:** CHV-024	**Revision No:** 2
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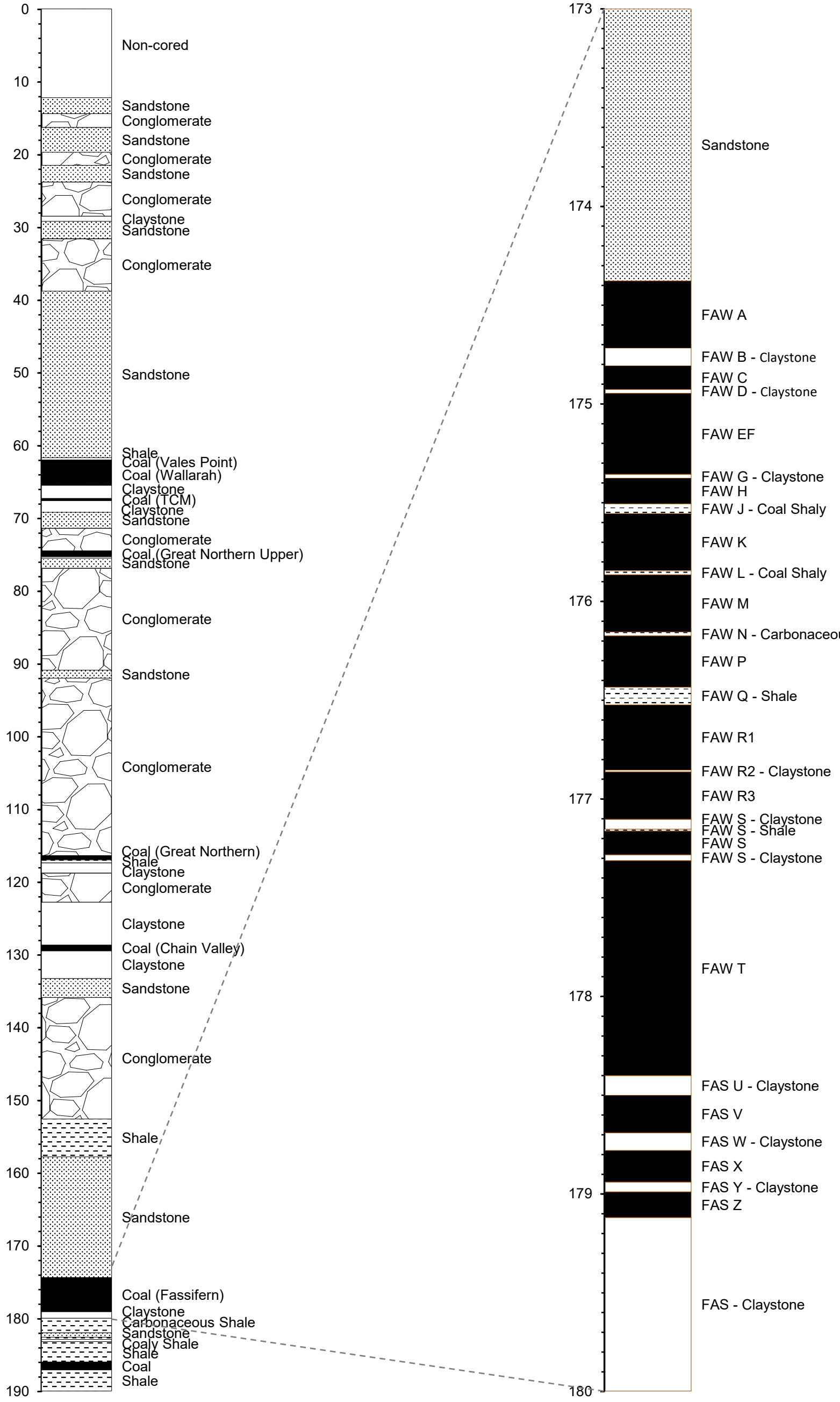
Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	R. de L.	**Title:**	JCV13 Lithology Log		
Date:	04.12.20				
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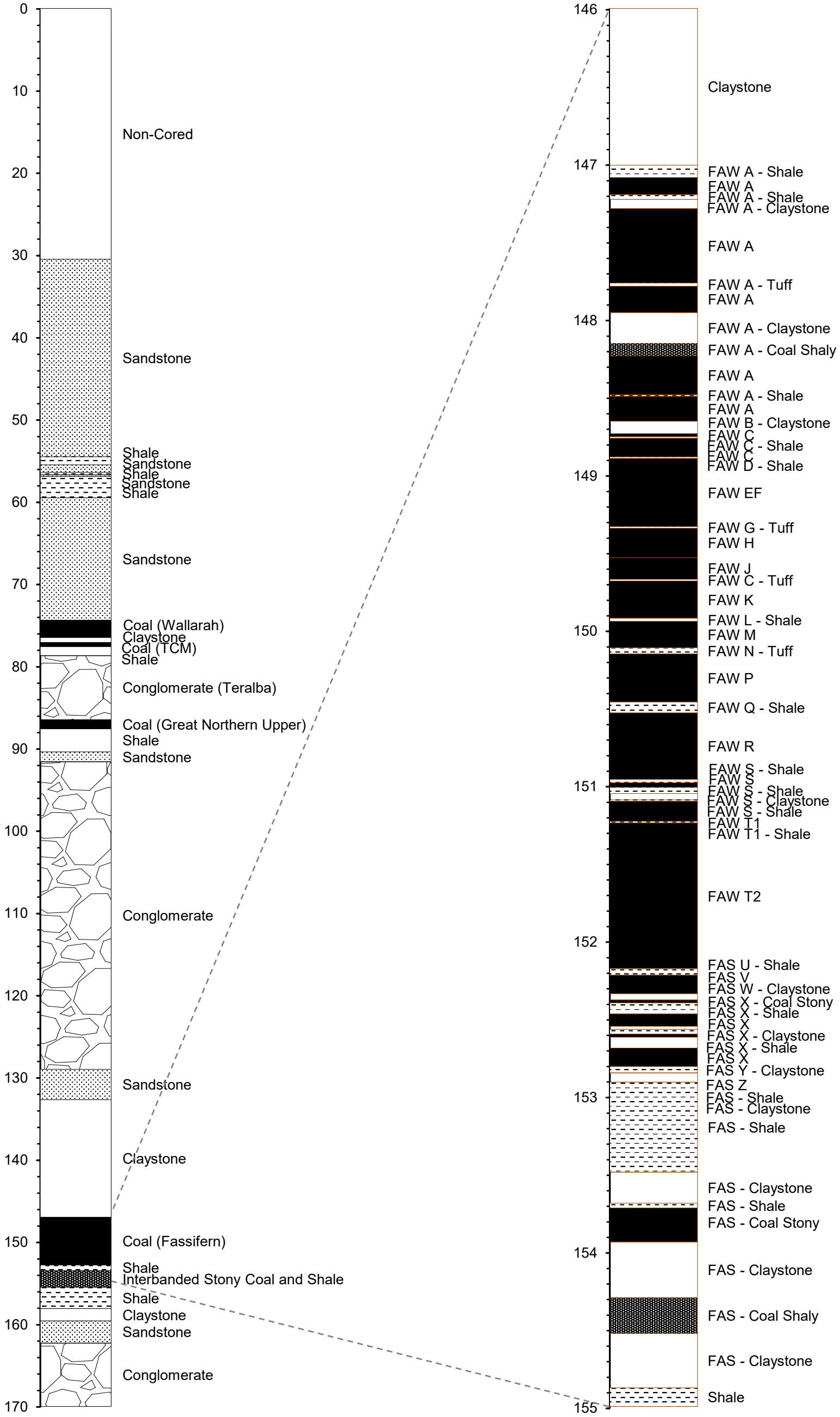
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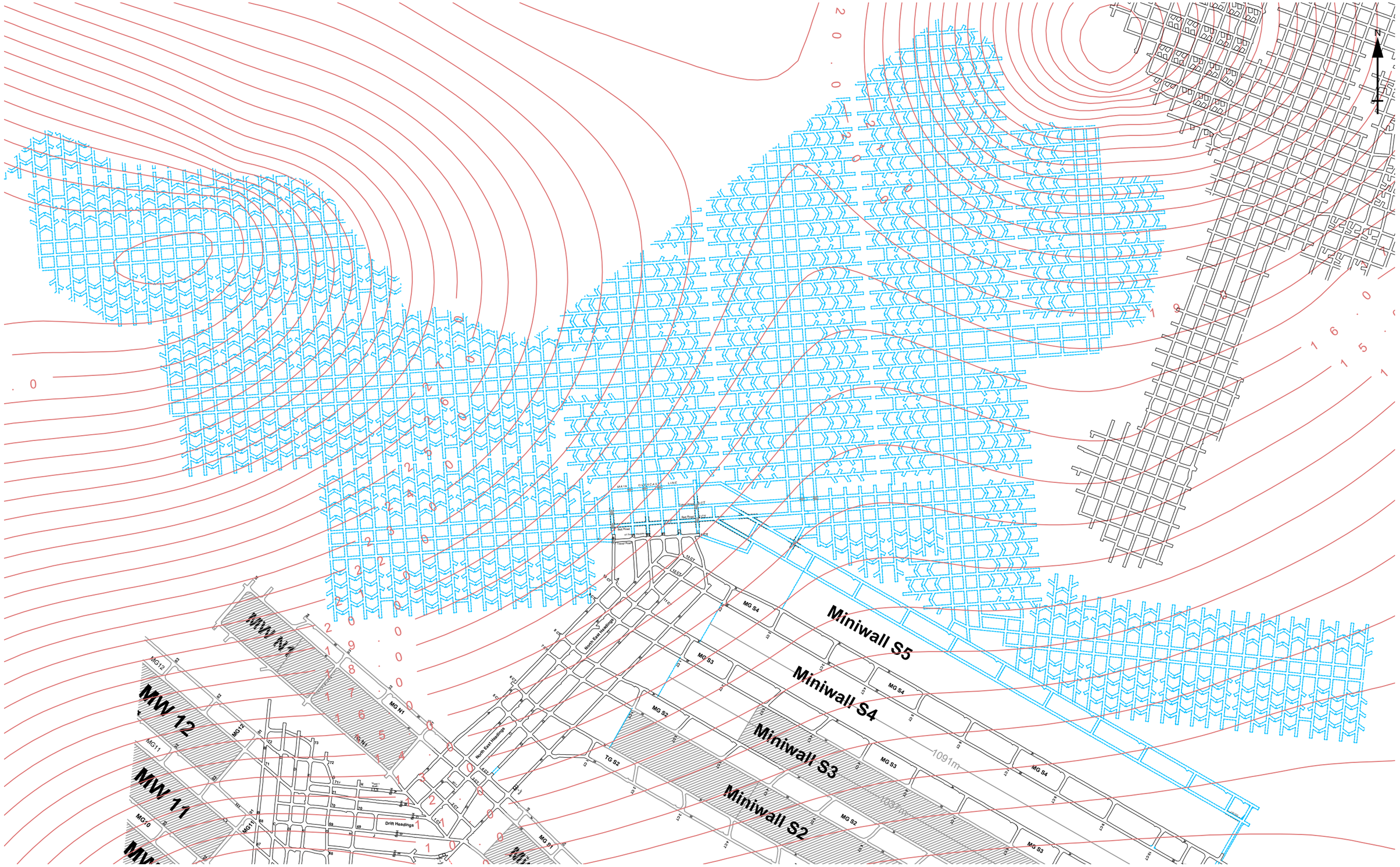
Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	R. de L.	**Title:**	EWN7 Lithology Log		
Date:	04.12.20				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
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Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	R. de L.	**Title:**	EWN2 Lithology Log		
Date:	04.12.20				
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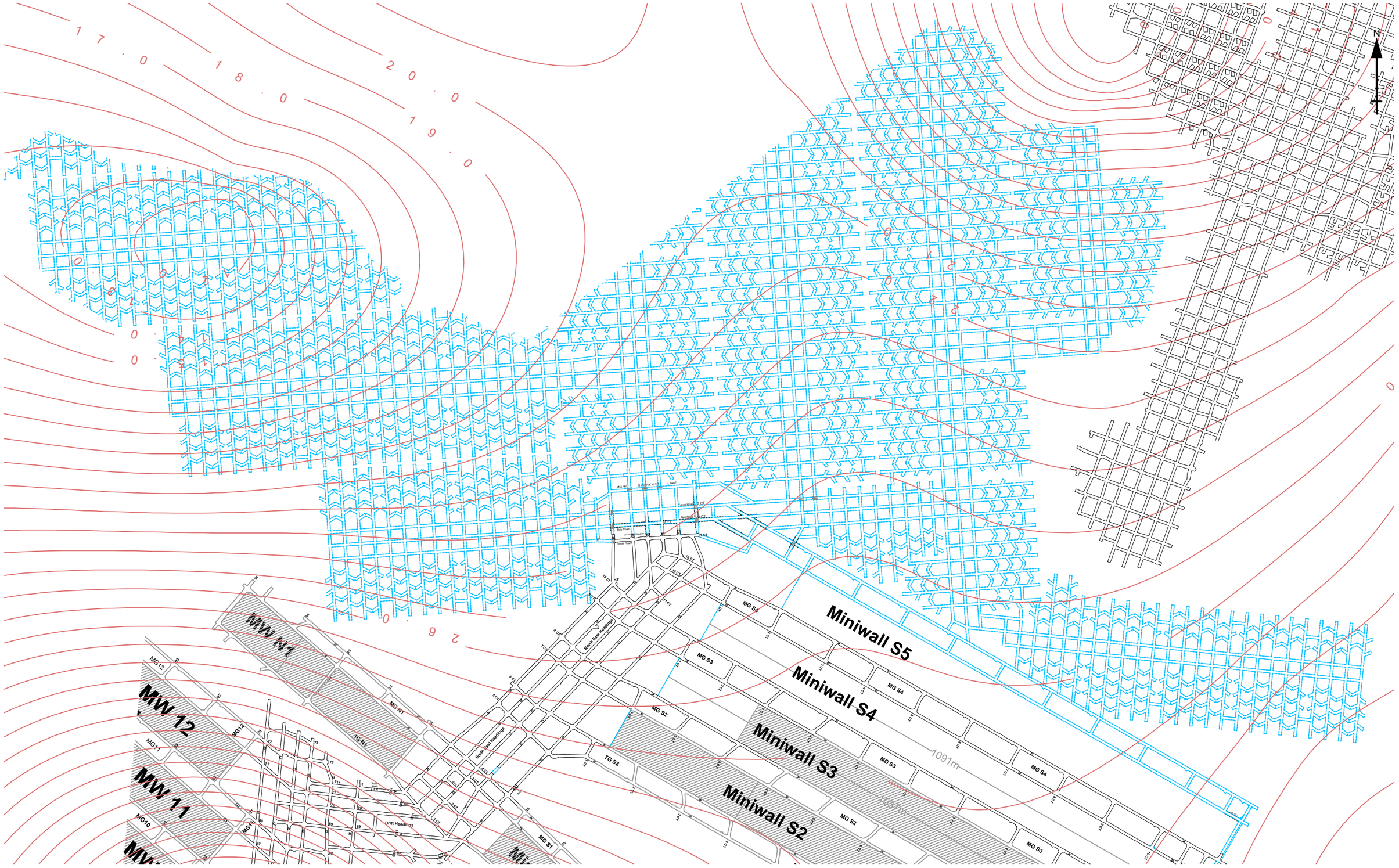
Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	R. de L.	**Title:**	EWO2 Lithology Log		
Date:	04.12.20				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	4e



Key:

~ - KRL Thickness (m)

Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	R. de Laubadere	**Title:**	Karingal Conglomerate Thickness		
Date:	04.12.20				
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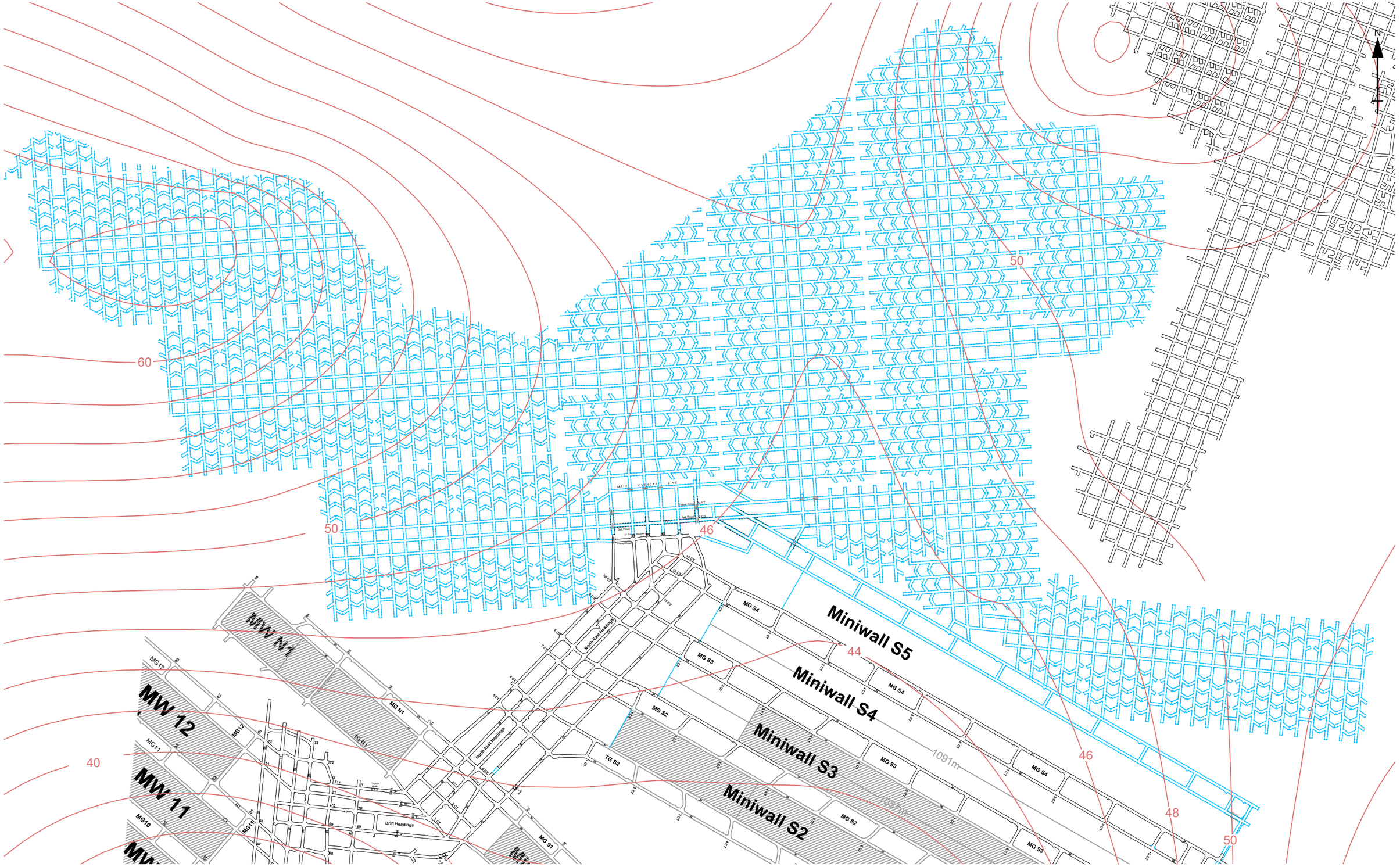


Key:

~ - TER thickness (m)

Engineer:	D. Hill	**Client:**	Chain Valley Colliery
Drawn:	R. de Laubadere	**Title:**	Teralba Conglomerate Thickness
Date:	04.12.20		
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		Revision No:	2
		Scale:	NTS
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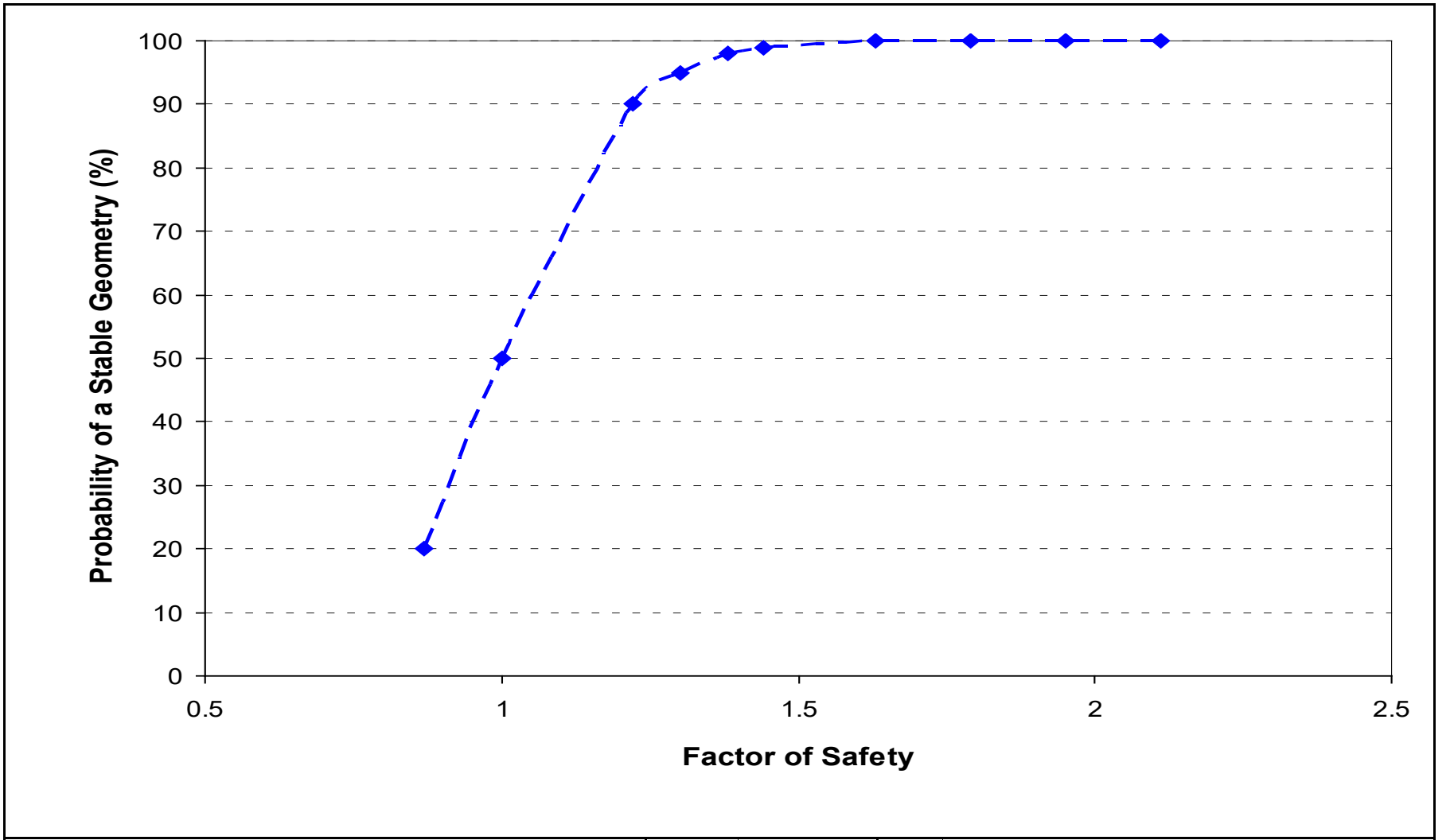
STRATA²



Key:

~ - GNW / FAS thickness (m)

Engineer:	D. Hill	**Client:**	Chain Valley Colliery
Drawn:	R. de Laubadere	**Title:**	Interburden Thickness from Great Northern Floor to Fassifern Roof (GNW/FAS)
Date:	04.12.20		
	STRATA²	**Ref:**	CHV-024
		Revision No:	2
		Scale:	NTS
		Figure No:	7



Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Salamon Factor of Safety versus Probability of Stability		
Date:	04.12.20				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	8

Figure 9a: Successful and Failed Cases (Failure nominally defined by >200mm of Subsidence)

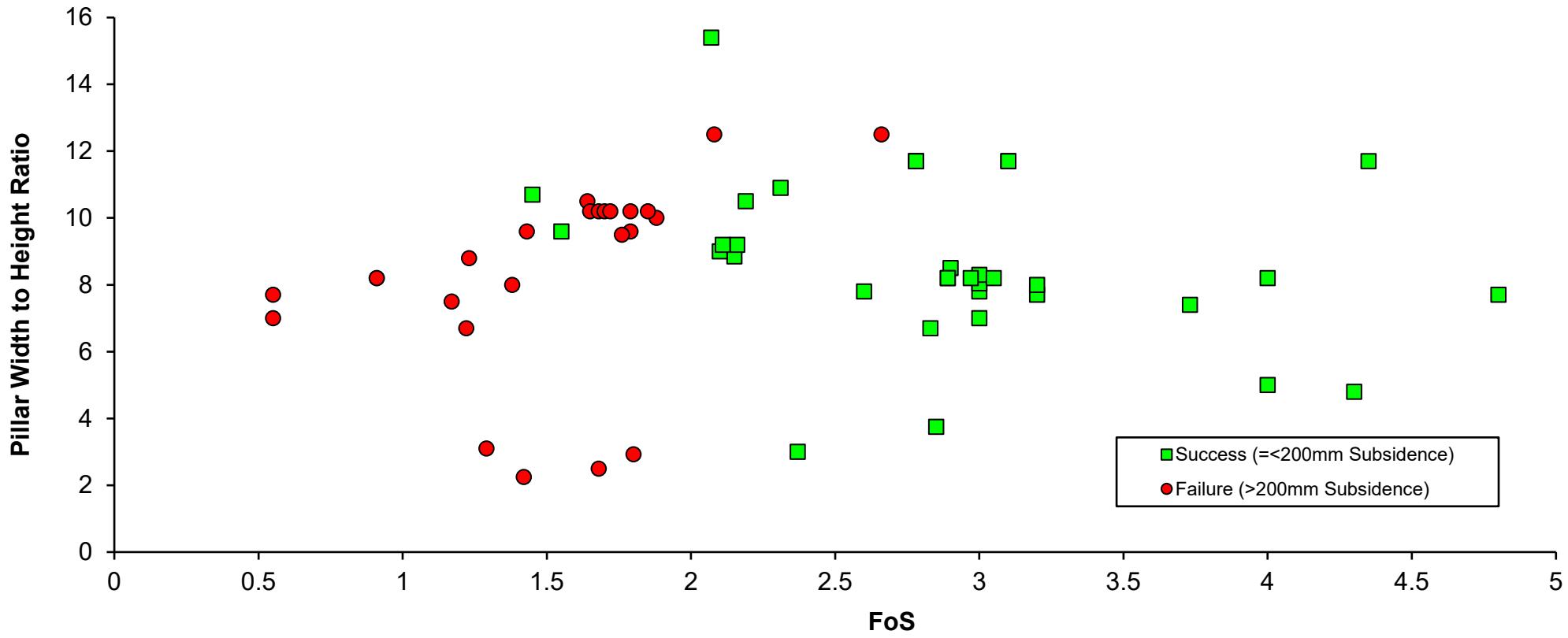


Figure 9b: Successful and Failed Cases (Cases involving Pillar Stresses >15MPa Excluded)

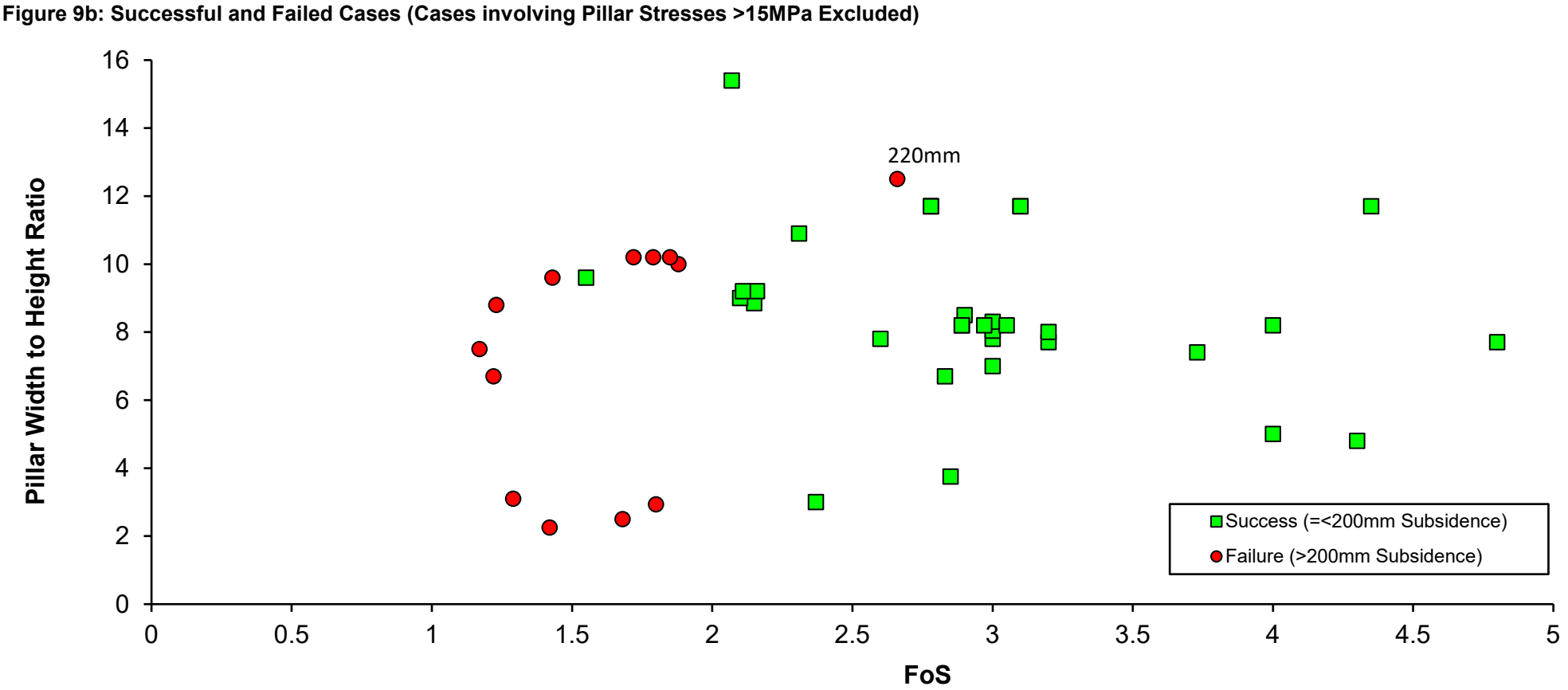
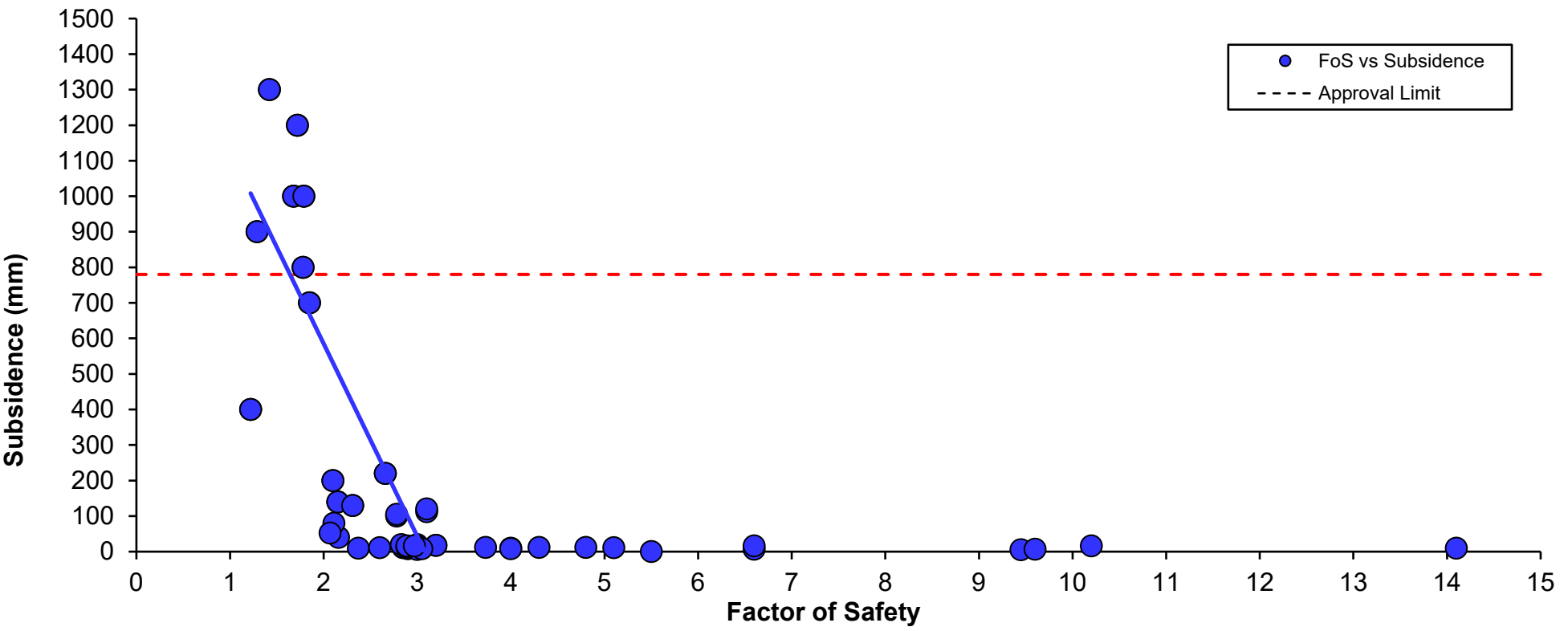


Figure 9c: Subsidence versus FoS, at Pillar Stress Values of <15MPa



Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Lake Macquarie Pillar Database		
Date:	04.12.20				
		Ref:	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	9a/b/c

Figure 10a: Subsidence Results - All Data

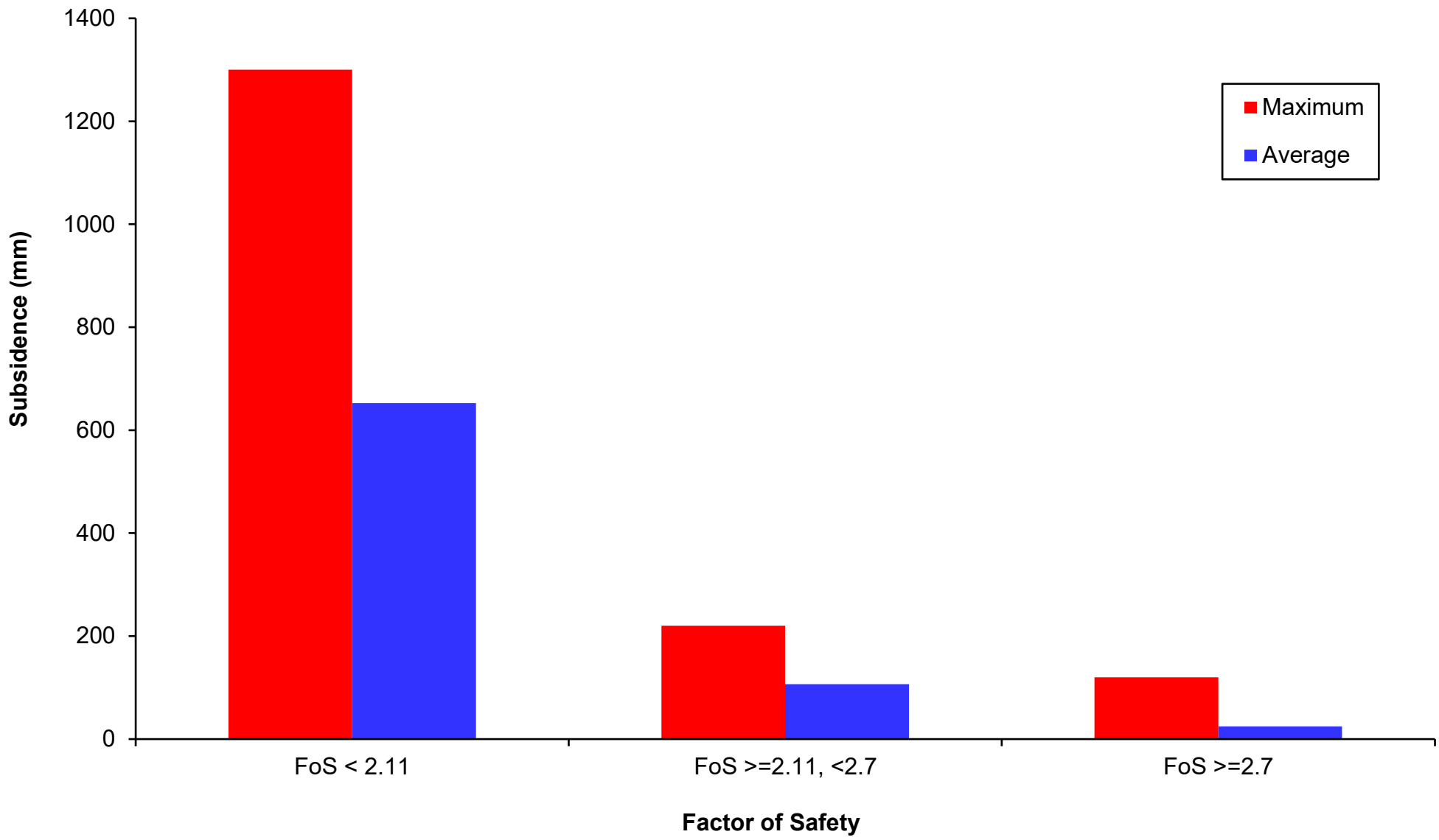
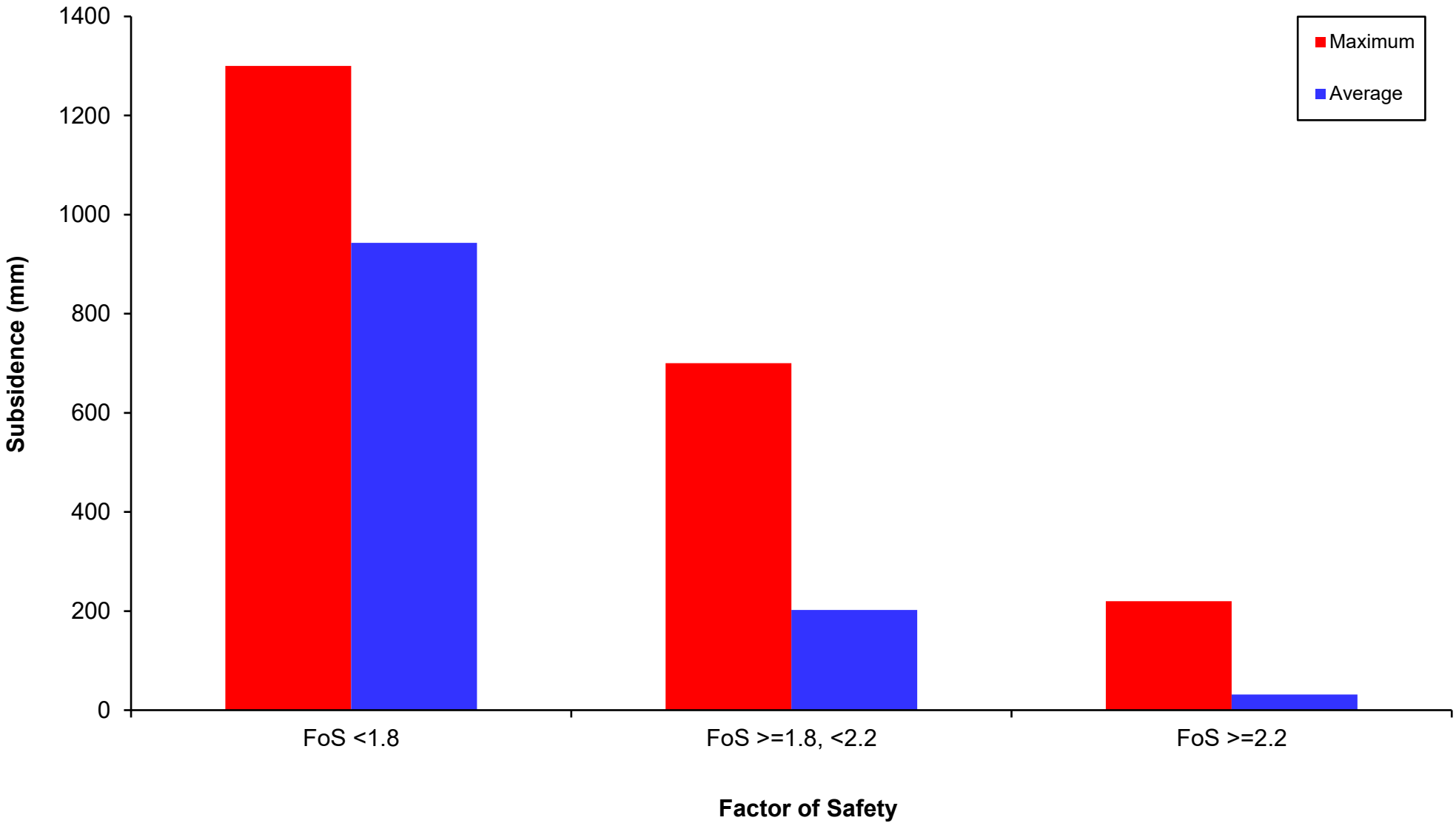
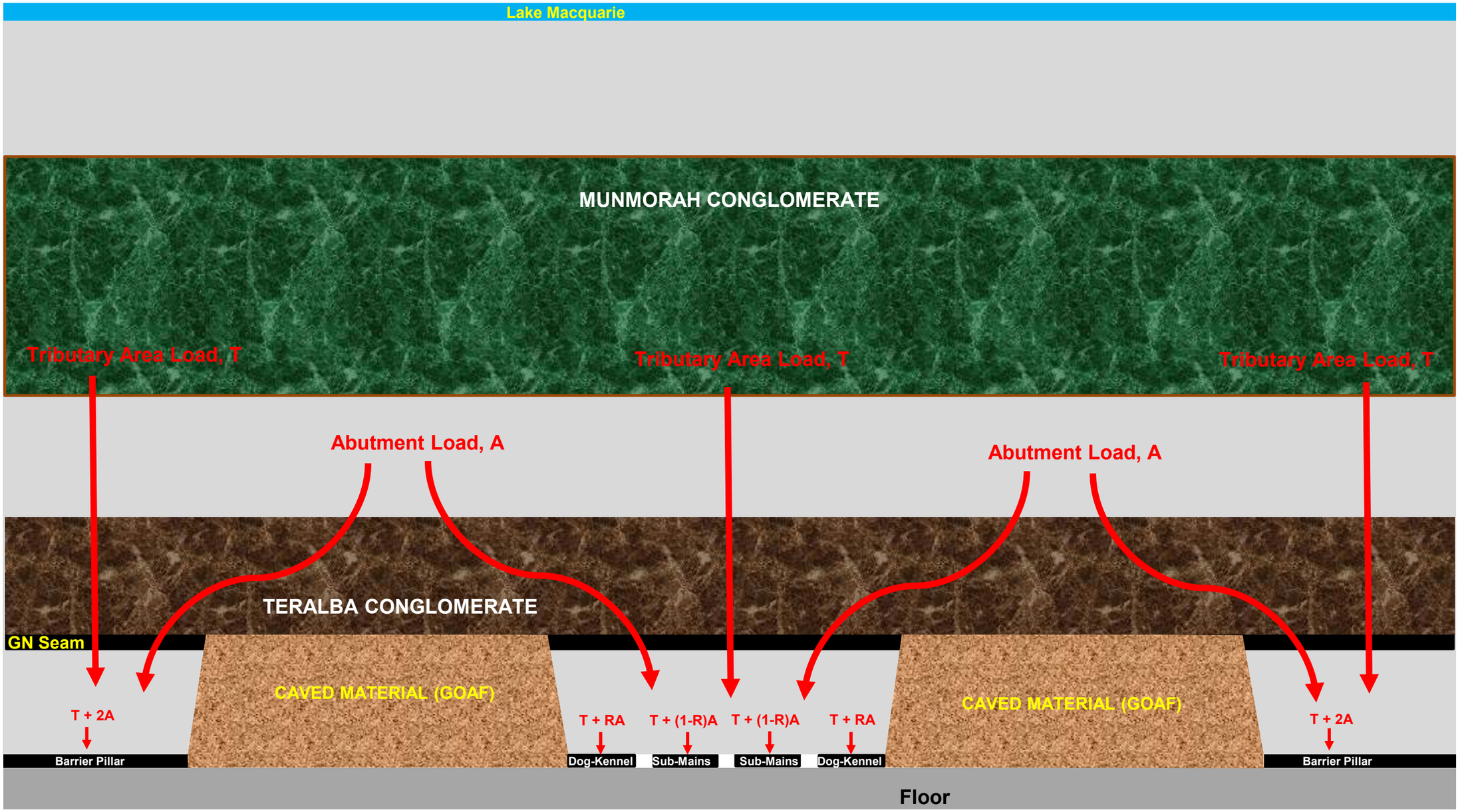


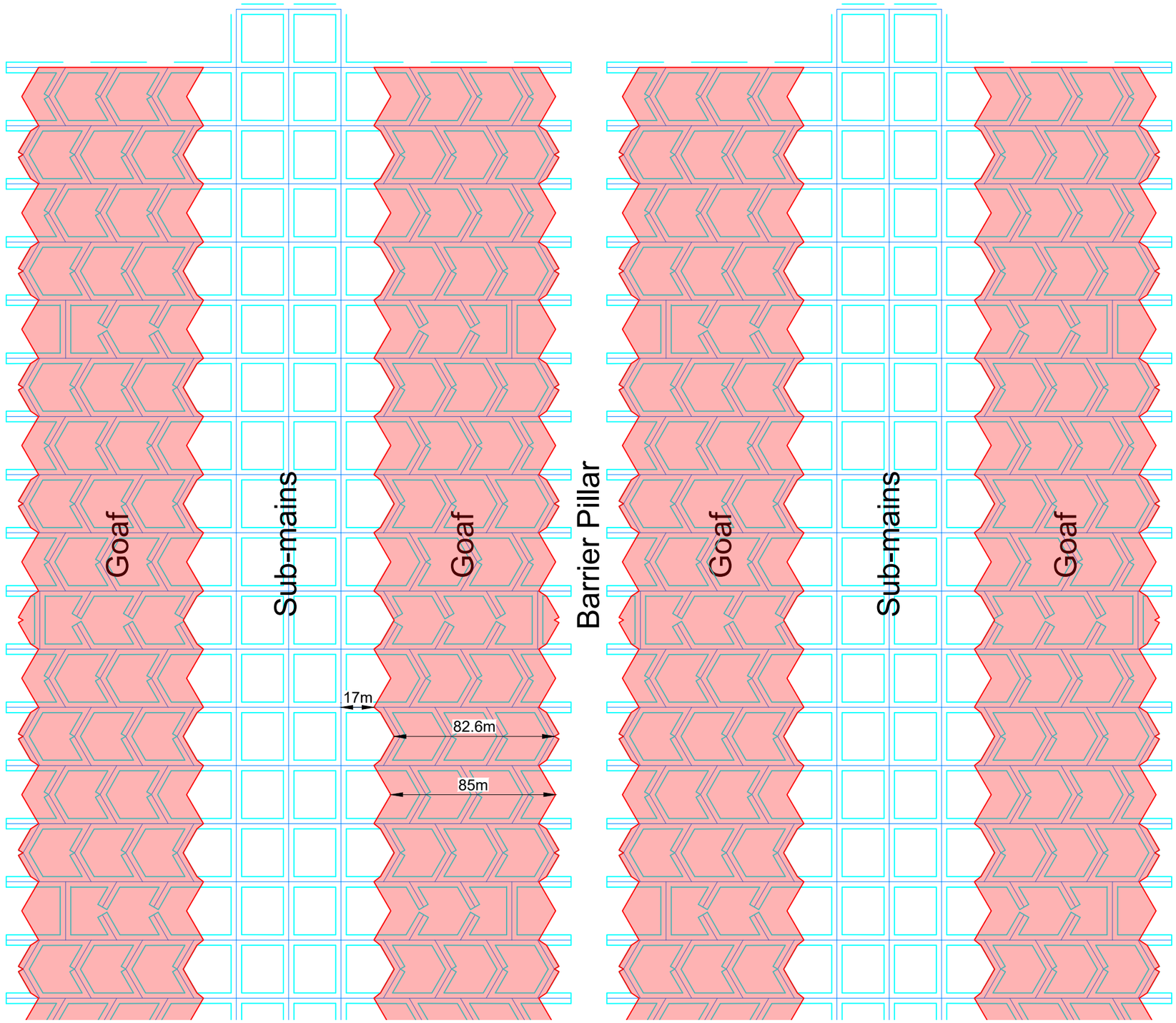
Figure 10b: Subsidence Results - Cases involving Pillar Stresses >15MPa Excluded



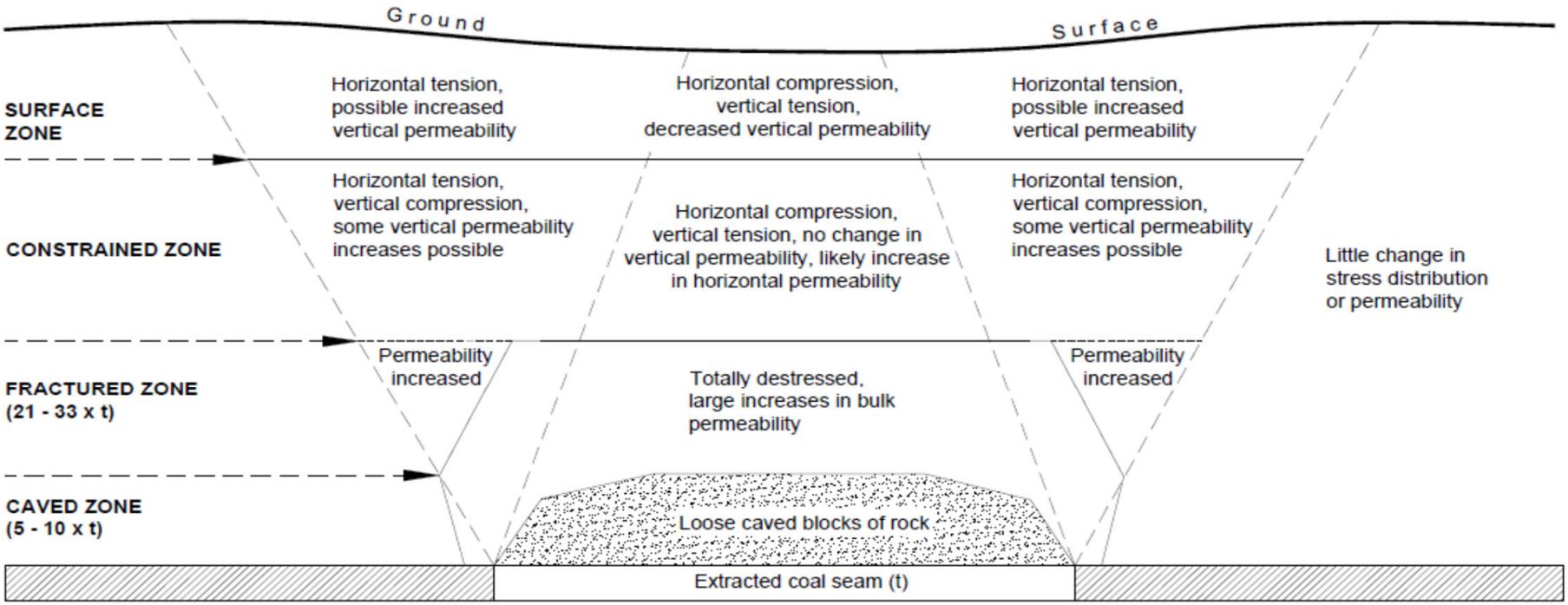
Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Lake Macquarie Pillar Database: Subsidence vs FoS		
Date:	04.12.20				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	10a/b



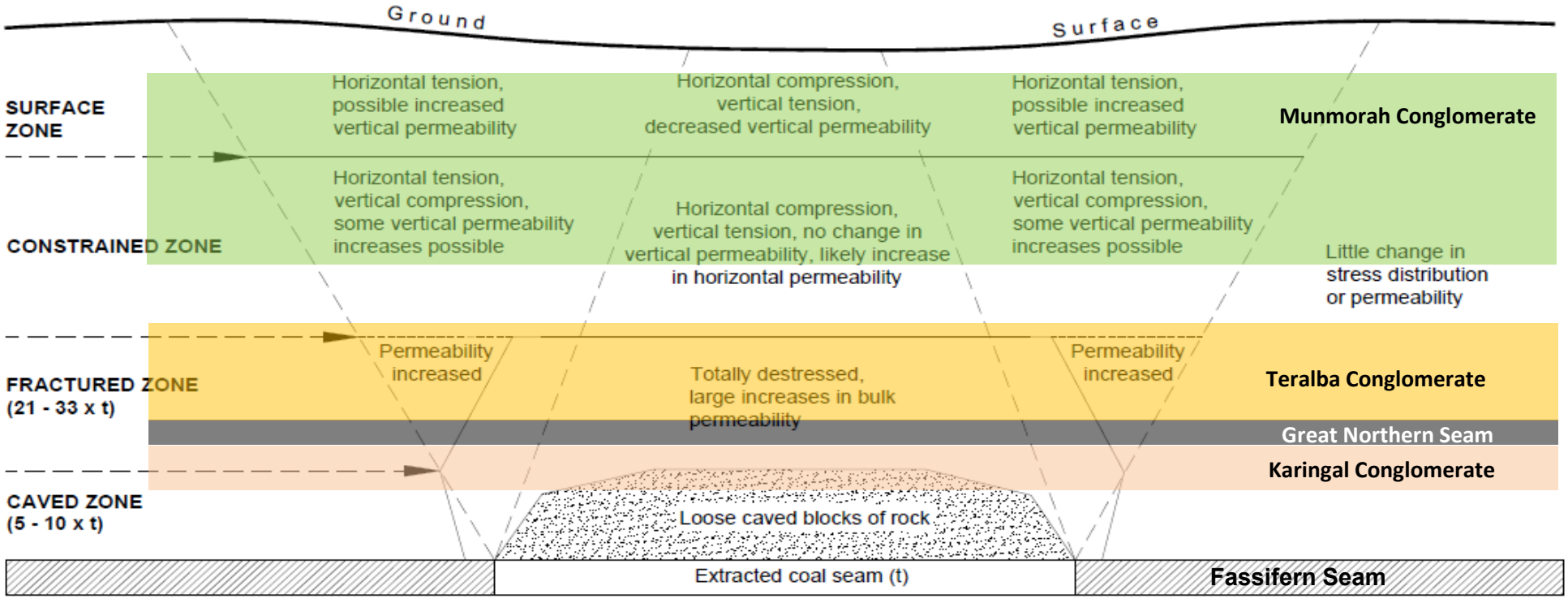
Engineer:	D. Hill	**Client:**	Chain Valley Colliery
Drawn:	D. Hill	**Title:**	Pillar Loading Schematic for the Herringbone Panel Secondary Extraction Operation
Date:	04.12.20		
STRATA^2		**Ref:**	CHV-024
		Revision No:	2
		Scale:	NTS
		Figure No:	11



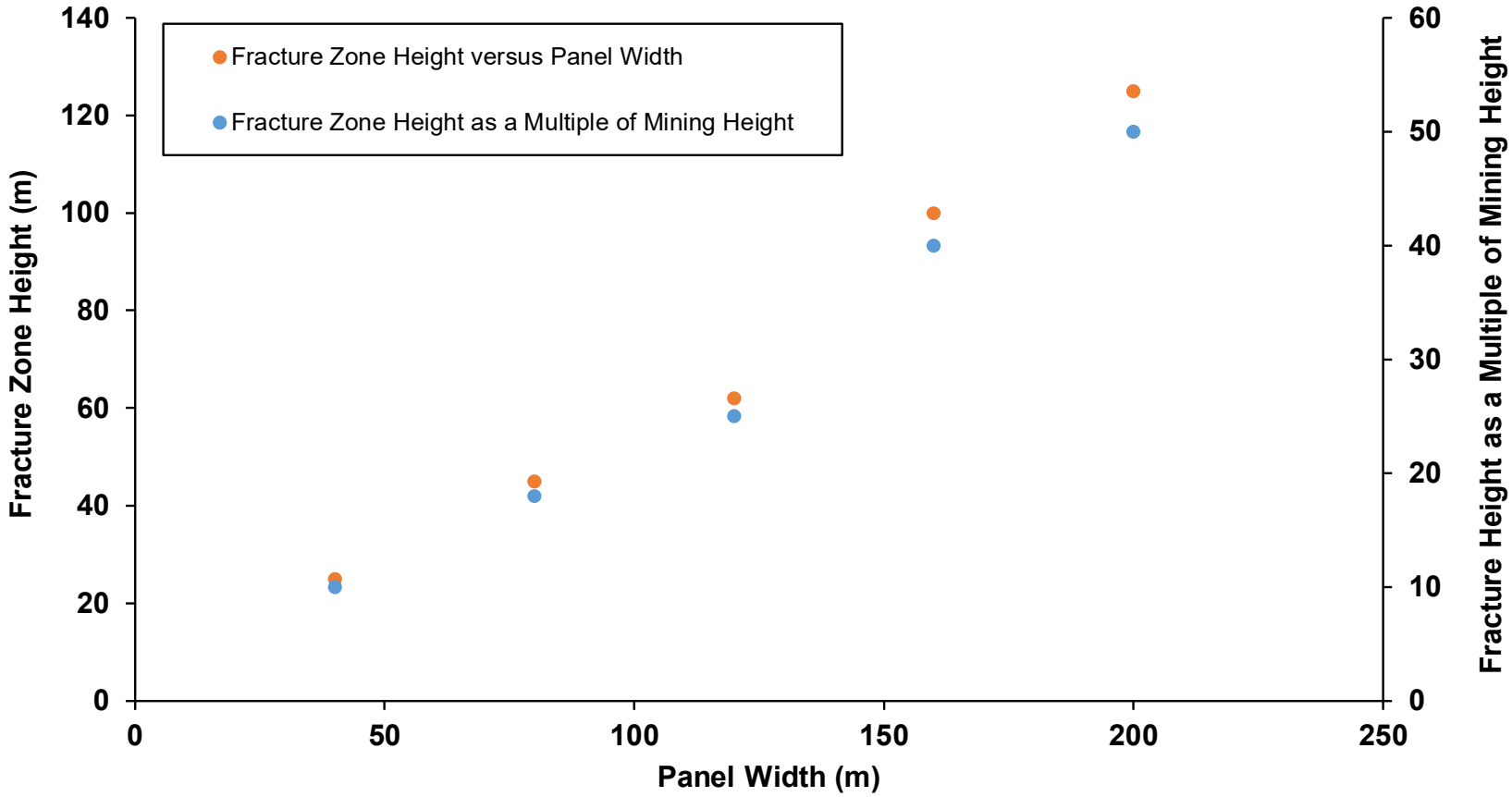
Engineer:	D. Hill	**Client:**	Chain Valley Colliery
Drawn:	R. de Laubadere	**Title:**	Schematic Showing Herringbone Layout Following Secondary Extraction
Date:	04.12.20		
STRATA^2		**Ref:**	CHV-024
		Revision No:	2
		Scale:	NTS
		Figure No:	12



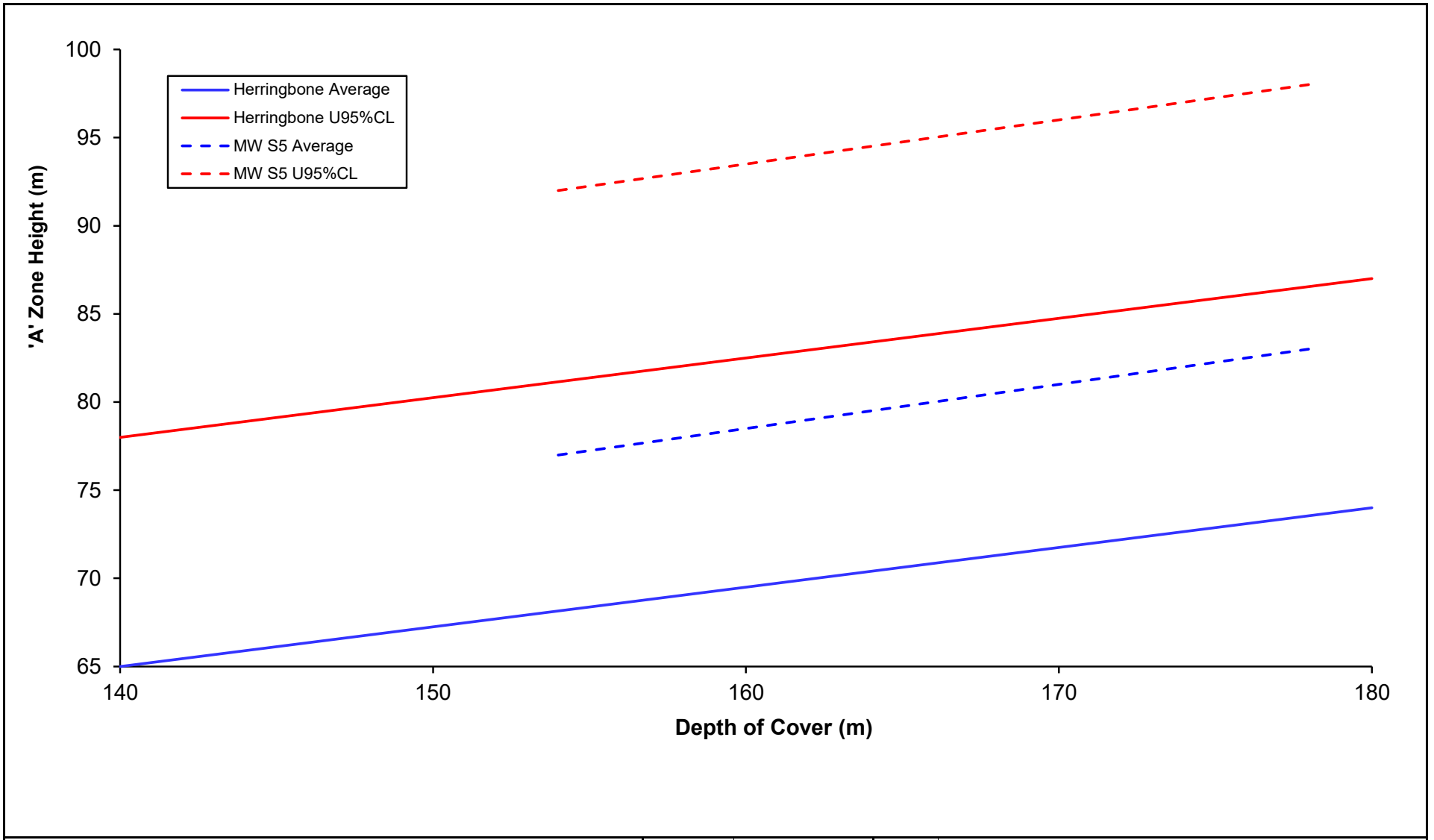
Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Hydrogeological Model above a Caved Longwall Panel **(adapted from Forster and Enever, 1992)**		
Date:	03.11.2020				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
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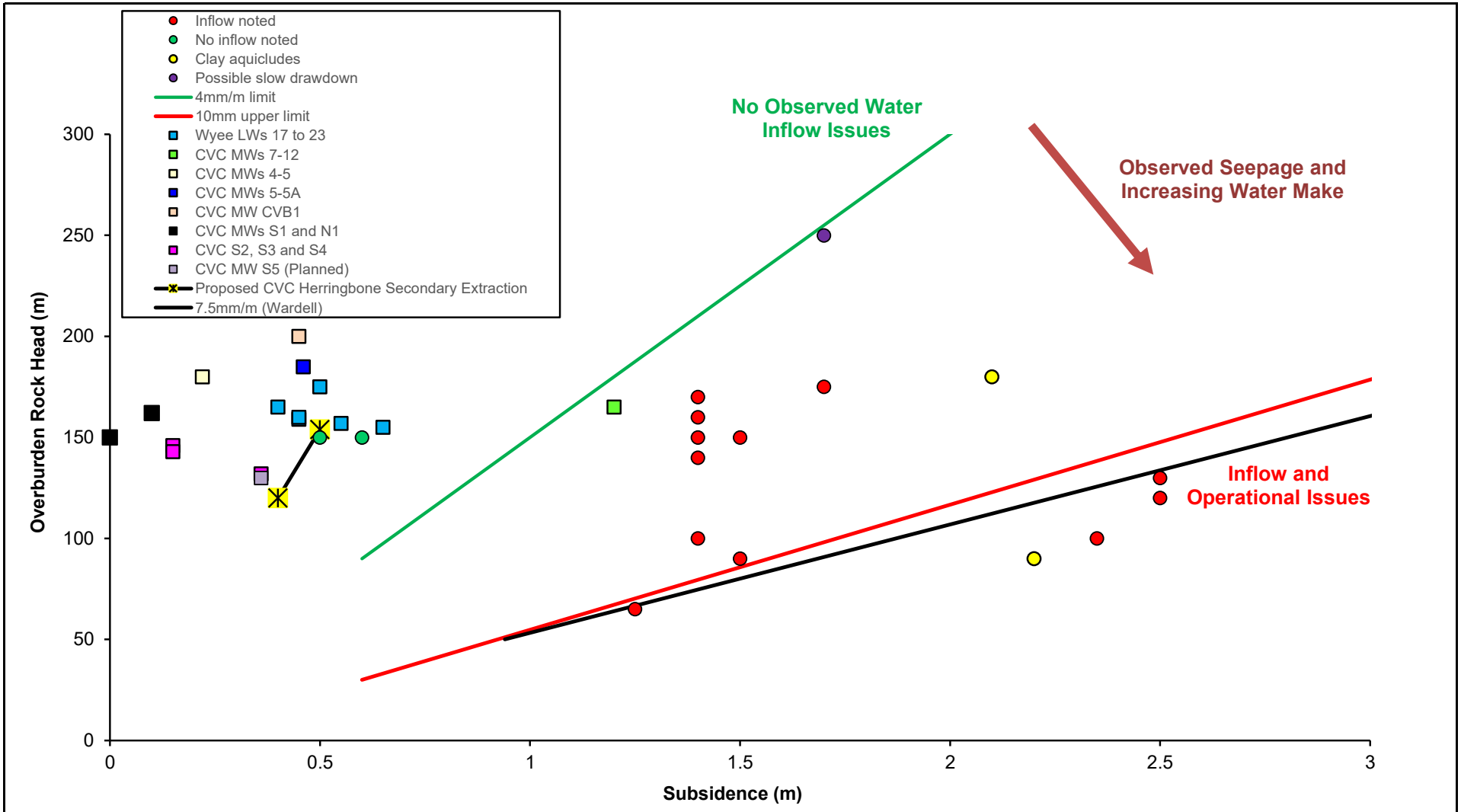
Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Hydrogeological Model, showing the GN Seam, Karingal, Teralba and Munmorah Conglomerates in the Overburden (Schematic)		
Date:	04.12.20				
STRATA^2		**Ref:**	CHV-019	**Revision No:**	2
		Scale:	N/A	**Figure No:**	13b



Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Fracture Zone Heights from Numerical Modelling **(Follington and Isaac, 1990)**		
Date:	04.12.20				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	14



Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Heights of Connective Fracturing for Extracted MW S5 and Herringbone Panels, based on **Ditton and Merrick (2014)**		
Date:	04.12.20				
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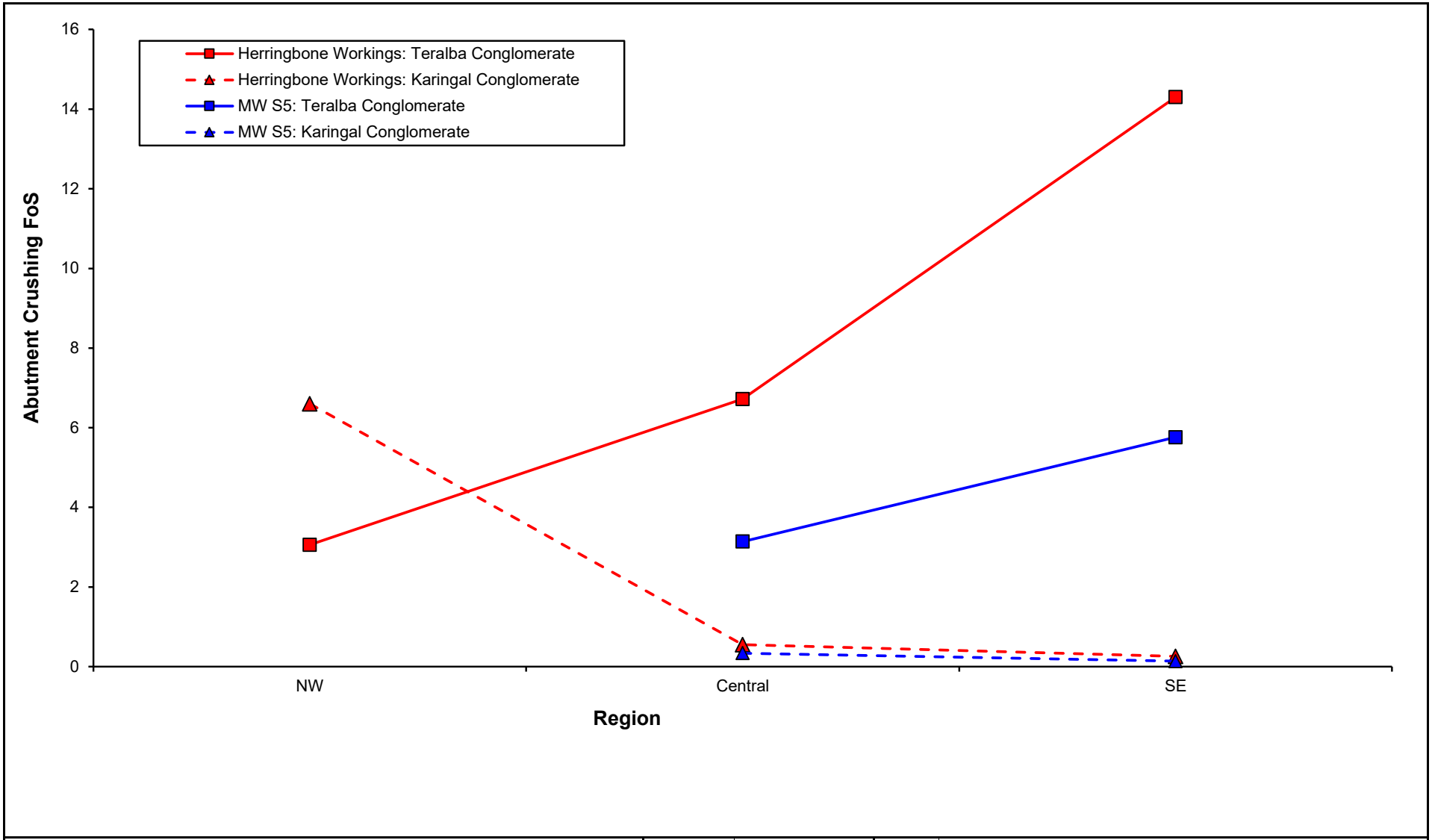


Note: Systematic tensile strain limit lines assume a k value of 0.6, whereas the CVC and Wyee values are based on the local k value of 0.4.

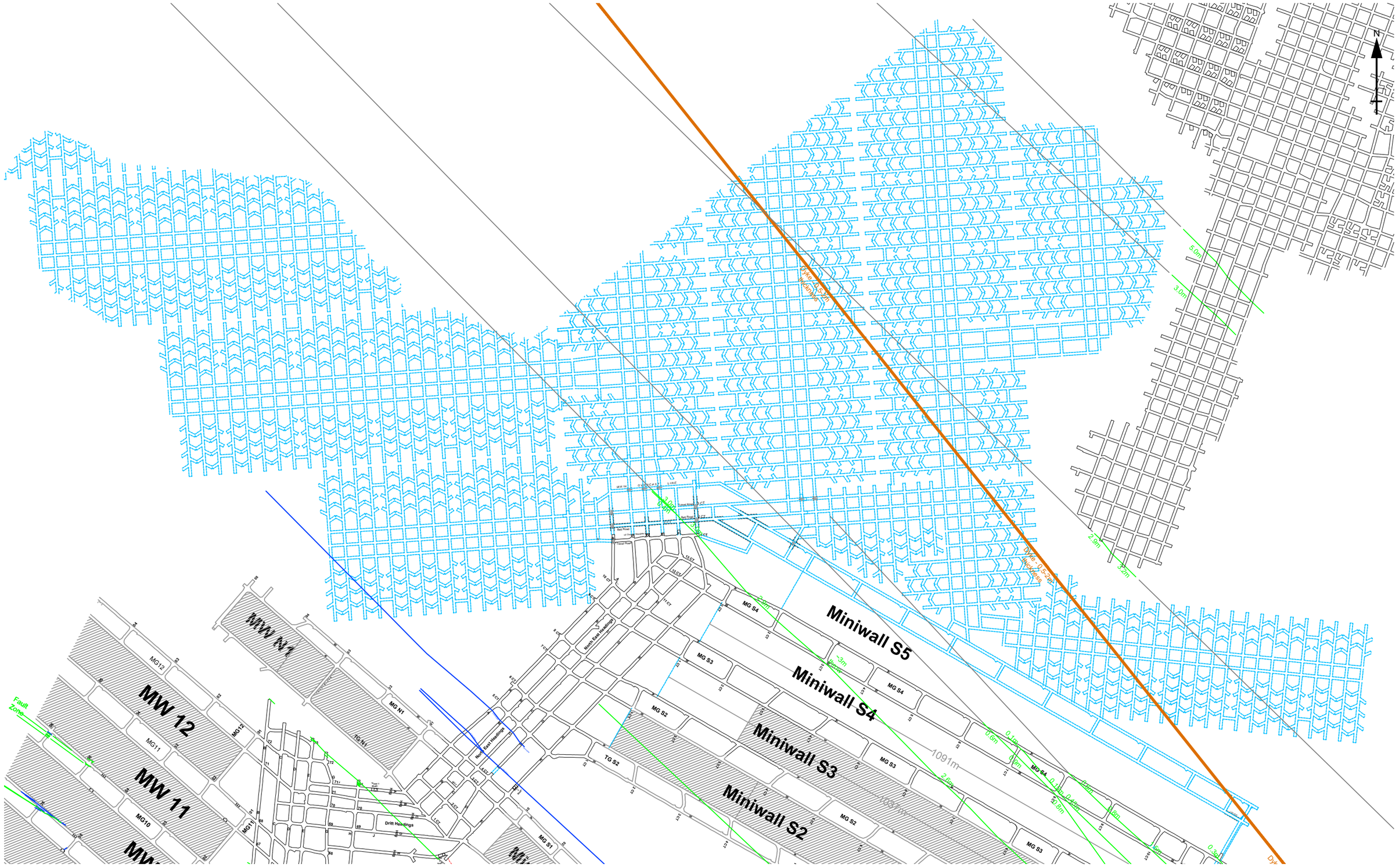
Engineer:	D. Hill
Drawn:	D. Hill
Date:	04.12.20

STRATA²

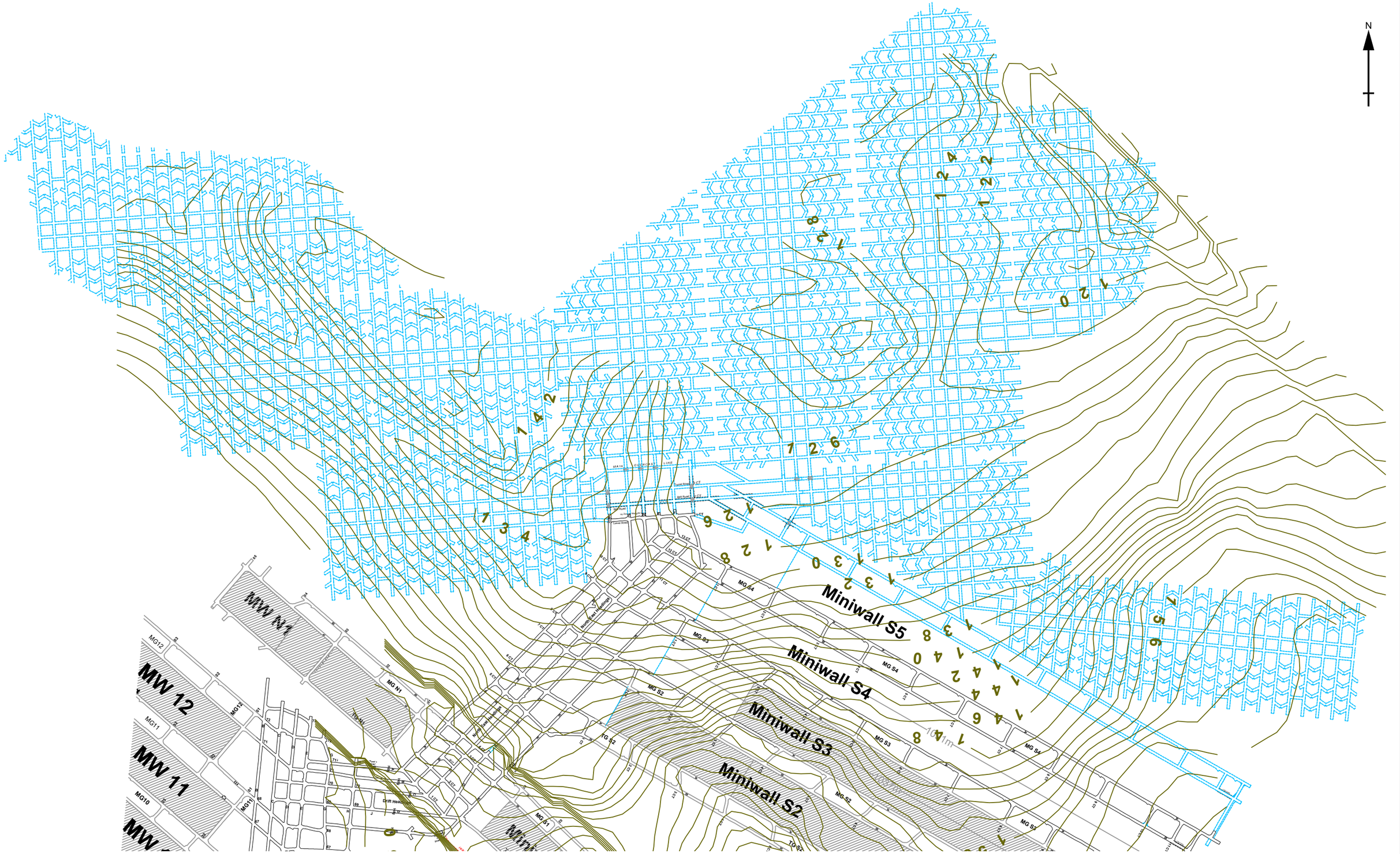
Client:	Chain Valley Colliery		
Title:	Australian Colliery Inflow Experiences relative to Subsidence and Rock Head Thickness (adapted from **SCT, 2008**), including CVC and Wyee Data		
Ref:	CHV-024	**Revision No:**	2
Scale:	N/A	**Figure No:**	16



Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Karingal and Teralba Conglomerates: Beam Stability Results for MW S5 and NMA Herringbone Panels		
Date:	04.12.2020				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	17



Engineer:	D. Hill	**Client:**	Chain Valley Colliery
Drawn:	R. de Laubadere	**Title:**	Mine Plan Showing Structural Features
Date:	04.12.20		
STRATA²		**Ref:**	CHV-024
		Revision No:	2
		Scale:	NTS
		Figure No:	18

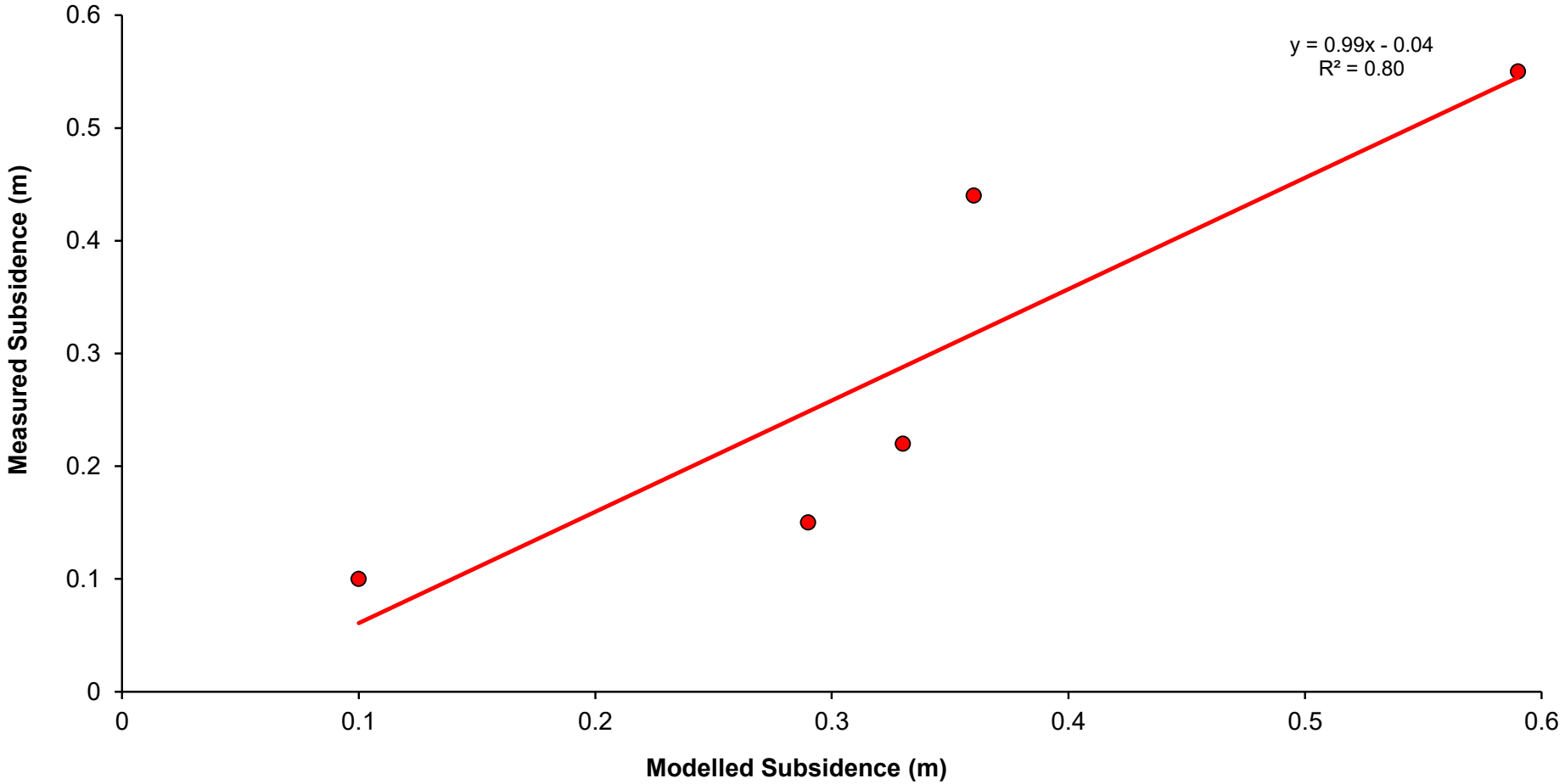


Key:

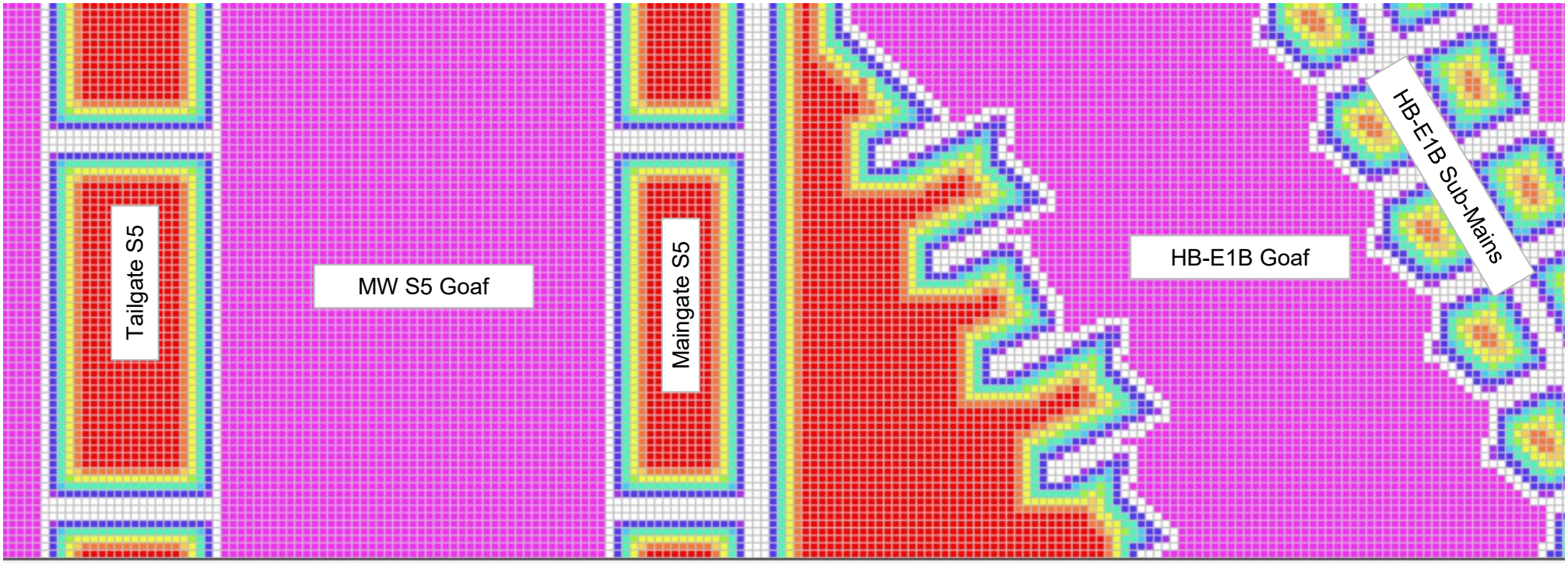
- Rock Head thickness (m)

Engineer:	D. Hill	**Client:**	Chain Valley Colliery
Drawn:	I. Saliamon	**Title:**	Mine Plan Showing Rock Head Contours for Proposed Herringbone Workings
Date:	07.12.20		
		Ref:	CHV-024
		Revision No:	2
		Scale:	NTS
		Figure No:	19

STRATA²

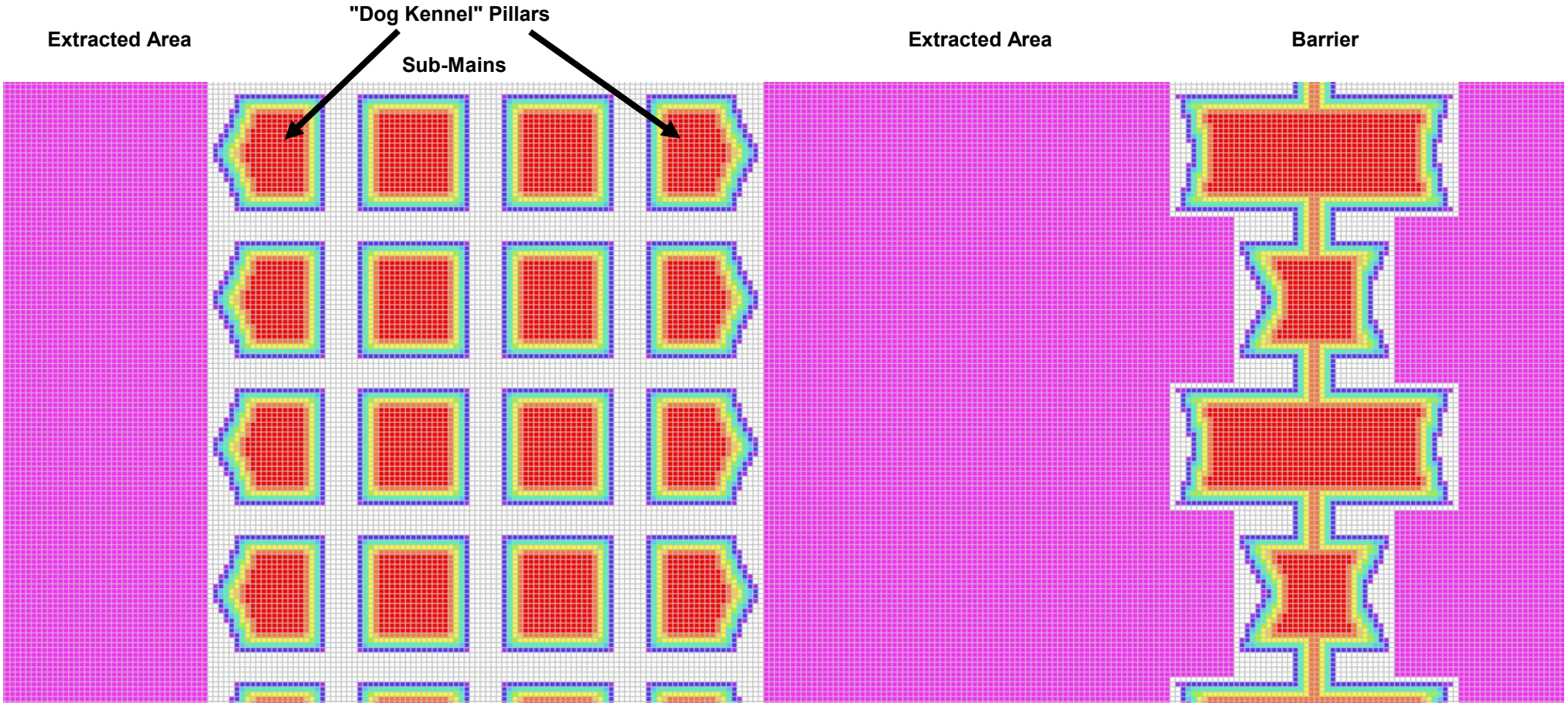


Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	LaModel Calibration Results: Predicted versus Measured Subsidence for Chain Valley Colliery Miniwall Panels and Wyee Colliery Longwall Panels		
Date:	04.12.20				
STRATA²		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	20

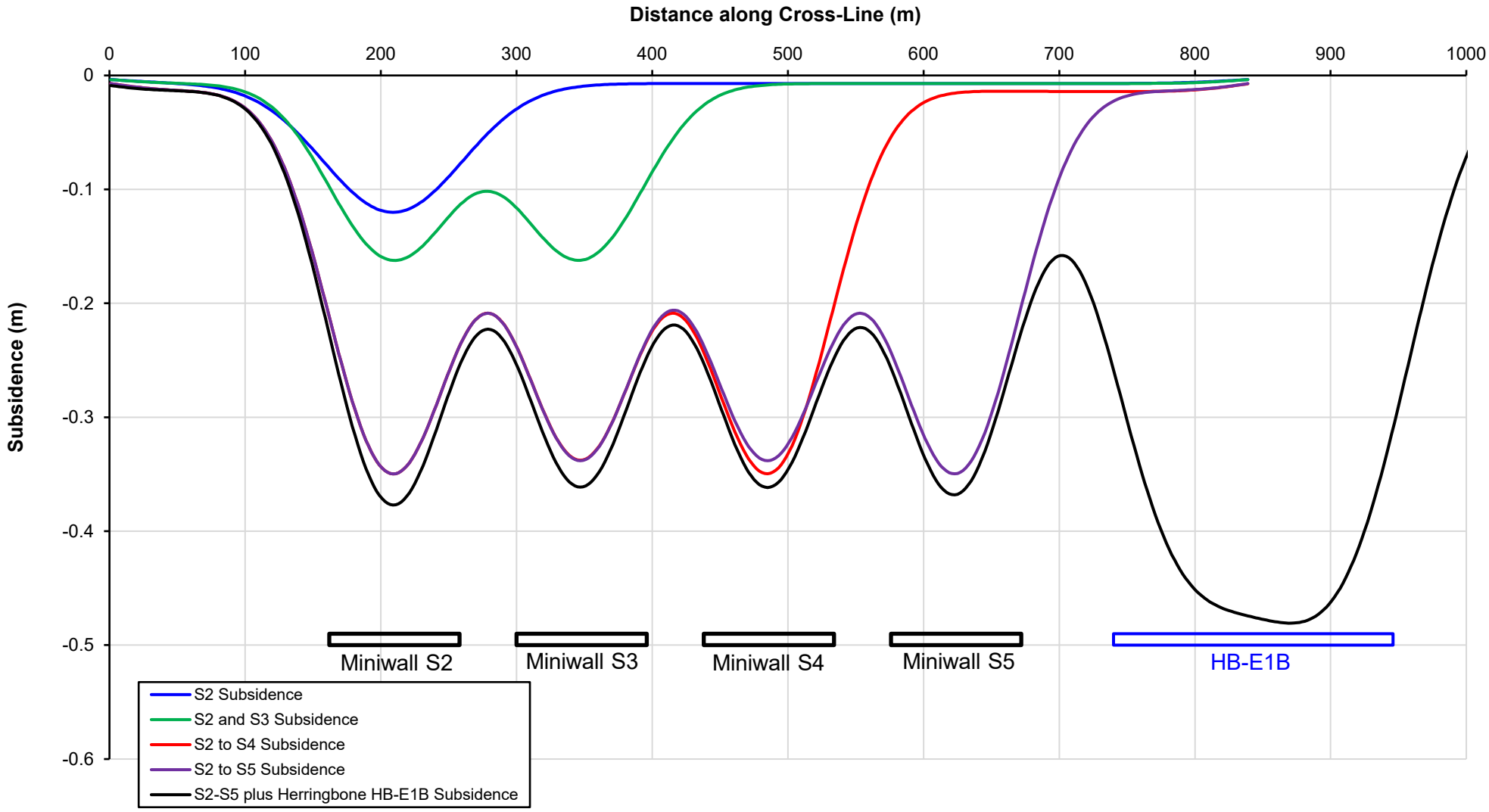


Engineer:	D. Hill	**Client:**	Chain Valley Colliery
Drawn:	D. Hill	**Title:**	Segment of LaModel Grid, showing MW S5 and Adjacent Area of HB-E1B
Date:	04.12.20		
		Ref:	CHV-024
		Revision No:	2
		Scale:	N/A
		Figure No:	21

STRATA²



Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Section of LaModel Grid for Multiple Herringbone Panels		
Date:	04.12.20				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	22



Engineer:	D. Hill	**Client:**	Chain Valley Colliery
Drawn:	D. Hill	**Title:**	LaModel Subsidence Results on a Cross-Line through MWs S2 to S5, plus Adjacent Herringbone HB-E1B Panel
Date:	04.12.20		
	STRATA^2		
		Ref:	CHV-024
		Revision No:	2
		Scale:	N/A
		Figure No:	23

Figure 24a: Tilt along a Cross-Line through MWs 2 and 3

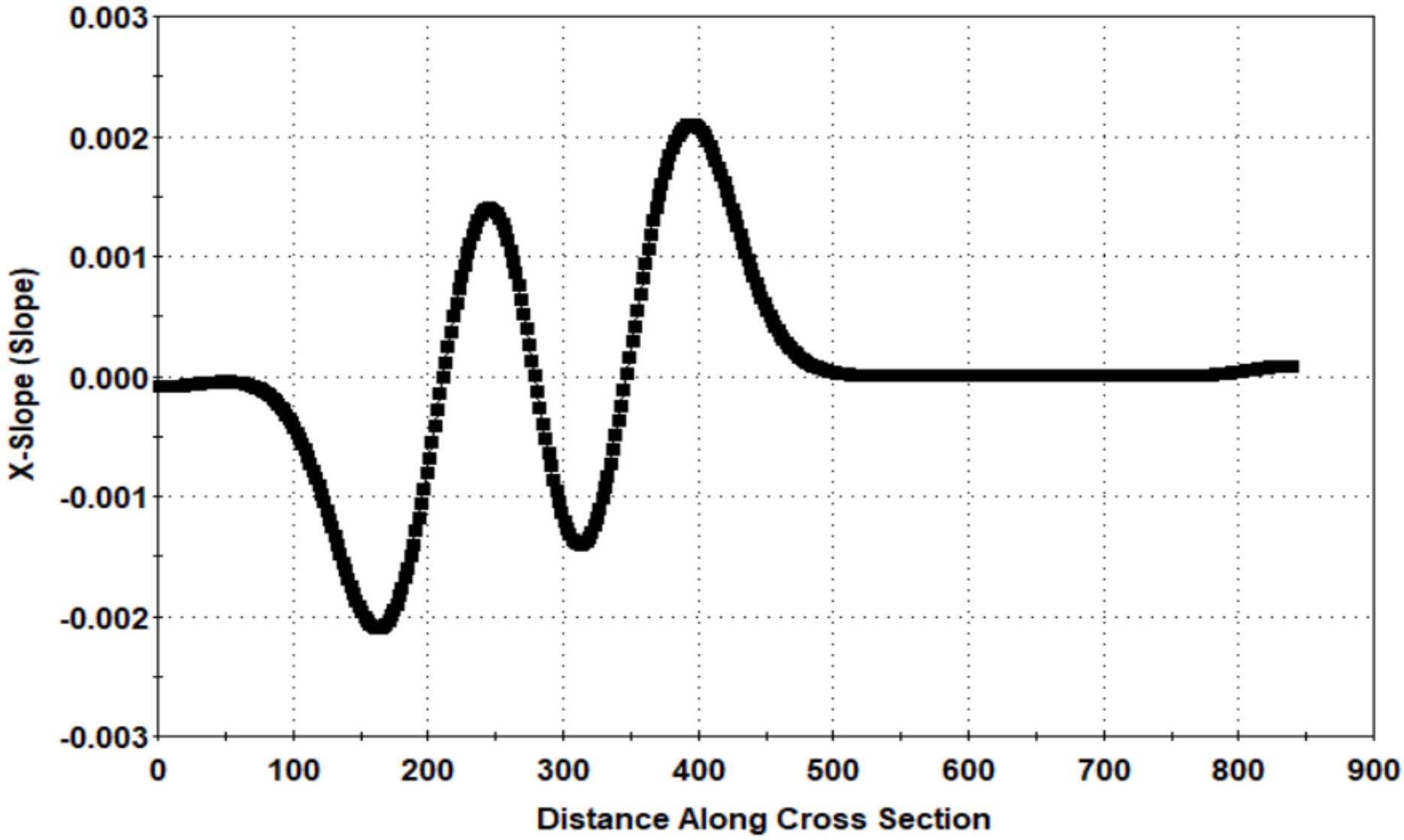
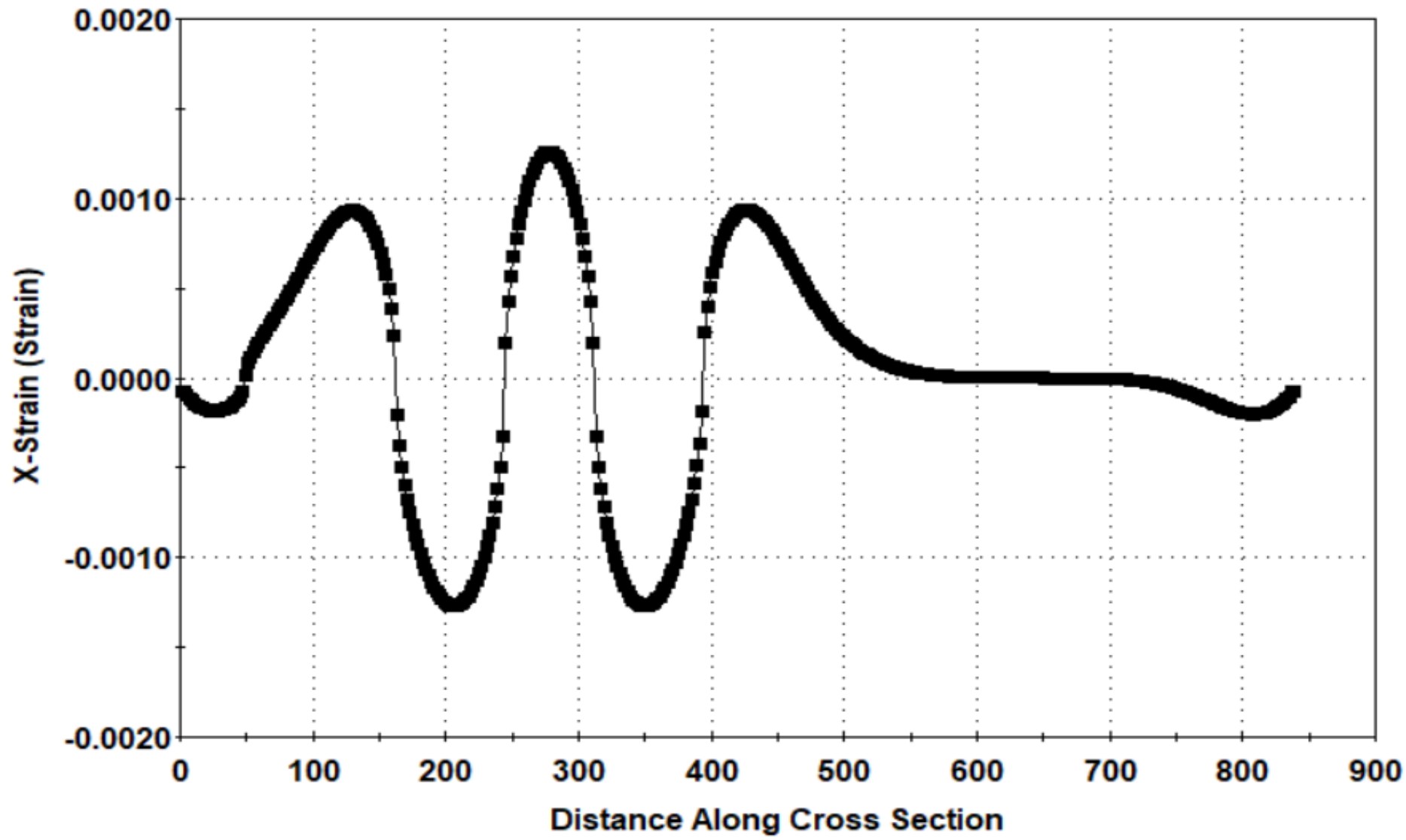


Figure 24b: Strain along a Cross-Line through MWs 2 and 3



Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Tilts and Strains following the Extraction of MW S3		
Date:	04.12.20				
STRATA²		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	24a/b

Figure 25a: Tilt along a Cross-Line through MWs 2 to 5

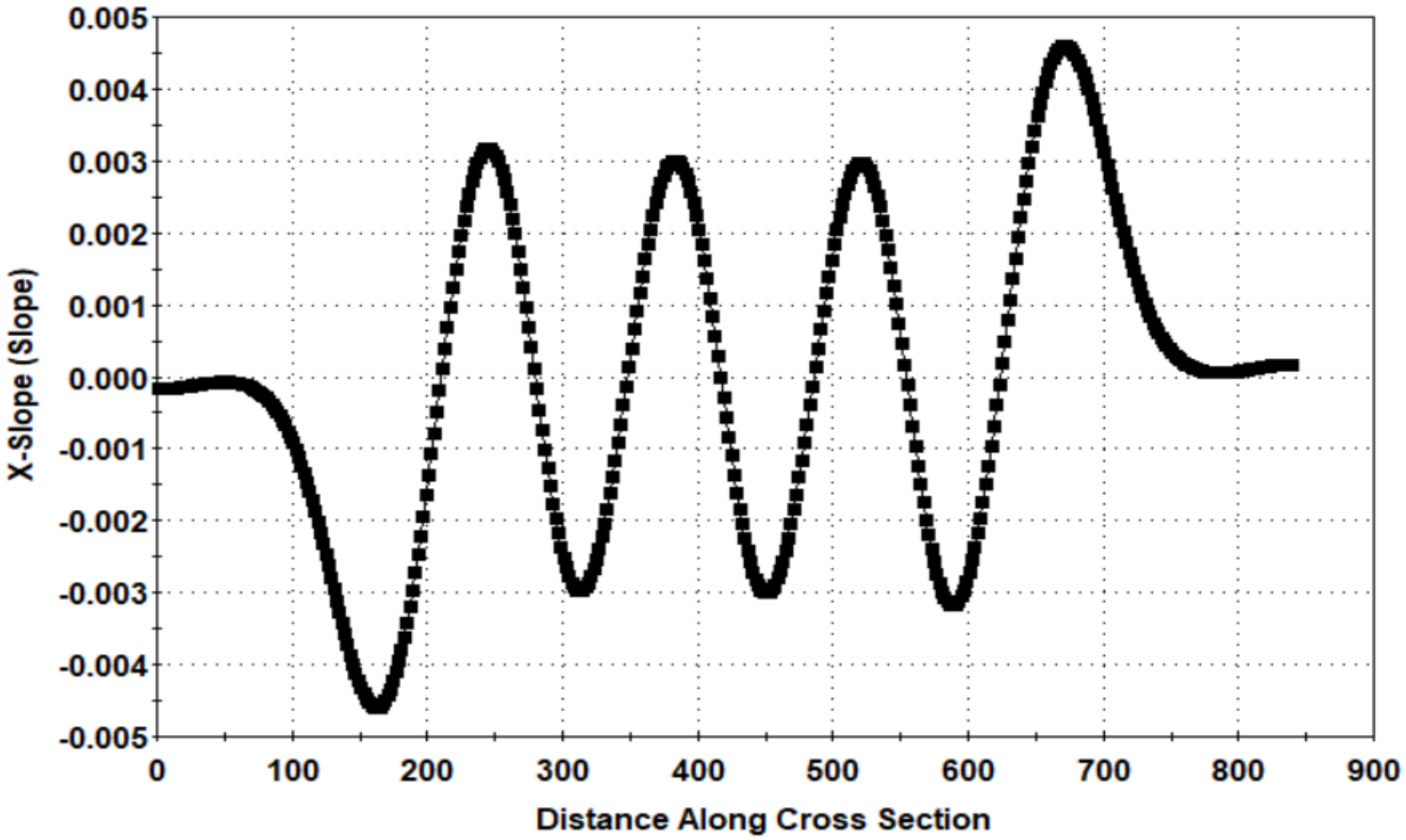
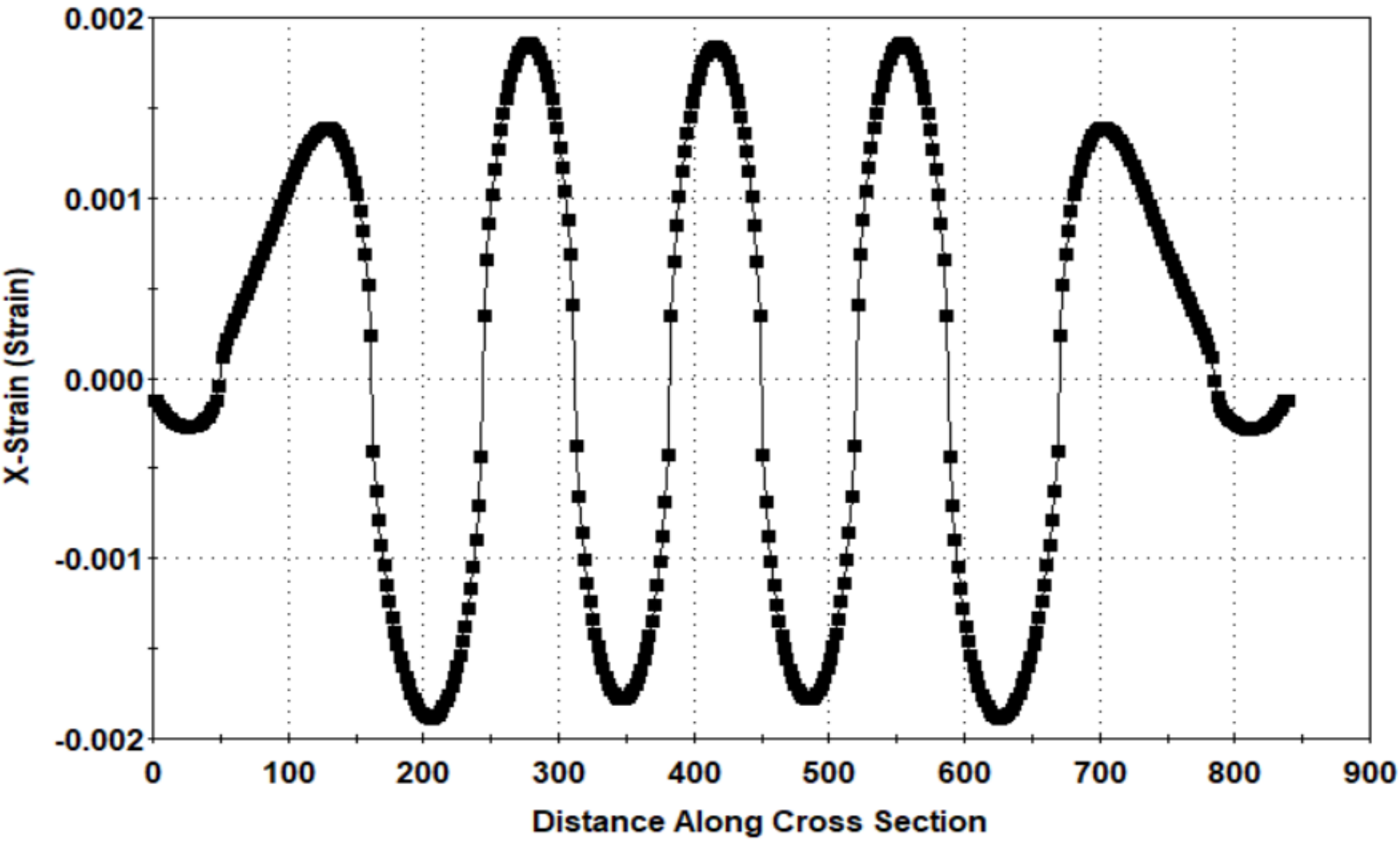


Figure 25b: Strain along a Cross-Line through MWs 2 to 5



Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Tilts and Strains following the Extraction of MWs S2 to S5 Inclusive		
Date:	04.12.20				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	25a/b

Figure 26a: Tilt along a Cross-Line through MWs 2 to 5 and HB-E1B

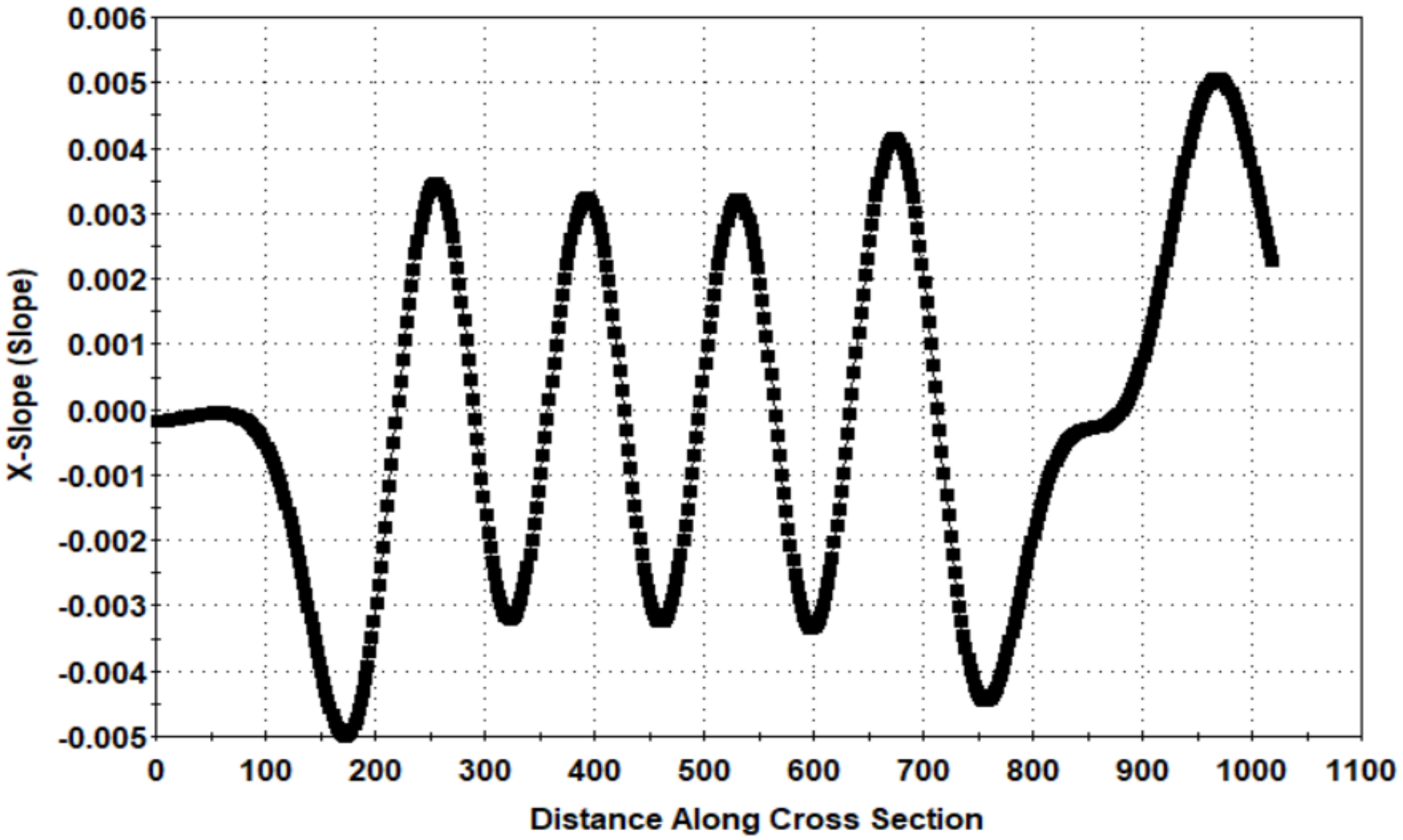
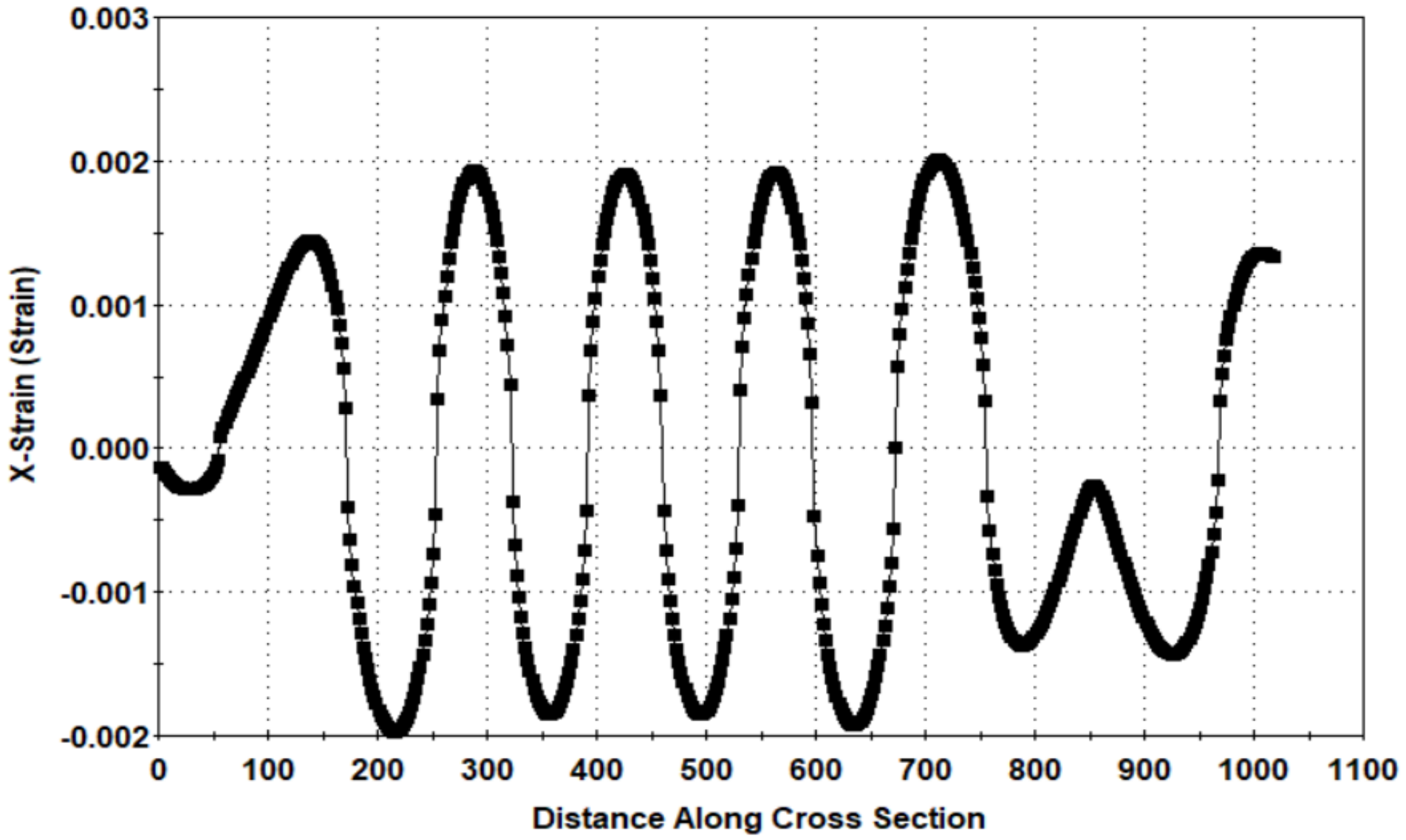
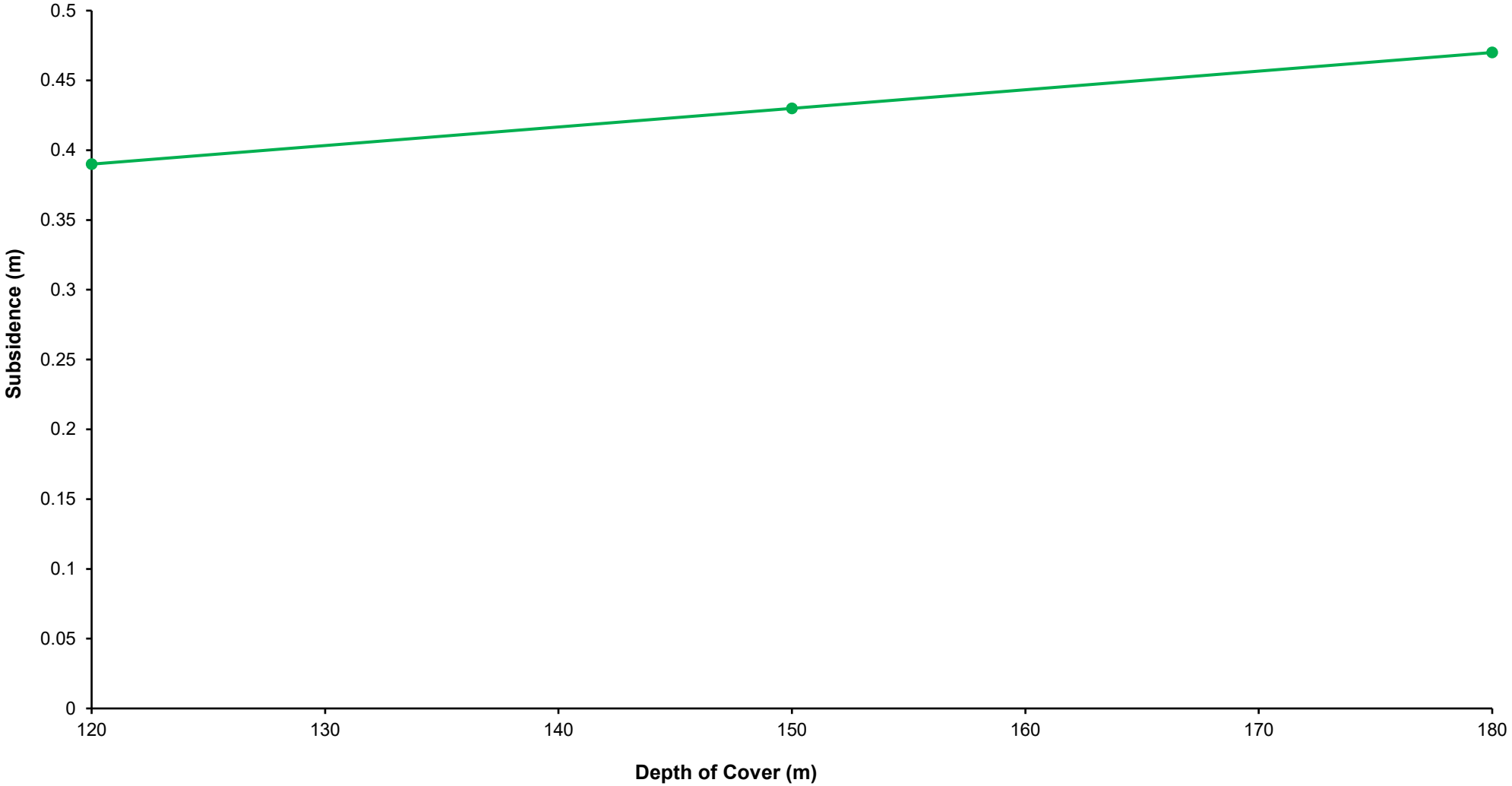


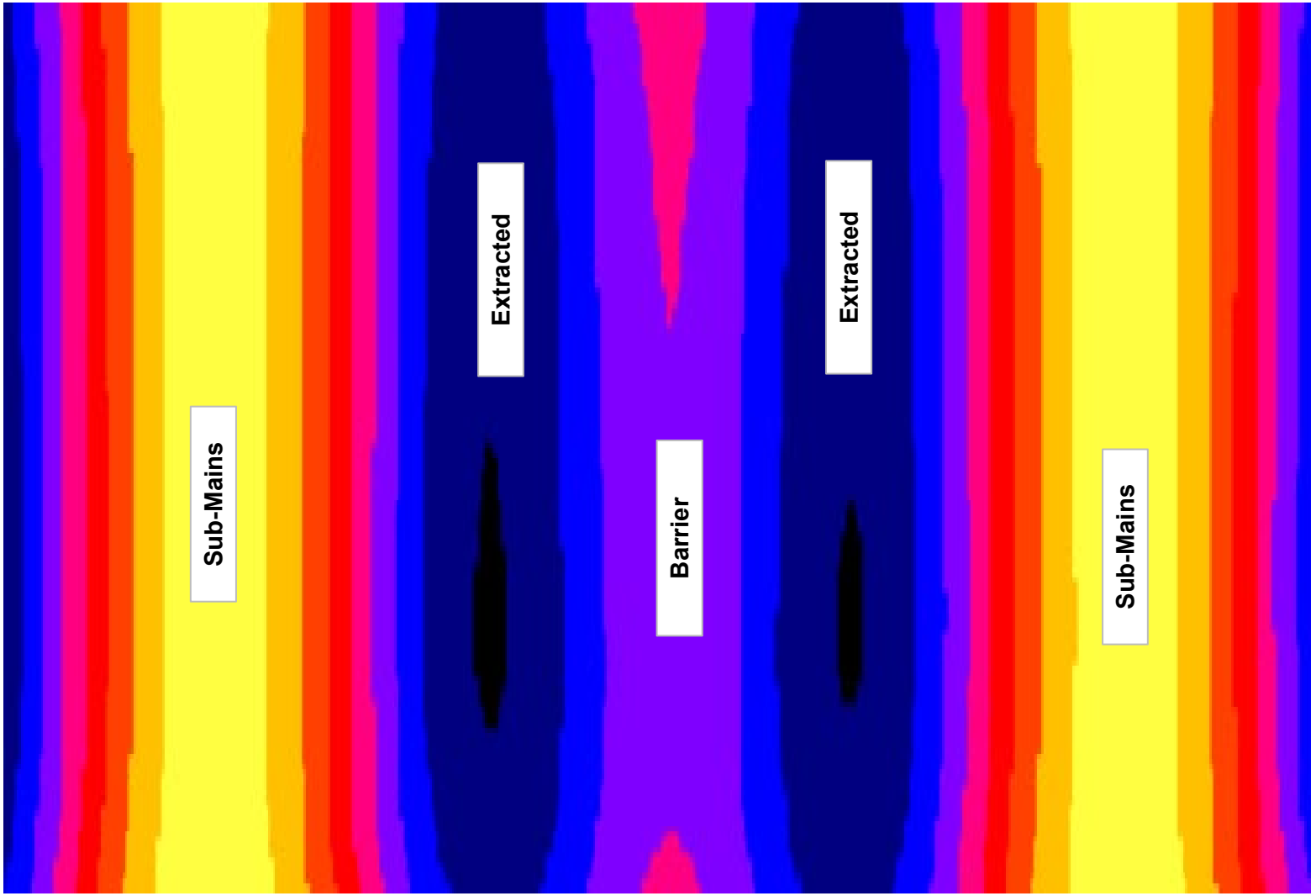
Figure 26b: Strain along a Cross-Line through MWs 2 to 5 and HB-E1B



Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Tilts and Strains following the Extraction of MWs S2-S5 plus Herringbone Panel HB-E1B		
Date:	04.12.20				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	26a/b



Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Summary of Subsidence Results (S_{max} values) from LaModel, following Herringbone Pillar Extraction at a Height of 3.5m and at an Extraction Span of 85m		
Date:	04.12.20				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	27



Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Subsidence Heat Map following Herringbone Pillar Extraction at a Height of 3.5m, an Extraction Span of 85m and at the Maximum Depth of 180m		
Date:	04.12.20				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	28

Figure 29a: Subsidence on Mid-Panel Cross-Line

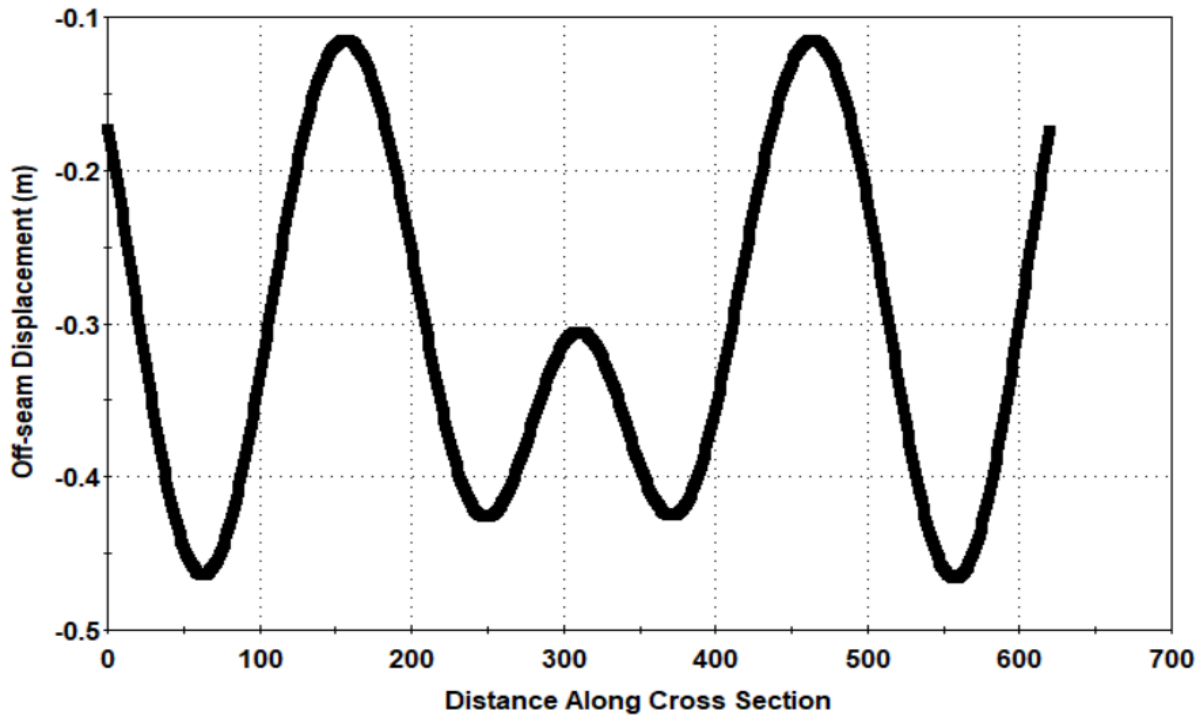


Figure 29b: Tilt on Mid-Panel Cross-Line

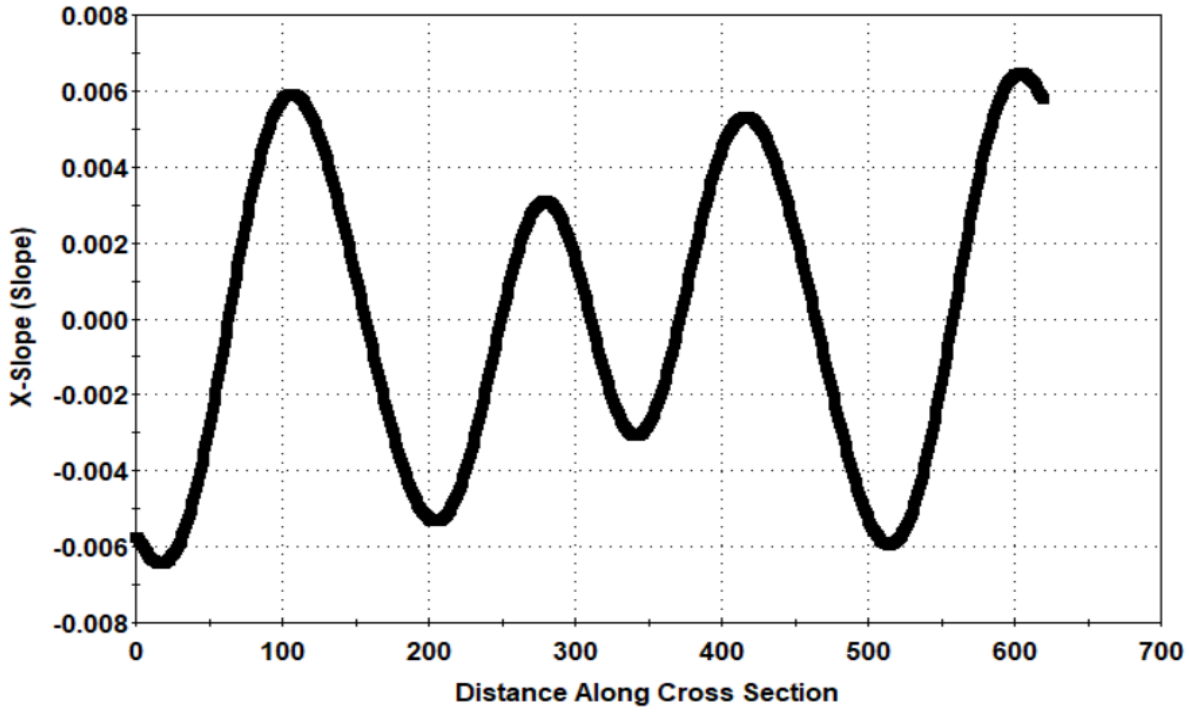
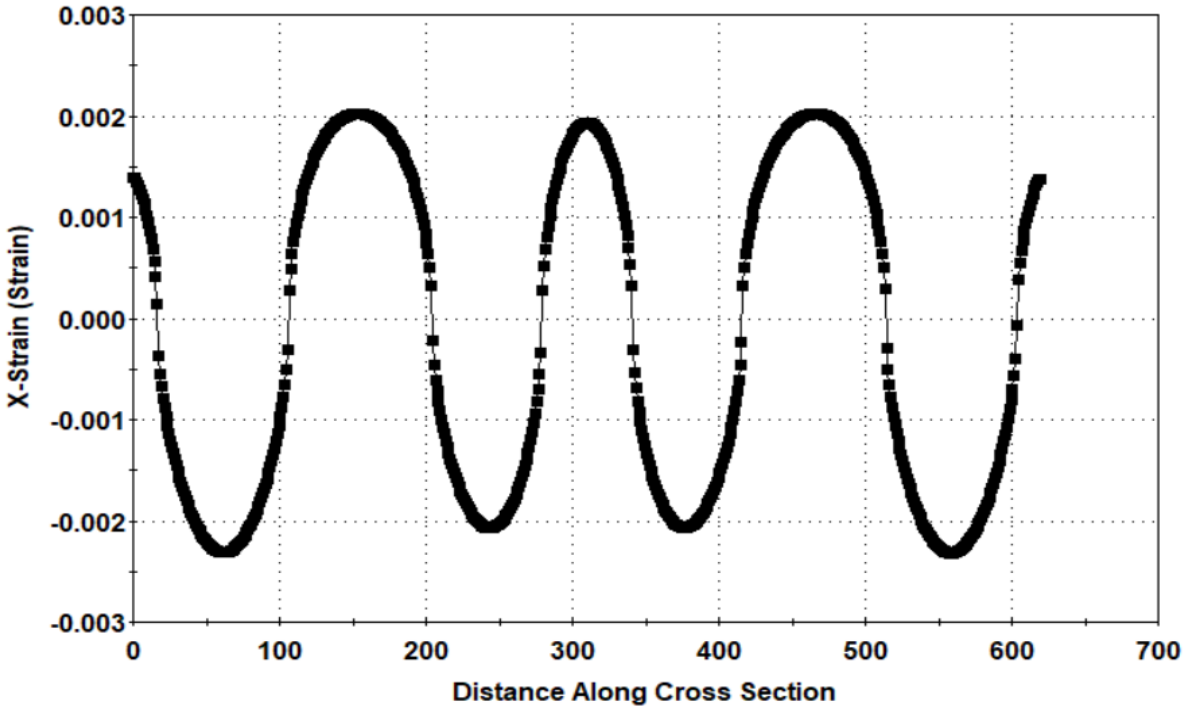
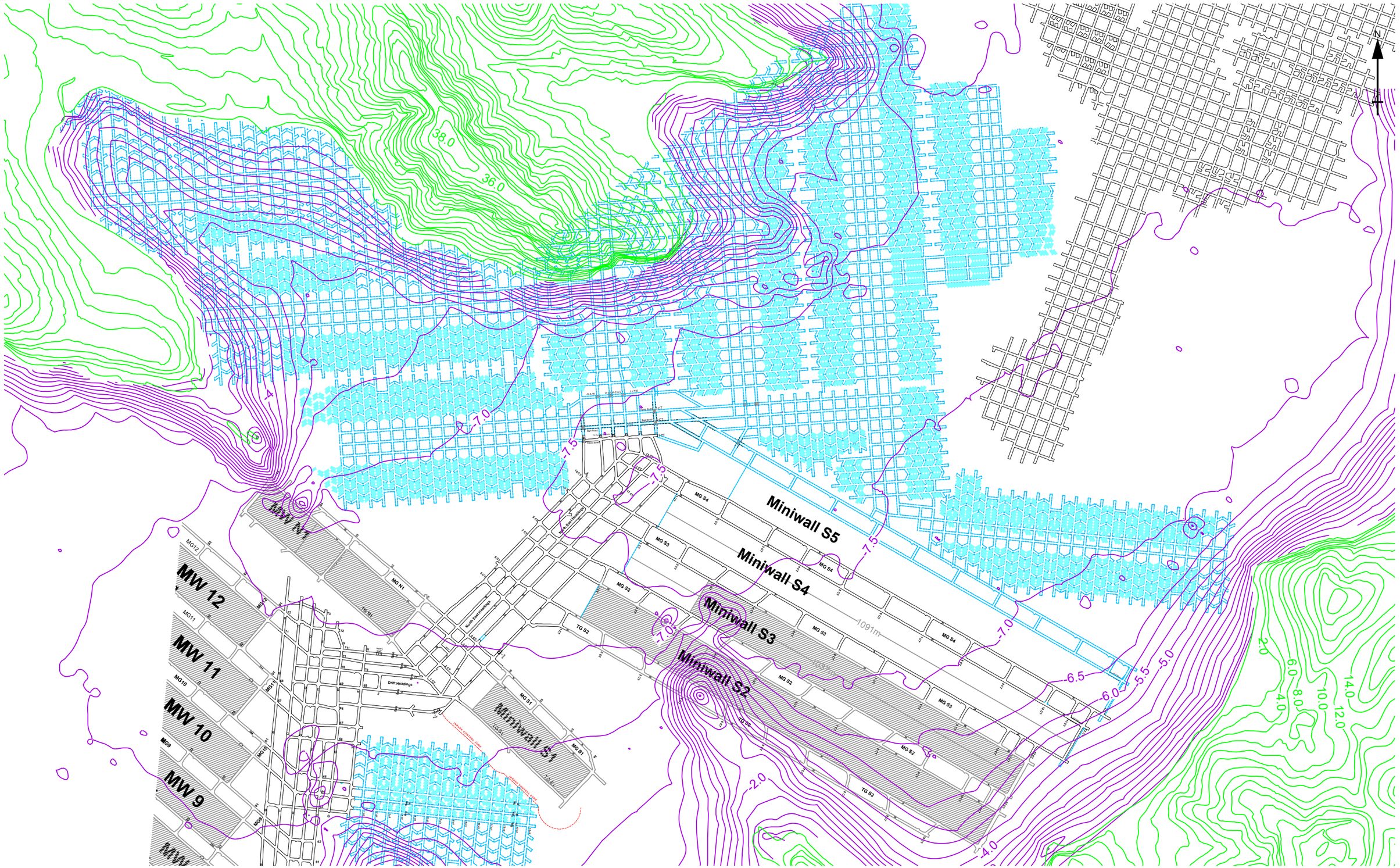


Figure 29c: Strain on Mid-Panel Cross-Line



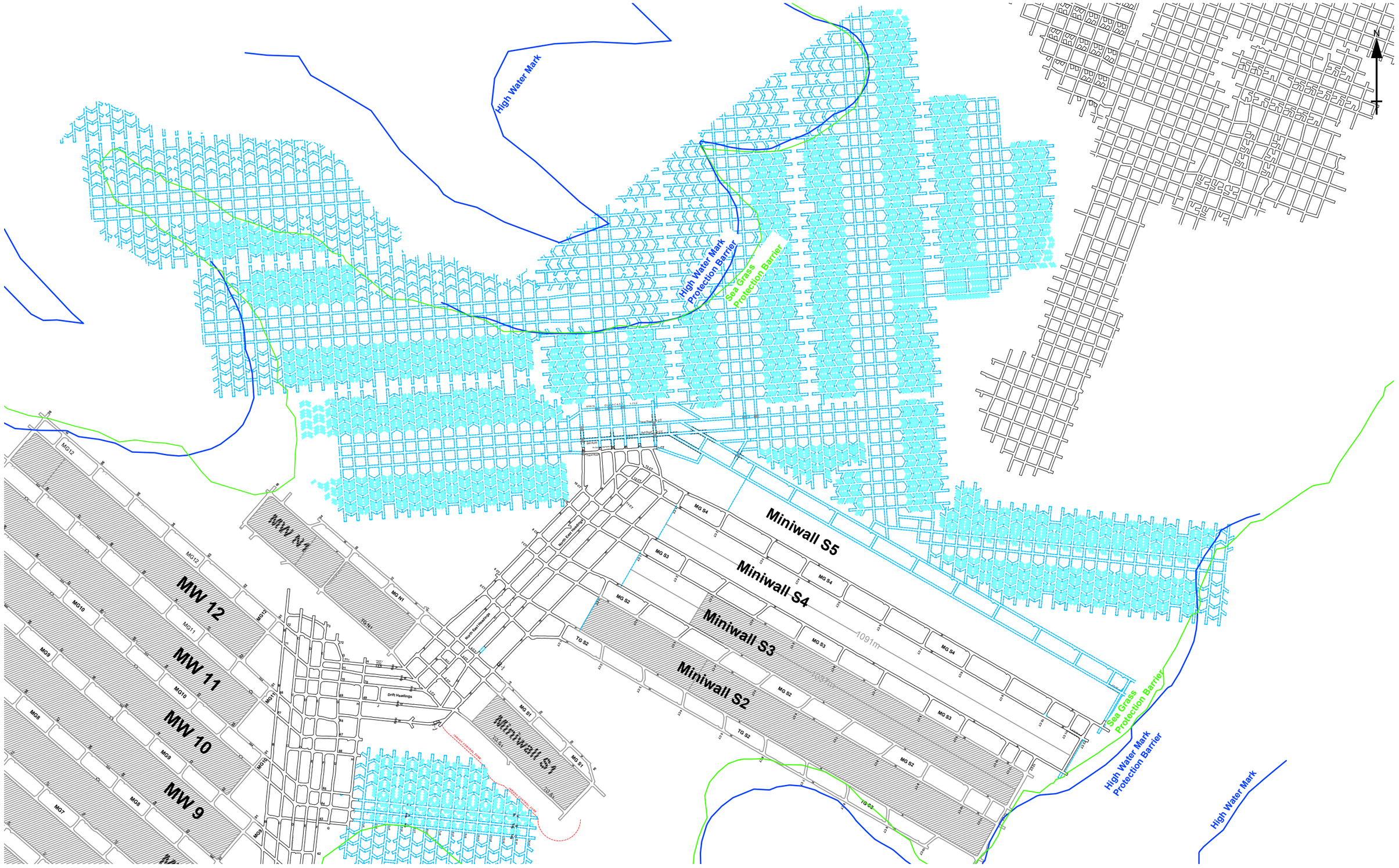
Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Subsidence, Tilts and Strains following the Extraction of Multiple Adjacent Herringbone Panels at a Depth of 180m		
Date:	04.12.20				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	29a/b/c



Key:

- Lake bed level contours (m)
- Surface level contours (m)

Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	R. de Laubadere	**Title:**	Mine Plan Showing Surface and Lake Bed Level Contours		
Date:	04.12.20				
STRATA²		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	NTS	**Figure No:**	30

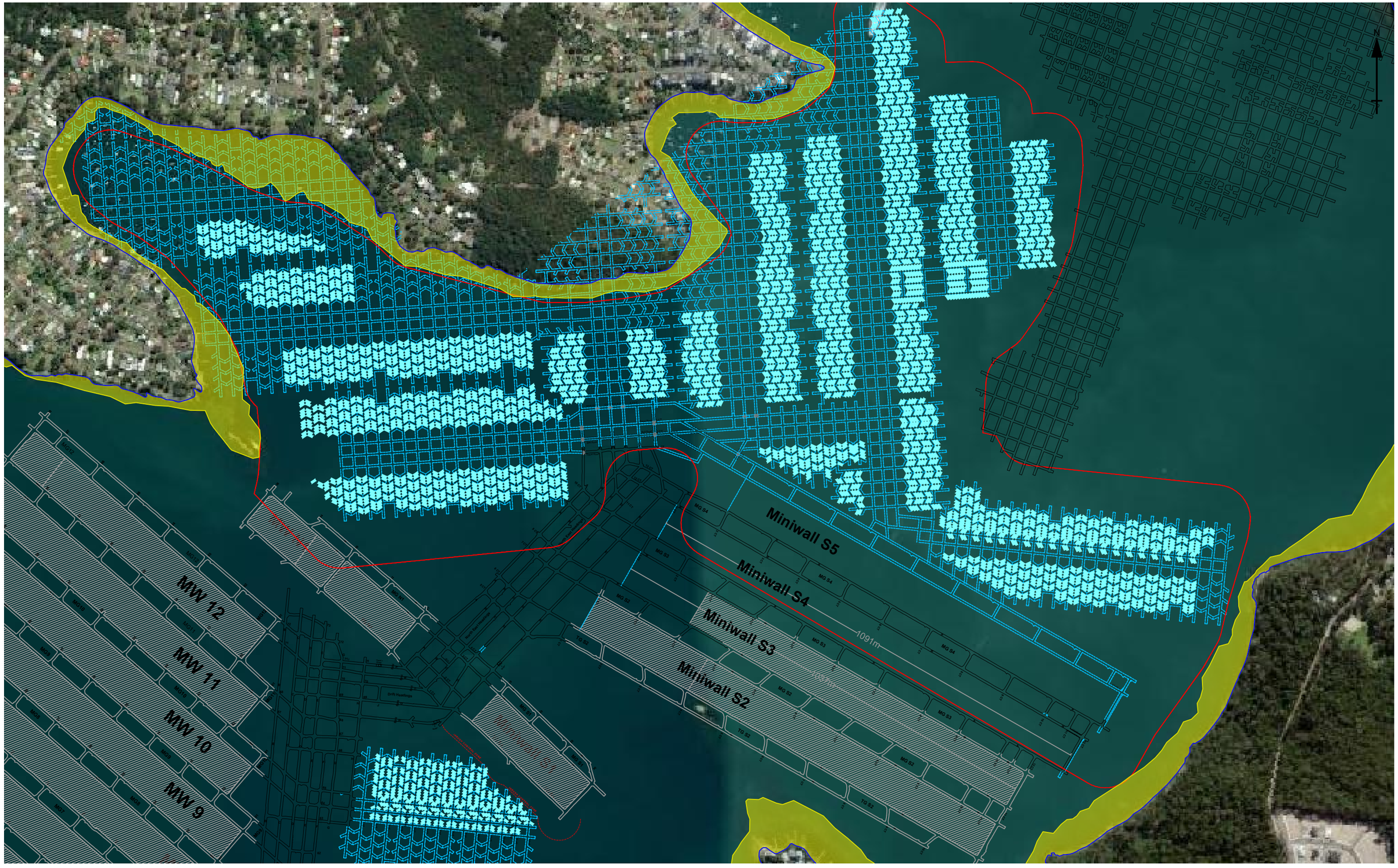


Key:

- High Water Mark Protection Barrier, based on a 35° Angle of Draw from the High-Water Mark
- Sea Grass Protection Barrier, based on a 26.5° Angle of Draw from the Sea Grass Beds

Engineer:	D. Hill	**Client:**	Chain Valley Colliery
Drawn:	R. de Laubadere	**Title:**	Mine Plan Showing High Water Mark Protection Barrier and Sea Grass Protection Barrier
Date:	04.12.20		
		Ref:	CHV-024
		Revision No:	2
		Scale:	NTS
		Figure No:	31

STRATA²



Key:

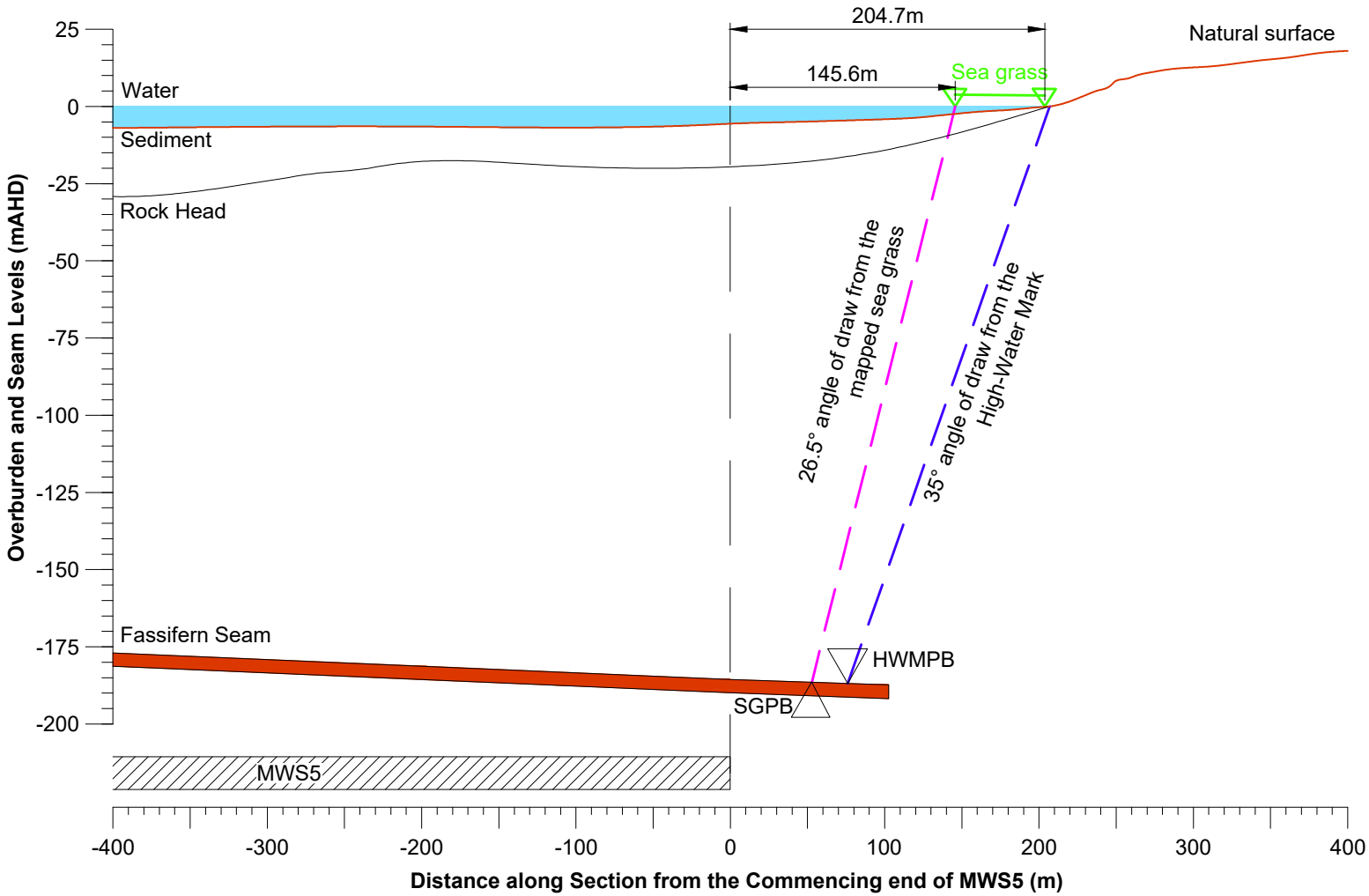
- High water mark
- Mapped sea grass beds
- Limit of Subsidence Based on Nominal Angle of Draw of 26.5°

Engineer:	D. Hill
Drawn:	R. de Laubadere
Date:	04.12.20

STRATA²

Client:	Chain Valley Colliery
Title:	Mine Plan Showing High Water Mark and the Mapped Sea Grass Beds

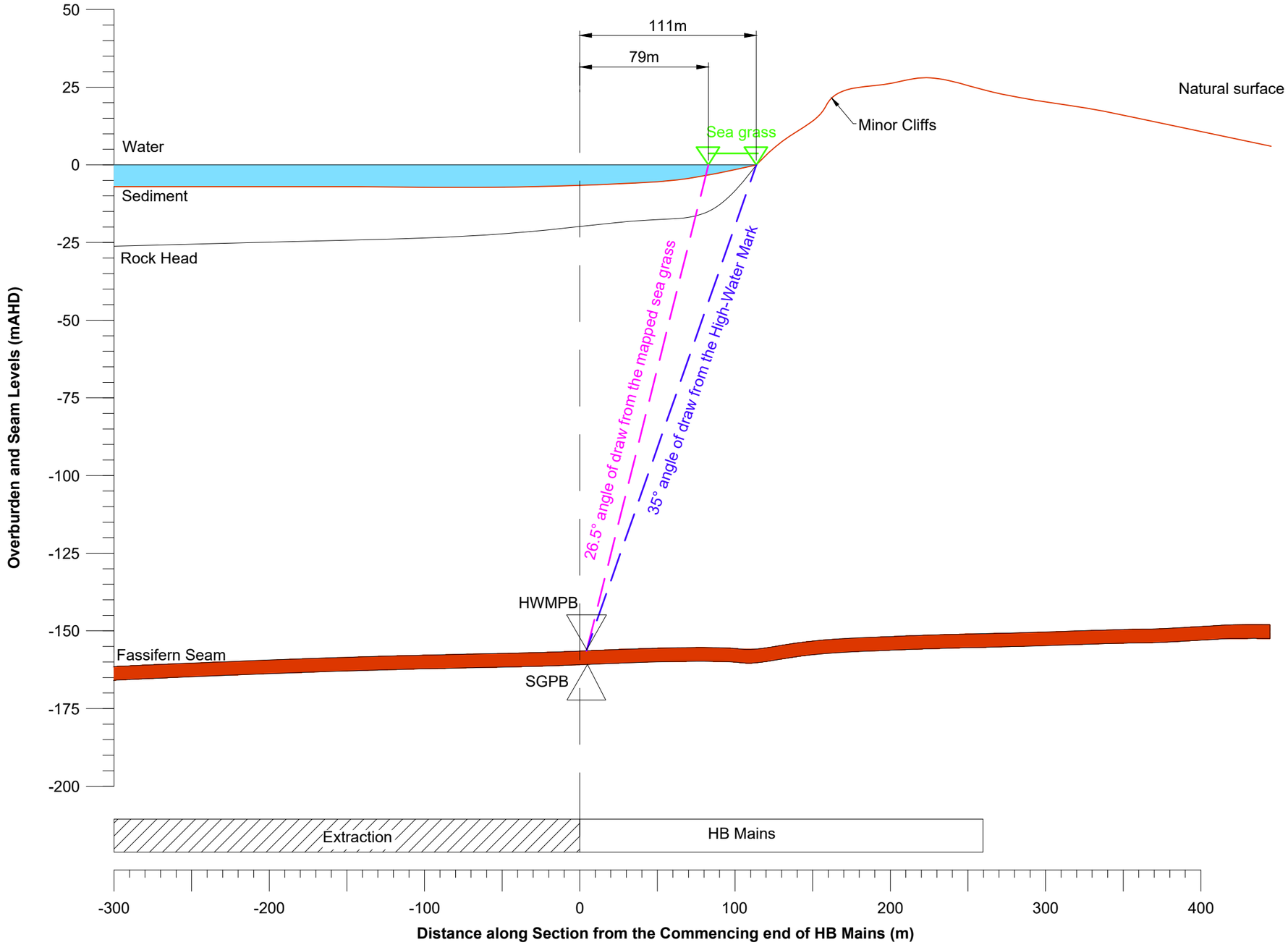
Ref:	CHV-024	**Revision No:**	2
Scale:	NTS	**Figure No:**	32



Notes:

2x vertical exaggeration

Engineer:	D. Hill	**Client:**	Chain Valley Colliery
Drawn:	I. Saliamon	**Title:**	Long-section at the Commencing End of MWS5, along the Panel Centre Line
Date:	07.12.20		
		Ref:	CHV-024
		Revision No:	2
		Scale:	NTS
		Figure No:	33



Notes:

2x vertical exaggeration

Engineer:	D. Hill	**Client:**	Chain Valley Colliery
Drawn:	I. Saliamon	**Title:**	Long-section through Western Flank of HB Mains (Morisset East Side)
Date:	07.12.20		
		Ref:	CHV-024
		Revision No:	2
		Scale:	NTS
		Figure No:	34

STRATA²

Figure 35a: Minor Cliffs and Wooded Slope at Mirrabooka / Fishery Point (Morisset East)



Figure 35b: Minor Cliff

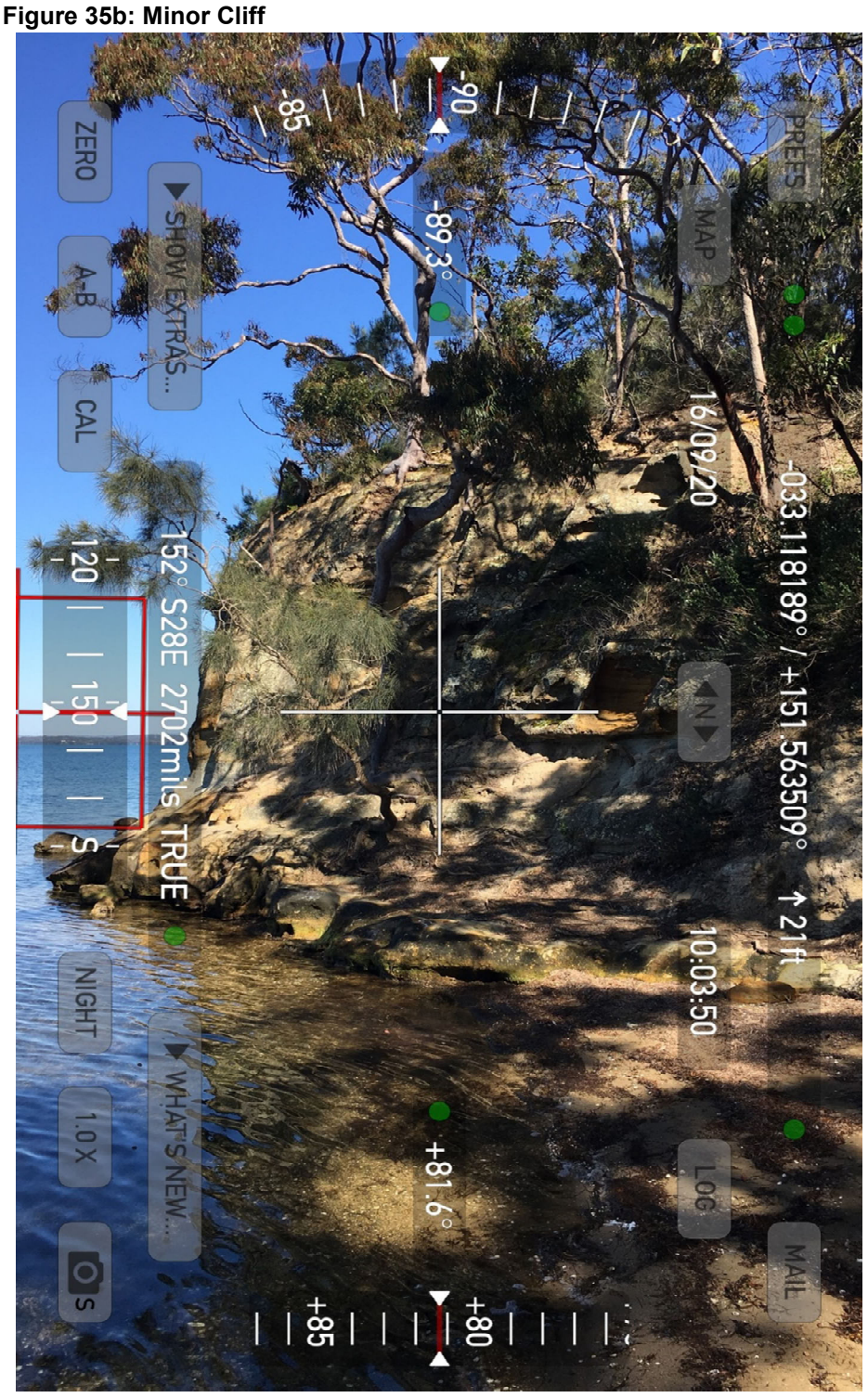


Figure 35c: Shoreline



Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Minor Cliffs and Steep Slope at Morisset Peninsula		
Date:	04.12.02				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	35a/b/c

Figure 36a: Fishery Point and Sunshine (Morisset East)



Figure 36b: Pelican Rock Navigation Marker



Figure 36c: Shoreline SE of MW S5



Engineer:	D. Hill	**Client:**	Chain Valley Colliery		
Drawn:	D. Hill	**Title:**	Built Features in the Northern Mining Area		
Date:	04.12.20				
STRATA^2		**Ref:**	CHV-024	**Revision No:**	2
		Scale:	N/A	**Figure No:**	36a/b

Appendix 16 Expert Endorsement Letter and Approval Letter

Mr Chris Armit
Approvals Coordinator
Chain Valley Colliery
PO Box 7115
Mannering Park NSW 2259

22/10/2020

Dear Mr Armit

Chain Valley Colliery (SSD-5465) - Appointment of Experts to Prepare an Extraction Plan for Miniwall S5 and the Northern Mining Area

I refer to your request for the Planning Secretary's approval of suitably qualified persons to prepare an Extraction Plan for Miniwall S5 and the Northern Mining Area for the Chain Valley Colliery (SSD-5465).

The Department has reviewed the nominations and information you have provided and is satisfied that these experts are suitably qualified and experienced. Consequently, I can advise that the Planning Secretary approves the appointment of the following experts to prepare the Extraction Plan for Miniwall S5 and the Northern Mining Area:

- Mr Tim Chisholm, Mine Surveyor, Delta Coal;
- Mr David Hill, Subsidence and Geotechnical Engineer, Strata 2; and
- Mr Chris Armit, Approvals Coordinator, Delta Coal.

If you wish to discuss the matter further, please contact Colin Phillips on 9274 6483.

Yours sincerely



Matthew Sprott
Director
Resource Assessments (Coal & Quarries)

As nominee of the Planning Secretary

Chris Armit
Approvals Coordinator
Chain Valley Colliery
Delta Coal Pty Ltd
Off Construction Road (Off Rutleys Road)
Mannering Park NSW 2259

06/04/2021

Dear Mr Armit

Chain Valley Colliery (SSD 5465)
Miniwall S5 and NPA Extraction Plan

I refer to the Miniwall S5 and NPA Extraction Plan which was submitted on 18 January 2021 in accordance with Condition 7 of Schedule 4 of the consent for Chain Valley Colliery (SSD 5465).

The Department has carefully reviewed the document and is satisfied that it addresses the requirements of the conditions of consent for Extraction Plans (see Attachment A).

Accordingly, the Planning Secretary has approved the Miniwall S5 and NPA Extraction Plan (Revision 1.2, dated 10 March 2021). Please ensure that the approved plan is placed on the project website at your earliest convenience.

If you wish to discuss the matter further, please contact James McDonough on 9585 6313.

Yours sincerely



Lauren Evans
A/Director
Resource Assessments (Coal & Quarries)
As nominee of the Planning Secretary