Before a Hearings Panel Appointed by the Selwyn District Council and Canterbury Regional Council

Under	the Resource Management Act 1991
And	
In the Matter	applications under section 88 of the Act by Bathurst Coal Limited in relation to the completion of mining and closure and rehabilitation of the Canterbury Coal Mine in the Malvern Hills, Canterbury

Statement of Evidence in Reply of **Eden James Paul Sinclair** for Bathurst Coal Limited

Dated: 25 February 2022

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INTRODUCTION

Qualifications and Experience

1. My full name is Eden James Paul Sinclair.

2. I have the qualifications and experience set out at paragraphs 1 – 5 of my Statement of Evidence dated 1 October 2021 (**EIC**).

Code of Conduct

3. I have read and agree to comply with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014. This evidence is within my area of expertise, except where I state I am relying on material produced by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

SCOPE OF EVIDENCE

4. My evidence will address the following matters that were raised at the hearing on 26 to 29 October 2021 and raised at post hearing conferencing on 23 and 24 November 2021:

   (a) water quality monitoring;

   (b) operation of the mine closure infrastructure;

   (c) adaptive Management and Trigger Action Response Plans;

   (d) north ELF Ponds;

   (e) future land uses; and

   (f) proposed water take.

EXECUTIVE SUMMARY

5. I respond to the matters raised during the hearing and conferencing on 23/24 November 2021.

6. I outline how the site infrastructure is proposed to operate, particularly in regard to issues raised during the caucusing or outlined in supplementary evidence during the hearing. I consider the infrastructure and processes

proposed will be effective in managing risk for discharges of contaminant from the site.

7. I have reviewed the final draft consent conditions, and I concur with Drs Hickey and Weber that the monitoring be split between compliance monitoring and performance monitoring. This approach will make it clear both for the regulator and BCL alike to ensure the right sampling and analysis is undertaken at the right locations to best manage and measure potential effects.

8. I discuss the proposed Trigger Action Response Plans (**TARPs**) and outline how they have evolved with the input from experts during the caucusing and hearing process. I consider that the TARPs now form a strong framework for managing contaminant risk in site discharges.

9. I participated in the water quality caucusing session on 23 – 24 November for the proposed consent conditions and for the TARPs I provide comments on issues raised during the caucusing and how these relate to the proposed operation and function of the site. Overall, I consider the outcome of caucusing undertaken to date has been to improve the efficacy and transparency of the adaptive management TARPs and robustness of the conditions.

WATER QUALITY MONITORING

10. In the following part of my reply evidence I respond to matters raised at the hearing and conferencing session in relation to water quality monitoring.

Performance monitoring and trigger limits

11. BCL provided amendments to the proposed TARP in the memorandum conferencing outcomes dated 20 December 2021 setting out the conferencing outcomes. A further revised version of the TARP is appended to my evidence at **Appendix 1** containing suggested amendments as set out in my reply evidence and the evidence of Drs Weber and Hickey.

12. The TARP document includes tables summarising the parameters to be monitored and the designated purpose, being for “Compliance” or “Performance/Receiving environment” monitoring. Table 1 within the TARP summarises for the Active Closure Phase Monitoring and Table 2 for the Post Closure Monitoring. **Appendix 1** includes updates to these tables which I discuss further in paragraph 44.

13. The evidence of Drs Hickey and Weber set out the basis for the proposed performance monitoring parameters.

Oyster Gully monitoring

14. During caucusing, the monitoring of potential AMD effects in Oyster gully was also discussed. This matter was raised by Dr Meredith in his supplementary evidence at paragraph 9. BCL has undertaken periodic baseline monitoring at CC12 located in the head of the oyster gully catchment since 2014. It was proposed and agreed during caucusing to use that site as a trend monitoring location as part of the wider performance monitoring programme.

15. CC12 performance monitoring has been added to the draft discharge consent condition 35a (b).

16. I provide the following information regarding the CC12 monitoring site:

    (a) The site is ephemeral with some occasions where recorded flows were zero and no sample could be taken. The median flows recorded over 29 flow records is 0.07L/s.

    (b) CC12 was chosen as a baseline location in 2014 due its proximity to the headwaters of Oyster Gully, and accessibility – being adjacent to a forestry road that crosses the gully. A culvert at this location concentrates the flows in the stream where flows are otherwise often obscured and difficult to sample.

    (c) The catchment area of CC12 once in the post closure phase is made up of 8.9Ha of rehabilitated mine footprint out of a total 50.5ha catchment area. This equates to 82% of runoff derived from land use outside of the control of BCL, and 18% from rehabilitated landform surface flows.

17. Dr Meredith [9] of his supplementary evidence noted agreement for CC12 to be monitored to verify that no issues arise following active closure. The landform will be visually inspected for any seeps within the catchment and managed at source.

18. I note Adele Dawson's comment in the marked up proposed general conditions [1][1] that "there should be associated limits that apply to Oyster Gully". I note Drs Weber and Hickey are in general agreement with Dr Meredith in that trend monitoring be carried out at the site. Dr Hickey in his reply evidence [95] does not consider that compliance limits are appropriate at this site and that it is useful for multiparameter monitoring to provide a "useful assessment for both remediation success and the effects of climatic factors on water quality". I note this is particularly valid when considering that this site has recorded baseline data since 2014 and has not always been within levels used as compliance limits at compliance sites. Out of 34 monitoring samples, contaminant levels have been above those used for compliance for Fe (6 occurrences), Al (11), Mn (2), Turbidity (1), and pH (3). As pointed out by Dr Meredith [9], caucusing has provided "agreement that Oyster Gully Stream will be both visually inspected for active seeps developing, and ongoing water quality monitoring at the CC12 site".

Duration of performance monitoring

19. Both Drs Weber and Hickey recommend a review of data to be undertaken in 2024. This aligns with BCL's proposal as shown in Figure 7 of the draft MCMP which provides 12 months of performance monitoring data during the post closure phase based on expected completion timeframes. The review will investigate water quality trends and in particular estimating contaminant load decay rates deriving from the landform underdrains in order to better estimate expectations for future treatment requirements.

20. The review above would not preclude further performance monitoring being undertaken beyond 2024 where this is appropriate for informing ongoing adaptive management TARPs.

21. I note draft condition 37[2] requires a review of the TARPs at end of active closure phase. This is expected to occur well before the review period described above providing the opportunity to further refine the performance monitoring and adaptive management TARPs prior to moving into post closure. This condition also states that further reviews of the TARPs may be undertaken at any time during the Post Closure phase conforming with good

[1] Condition 1 CRC [discharges to Tara Stream], marked up conditions appended to the memorandum of Bathurst Coal Limited dated 20 December 2021.
[2] CRC [discharges to Tara Stream].

adaptive management practice. Such amendments shall be for the purpose of improving the efficiency of measures to avoid remedy or mitigate adverse effects and shall be consistent with the proposed conditions of consent in accordance with proposed general condition 7.

22. Dr Massey recommended "*an initial water quality monitoring period of at least ten to twenty years*" [26]. I do not consider that a length of performance monitoring would be required for this length of time. As set out in the evidence of Drs Weber and Hickey the data captured by the performance and compliance monitoring would inform the length of the next stage of the performance monitoring. Certain climatic conditions may lead to a reduction or increase in monitoring requirements for example. I address compliance monitoring below.

Performance monitoring frequencies or locations

23. I do not consider it appropriate to "*codify*"[3] or lock in the performance monitoring locations and frequencies into conditions of consent as this prevents adaptive management to be used to evolve over time in response to changing requirements, updated models or evidence or changing environmental conditions that may require/recommend modifications to frequency or sampling locations to manage contaminant concentrations being discharged into the receiving environment.

24. I also consider that the notification requirements outlined in proposed condition [36] would most appropriately be limited to red triggers. In most cases, orange TARP levels trigger an increased frequency of sampling to ensure risk levels are maintained and reduced by ensuring subsequent actions are reducing the measured contaminant levels sufficiently. I suggest that only a red level trigger should be notified within the 5 working days. I note that Dr Weber [97] has also recommended notification be limited to red trigger levels only and provides justification for this.

Compliance monitoring and limits

25. Proposed conditions 20 and 22, contain the proposed parameters and limits for compliance monitoring. The evidence of Drs Hickey and Weber set out the

[3] Summary Statement of Dr Massey dated 28 of October 2021 at [29].

basis for the proposed parameters and limits for the proposed compliance monitoring.

26. I agree that it is appropriate for compliance monitoring to be required for the life of consent or until such time as it can be shown that contaminant loads emanating from the final landform have subsided to levels that no longer pose a risk to the receiving environment.

27. At this time there is no proposal to review the monitoring requirements or frequency for compliance point monitoring which remain for the duration of the consent. I understand that if such a review does occur before the life of the consent a consent variation would be needed for any amendment of the consent conditions as noted in proposed condition [37].[4] The effects of the proposed variation would be considered by the Council before granting any proposed variation.

Tara discharge compliance point

28. During caucusing a move to the compliance monitoring location was discussed. It is proposed to move the compliance monitoring location to bottom of the Tara spillway mixing structure at times during the active closure phase and at all times during post closure phase. I support the proposed amendment for the reasons set out in the evidence of Dr Weber and Hickey. This modification was reflected in the proposed draft conditions[5] and TARP monitoring locations provided in December 2021.

29. The relocation of the compliance point was discussed in Dr Meredith's supplementary evidence [13]. I agree with his summation of the caucusing outcomes and consider the revised wording of the proposed condition [3] [6] reflects this. The wording also reflects further caucusing completed after the hearing to revise the outstanding issue noted in [14] of Dr Meredith supplementary evidence of the location being below the Tara spillway *mixing structure*, which clarified the previously suggested wording of *mixing basin* which had been misinterpreted as being the Tara basin (entire gully).

[4] CRC [discharges to Tara Stream].
[5] Proposed condition 3 of CRC [Tara Stream Discharge].
[6] Proposed condition 3 of CRC [Tara Stream Discharge].

Resampling approach

30. Proposed condition 23 provides for a resampling approach. Should any contaminant of concern exceed a limit as set out in condition [22] from a monthly discrete sample, I consider there should immediately be a field check/investigation to identify any possible cause and attempt to remedy the situation where practicable with the assumption the sampling result is correct. For example if boron has exceeded the limit in a monthly sample while only diluted MSR effluent is being discharged at CC02_TSMS, BCL could temporarily increase the flow rate of the diluent to further dilute the combined flow and reduce any environmental risk while further analysis or investigations are carried out.

31. As recommended by Dr Hickey, a duplicate sample could be taken at the compliance point and analysed at the laboratory to confirm the accuracy of the initial monthly discrete sample. Resampling should also be undertaken as soon as reasonably practicable to ensure contaminant levels are not elevated and provide certainty that discharges remain within compliance limits.

32. Dr Weber [93] has also recommended additions to proposed conditions to allow for retesting or resampling of contaminants particularly for Iron and Aluminium concentrations should colloidal particles be suspected to be present in the sample.

33. I agree with this approach and consider that it should be reflected in condition 23.

Oyster Gully

34. As described in paragraphs 14 - 18 above and based on the range of results from water quality monitoring at CC12 from 2014 - 2021, in my opinion it is not appropriate to set compliance limits at the site.

Cost of additional contaminant monitoring

35. Dr Massey in his supplementary evidence [45 – 47] discussed his thoughts of costs for additional contaminants. In summary he states "*the cost of additional laboratory analyses seems reasonable*". In response to these statements, I provide the following review of the cost of water quality analysis both to maintain compliance with the current consents (CRC170541, and

CRC173823), and the costs to maintain compliance as proposed by Dr Massey.

36. Laboratory costs for extra elements being measured by ICP-MS analysis is around $10 per element. Analysis for PAH's is $140 per sample. These are slightly higher than proffered by Dr Massey but are similar. While adding additional elements in the analysis may be relatively minor when looking at the cost of an individual sample, I do not agree when comparing the scale of the proposed compliance and performance monitoring program, added to an additional set of contaminants, that additional costs are negligible.

37. Current consents require analysis for Al, Fe, Mn, B, Ni, Zn, Turbidity, pH, and TSS (for developing relationships with turbidity). Conductivity, Sulphate, Mg, and Ca are also analysed for hardness calculations, and additional performance monitoring and to meet consent requirements. Excluding costs of "*of obtaining the samples, transporting them to the laboratory for analysis, and reporting the results to regulatory authorities*" as Dr Massey correctly points out are sunk costs, the cost of analysis are $195 per sample at two sites CC02_tele and CC24. This equates to $390/ month, and $4,690 annually (regardless of closure phase).

38. BCL have usually undertaken monthly sampling at a significant number of additional sites, and included additional contaminants or parameters as deemed appropriate to better understand the surface water quality around the site and the surrounding environment both to monitor effects, and record baseline information that could be used for studies to evaluate and plan for mine extension proposals that are no longer being considered. Over 50 different sampling sites have been monitored at times over the life of the mine.

39. As I understand it, the suite of additional contaminants recommended by Dr Massey, Mr Gardner, and Dr Meredith to be added to the base set stated in [37] above are: As, Cd, Cr, Cu, Pb, Hg, PAHs [76 – 77 of Massey supp evidence, 44 of S Gardner Officers report], plus total contaminant concentrations for metals/metalloids [47 of Massey supp evidence], Dissolved oxygen [60 of Massey supp evidence, draft condition 20] and sulphide, Alkalinity, and DOC [Dr Meredith, Officers report 198].

40. The addition of these analysis requirements increase the cost to $682 per sample.

41. As stated by in the summary of evidence of Dr Massey [29] he recommends "*regular, frequent long-term monitoring at all existing monitoring points be codified as a condition of consent*". Through conferencing it was clarified that he does not suggest further monitoring at all 50+ sites that have been monitored previously but rather at all compliance and performance monitoring sites defined in the marked up TARP document. There are 11 compliance and performance sites requiring discrete sampling defined for the active closure phase and 12 for the post closure phase. Some of these could potentially be required to be sampled weekly should that be required by the TARPs.

42. Therefore, what Dr Massey seems reasonable equates to a cost (for analysis costs only) of $8,500/month, or $102,300/year during the active closure phase. This amounts to an increase of over 2000% vs current consent requirements which still provide effects based compliance monitoring.

43. Drs Weber and Hickey are proposing compliance and performance monitoring as described in the draft conditions and TARPs. Dr Paul Weber has recommended a set of parameters to monitor (Table 1, Table 2, Weber reply evidence) and an annual sample be taken at the two compliance points that analyses the additional potential contaminants of concern to screen for any changes to concentrations of low-risk contaminants.

44. The costs anticipated from the above monthly laboratory analysis is $254 per sample, with compliance monitoring expected to be $1,000 per month and $12,000 per year, and performance monitoring requirements of $2,200 per month and $27,300 per year initially including annual samples analysing the additional contaminants. This is still a considerable increase over current consent requirements, but I consider is more reasonable accounting for the level of management and control required from the system to ensure any effects on the receiving environment are minimised.

OPERATION OF THE MINE CLOSURE INFRASTRUCTURE

45. During the hearing and caucusing process, both the October and November sessions, the operation of the mine closure infrastructure was highlighted and discussed in depth. In response to this process a number of amendments have been made to the proposed conditions and the TARPs that provides for improvement to the proposed infrastructure and processes.

Conduit for decanting flows from N02 Pit Pond

46. It is now proposed, in line with discussions held during conferencing that piping of the decanting flows from the N02 Pit Pond to the Tara spillway mixing structure for dilution purposes shall be used instead of using the surface drain from the N02 Pit Pond to Tara Pond as a conduit for this flow. This is required by proposed condition 17.[7]

47. It is proposed that his will reduce any potential reduction if flow (evaporation) or change in water quality of the water as if flows down the system, particularly around changes in dissolved oxygen or temperature levels. To further manage these parameters the pipe is proposed to be buried where practicable for the entire length from N02 Pit Pond to the Tara spillway mixing structure.

48. The diluting flow is proposed to be derived from a floating decant system taking water from the surface (or near surface). I refer to para 139 – 142 of my EIC and reiterate that the final design for the decant shall be included as part the MCMP update proposed [general condition 4 and 6].[8]

Sampling of the N02 pit pond for stratification monitoring

49. Monitoring of stratification levels was a large discussion topic during conferencing and at the hearing. Following conferencing it is proposed that a new TARP for monitoring of the N02 Pit Pond for stratification be developed, and it was further discussed at the November conferencing.

50. The new *N02 Pit Pond Stratification* TARP [page 27-30] requires performance monitoring of both N02 pit surface water and bottom water (nominally 0.5m and 2.5m depth respectively).

51. To allow reliable and repeatable sampling of the water at the specified levels, permanent piping systems will be installed that can be connected to a small pump to enable the extraction of water from the two depths within the pond as was recommended by Dr Hickey during conferencing. The extracted water can then be tested using handheld meters for EC, pH, DO, and temperature. Results can then be compared to triggers in the TARP and subsequent action taken.

[7] CRC [Tara Stream Discharge].
[8] CRC [General conditions].

52. In my opinion, the *N02 Pit Pond Stratification* TARP will effectively manage the risk to the environment should the N02 pit pond show signs of stratification where contaminant levels at the base of the water column show signs of elevated contaminant levels that may harm the receiving environment should the pond waters invert.

Tara spillway mixing structure

53. During conferencing and at the hearing it was discussed how essential it was to ensure good mixing of the MSR effluent and diluent flows prior to discharge. The Tara spillway had in its design a small ponded area at the toe of the spillway that was to be used for mixing of MSR and diluent waters during low flows, and aid in the dissipation of high energy flows when the Tara Pond is spilling.

54. To ensure adequate mixing, the Tara spillway design was modified to provide a slightly larger mixing structure that will allow MSR effluent and a diluent flow (either clean potable water, or water from the N02 pit pond decant) to mix prior to discharge. Any overflow from Tara spillway will also merge with the mixed flows prior to discharge. The Tara spillway and mixing structure has been constructed and is shown in Figure 1 below.

Figure 1 Image taken 14/02/2022 showing the completed Tara Spillway and mixing structure. Note the MSR effluent collection tub (blue) currently used to pump the water back to Tara Pond during commissioning. MSR effluent (Yellow line), dilution water (blue line), and path through the mixing structure prior to discharge (green line) are shown.

Aeration of MSR effluent

55. At paragraph 11 of his summary of evidence Dr Meredith raised concerns that: "*The MSR is essentially an operation to precipitate out contaminants in an alkaline and reducing environment. Inherently the discharge from the MSR will therefore be oxygen depleted. This runs the risk of carrying contaminants into the receiving environment in an anoxic or reduced state that will subsequently be precipitated upon reaeration. This situation is almost certain and requires aeration of the discharge from the MSR under a controlled situation."*

56. Consistent with these recommendations, the MSR effluent pipe that has been installed passively aerates the MSR effluent as it flows over a ~20m length of corrugated nova-flow pipe to the mixing point.

57. As discussed by Dr Hickey at paragraph 10(b) of his reply evidence this turbulent flow path will be effective in providing adequate aeration prior to

entering the mixing structure and being further aerated by mixing with an aerated diluent flow. Dr Hickey also recommends DO performance monitoring below the Tara spillway mixing structure which has been included in updates to the TARP (attached at Appendix 1).

Figure 2 Image of the Tara MSR, and Tara Spillway taken 14/02/2022. MSR effluent pipe is ~20m in length and shown as a dashed yellow line.

58. Consistent with discussions and comments, particularly Dr Massey, it was acknowledged that maintenance to the MSR other than removing sludge build up may be required, this has been reflected in the proposed conditions [18a]. In my opinion further maintenance activities are not required to be named explicitly in the condition wording with the key requirement being '*maintain compliance of water discharges.*

N02 Decant

59. I disagree with comments from Dr Massey suggesting a timeframe be added to condition [13a] to prevent 'permanent' trials be undertaken using N02 decant water. The proposed condition wording will allow for the N02 decant and decant pipe to be installed and be commissioned (to ensure adequate flows can be achieved, the floating decant works and can prevent build-up of materials around the decant inlet etc which may require longer time periods to adequately identify any issues during commissioning). Performance data from

the N02 Pit Pond and TARPs will be used to ensure no risk of exceeding compliance limits during such trials.

Sampling of MSR sludge prior to removal

60. Sampling of MSR sludge once, prior to a clean out and disposal operation, along with submission of the results of analysis to ECan seems reasonable. I agree with the planners note in this regard [18b]. I think it would be onerous to sample the sludge on a regular basis as has been suggested previously.

TRIGGER ACTION MANAGEMENT PLANS

61. The TARPs have been updated a number of times through the hearing process. The most recent set of updates have been appended to my evidence at Appendix 1 and reflect discussions during caucusing 23 - 24 November 2021 as well as the following matters:

Active Closure Phase TARPs

62. Section 1.3; "*During the Active ~~Operational~~Closure Phase the following activities will be undertaken"*. The Tara MSR has been constructed and is being commissioned during the operational phase of the mine closure. It should therefore read 'Operational Phase'.

63. After further refinement through caucusing and as recommended in reply evidence of Drs Weber and Hickey, an explicit requirement to measure dissolved oxygen (DO) has been added to section 1.3 during the MSR commissioning phase. Once MSR commissioning is completed, DO will be measured at CC02_TSMS as defined in Table 1 and 2, with a target saturation level of 50%. This addition is also reflected in section 1.3.

MSR Effluent / Clean Water Mixing Zone Water Quality TARP

64. Note 3; the text added "*while a piped discharge continues to be operated immediately above it*." Is not in line with the proposed conditions and I therefore think it best to remove them and refer to whatever the final consent conditions say in terms of monitoring CC02_tele to prevent any uncertainty/ambiguity.

Post Closure Phase TARPs

65. Section 2.0; The addition of the word *"limits"* to the first sentence. I disagree with the word because the limits referred to are already managed by the TARPs and compliance limits at compliance points. The post closure phase is not a sudden transition. It involves the staged dispersal of water to the natural flow paths at described in the MCMP appendix 4. Proposed CRC184166 consent condition [19] makes it clear ECan are informed monthly on progress through the active closure phase. Removal of significant infrastructure such as the Oyster pump or Tara pump does not have to occur at the same instant, just so long as the vegetative cover and concentrated flow paths meet closure criteria.

N02 Pit Pond Boron Concentrations TARP

66. Green Trigger limit; I disagree with the removal of *"(or maximum tolerated for suitable dilution)"* and believe it should be retained but reworded to *'(or < 80% of maximum tolerated for suitable dilution)'* I explain my reasoning as follows.

    (a) the yellow trigger has a limit of 80% - 90% of the maximum tolerated in diluting flows. Changing the green to be < 80% makes logical sense.

67. To reduce a contaminant of known concentration within a known flow of water by adding a diluent you must know what the contaminant concentration is within the diluent and calculate the diluent flow required to reduce the combined flow.

68. In the equation above, 3 of the four parameters are known/measured, with the diluent flow rate being calculated.

69. A margin of safety is best applied to the variable that can be controlled ie flow rate, and therefore the TARPs apply this margin of safety to the *N02 Pit Pond Decant Flow Rates TARP* (Green level is >150% of the calculated flow to provide margin of safety, but <200% of the flow to conserve water). An additional 20% margin of safety is used for B concentration in the diluent.

70. The underdrain B concentration is predicted to be 3.65mg/L at nominal flow of 0.2L/s used for MSR design (MWM 2021) with 10th percentile flows of 0.076L/s.

71. The 0.60mg/L Boron is based on the analogue model used to predict the N02 pit pond water quality post closure. At this B level, scenario 7 (MWM 2021) showed diluted flow (0.48L/s) could be provided to dilute the design flow for the MSR. This dilutent flow provided a margin of safety of 264% based on the 10th percentile flows or most recent underdrain flow rates of 0.076L/s.

72. It is therefore possible that B concentrations within the N02 Pit Pond could be greater than 0.6mg/L, but adequately low enough reduce the B concentration in the combined flow to below 1.5mg/L and decant flow rates still within the margins of safety set by the *N02 Pit Pond Decant Flow Rates TARP.*

73. The above amendments have been made to the TARPs attached to my evidence at Appendix 1, including updating of Table 1 and Table 2 to reflect compliance and performance monitoring that is consistent with reply evidence of Drs Weber and Hickey and also consistent with the proposed conditions.

74. I agree with Drs Hickey and Weber that the proposed TARPs provide a good framework for BCL to identify and manage contaminants of concern before they become an issue in site discharges. Updates made during caucusing and after the hearing have only strengthened this framework. Adaptive management is a proven industry standard and allows management and controls to improve overtime both in terms of lowering environmental risk but also cost.

75. I provide an updated Table 1 (section 1.4) and Table 2 (section 2.4) of the TARP document incorporating changes discussed through the caucusing and recommended by Drs Hickey and Dr Weber rebuttal evidence. These tables clarify whether monitoring is for compliance (with associated limits) or performance monitoring. These tables are provided in Appendix 1.

NORTH ELF PONDS

76. The original mine closure proposal planned for the conversion of North ELF Pond 1 into a shallow wetland by installing a gabion drain connecting the underdrain outlet to the surface and lining of surface flows through the area to enable use of the area as an offset wetland. Due to a number of factors, the wetland compensation areas are now proposed to occur at the North Property to allow for protection in perpetuity. The North ELF ponds are proposed to be left with native plantings surrounding them. This allows the underdrains to

continue to be flooded to prevent oxygen ingress, and provides an attenuation of water quality and flows through wet/dry periods as further set out in the evidence of Drs Hickey and Weber[9]. As described in Dr Hogsden reply evidence [31-32], the ponds are likely to support aquatic invertebrates.

FUTURE LAND USES

77. The future land uses at the site are expected to be pastoral farming and production forestry. Outlined in my EIC [147-150], I do not expect there to be any issues arise from post mining land uses.

78. Dr Weber in his reply evidence [62] outlines further details on future land use particularly in regards to the capping of insitu coal measures on some of the highwalls with 0.5m of NAF and soil cover. Capping is about reducing risk of oxygen ingress leading to oxidation of pyrite minerals and subsequent levels of AMD causing negative effects on receiving environment. Insitu (unbroken) rock mass has a limited ability for oxygen to permeate therefore having a low risk of prolonged AMD generation. The 0.5m capping limits oxygen ingress substantially and provides a suitable growing medium for vegetative cover (be it pasture, natives, or production forestry).

79. Proposed Tara discharge consent condition [13] proposes "at least 0.5 metre of non-acid forming rock and/or topsoil is placed against all final backfill areas and reshaped surface in the N02 pit pond high wall catchment areas to prevent insitu exposed coal seams and potentially acid forming rock deposits continuing to be being exposed to the atmosphere". I consider this condition, and the application of the 0.5m capping cover adequately controls any risk of potential risk of leaching of contaminants from the underlying insitu rock mass as outlined in Dr Weber's rebuttal evidence. I also point out that the area of the footwall side of the N02 landform does not host any PAF rock and is not planned to be covered with a cover of soils. This ensured the disturbance footprint of the landform to the north of N02 pit, and subsequent disturbance to wiwi rush seepages, could be minimised.

80. I remain of the view that the final rehabilitated landform will be safe and stable and provide for future land uses without undue risk to the environment.

[9] Statement of Evidence in Reply of Dr Paul Weber, 25 February 2022 at [54] and Statement of Evidence in Reply of Dr Christopher Hickey, 25 February 2022 at [12], [148]-[150].

81. I note that Dr Massey in his supplementary evidence [68] discusses limiting the use of nitrogen based fertilisers at the site. Dr Weber [74] provides an explanation of nitrate oxidation of pyrite and that it generates one quarter as much acid compared to oxygenation of pyrite by oxygen. I would also consider any effects from fertiliser applications on levels of nitrate in water discharges would be similar to any other farming activity in the district and would be managed accordingly (in farm management plans for example).

PROPOSED WATER TAKE

82. As part of meeting the requirements of mine closure activities, BCL have included a water take consent to enable consumptive water extraction from onsite ponds, albeit at a lower maximum rate than originally proposed.

83. From an operational perspective, the water would be used for two aspects of the mine closure – water used for dust suppression during the operational phase, and for water to aid in vegetation establishment during the operational and active closure phases. No consumptive take is expected to be required in the post closure phase.

Water for dust suppression

84. Traditionally dust suppression has been required onsite for two reasons.

Control of nuisance dust emissions (environmental/social)

85. Dust suppression is required to reduce effects from dust emissions on neighbouring properties, particularly where required on the access road due to mine related traffic.

86. This control and management is no longer very relevant to the operation as there is little traffic on the access road with the cessation of coal mining, with only a residual risk from a compliance point of view.

Management of dust on site for health and safety of mine workers.

87. Dust suppression at the site is still required for the operational phase, although not as essential as it once was during active mining where the scale of the operation and workforce was larger.

88. If a dry period occurs, particularly during summer periods (although I note that only a week of summer remains for the operational phase), the roads can quickly become dusty which causes issues with safety (visibility), equipment wear and maintenance(safety), and also respirable dust which is an immediate health issue and long term health issue.

89. If site cannot use dust suppression there may be extended periods where no vehicle movements within the site could occur, or a limitation of operations may be required, therefore leading to inefficient or ineffective operations leading to delays in final completion of the landform.

90. Fortunately, Canterbury has experienced a wetter than usual spring/summer 2021-2022 with little need for dust suppression to manage nuisance dust or effects on health and safety thus far, with the closure earthworks required to construct the final landform is nearing completion. If the water take is not granted then water trucks could be brought in for dust suppression if required, which would result in high costs on BCL.

Water for irrigation to encourage pasture establishment.

91. Irrigation has been proven to add value at the CCM site to improve establishment of vegetative cover, particularly on north facing slopes such as the North ELF.

92. The North ELF batter slopes struggled for vegetation establishment in places in the first ~18-24 months after rehabilitation. This led to some areas of the upper two batters requiring reseeding.

93. Once small scale irrigation was installed (and fed using 20m3 loads of water from the watercart) it allowed grass to establish through the heat of the summer period. Without vegetation established there is high risk of soil loss thus leading to further difficulty in establishing self-sustaining vegetative cover.

94. In the best case - such as the spring/summer experienced thus far in 2021-22 where the West Pit rehabilitation is now fully vegetated, there may not be any requirement for irrigation to aid in pasture establishment.

95. However, if BCL are prevented from taking water for use as irrigation despite a dry autumn/winter/spring 2022 due to not having consent, there could potentially be delays to final vegetation establishment around the N02 pit and

along roadways which make up the remaining rehabilitation areas yet to be established, and could lead to a requirement to come back in late 2022 or 2023 to re-hydroseed areas when vegetation is slow to establish.

96. If the worst case occurs it will potentially delay the ability to transition to post closure phase and thus delay the removal of pumps / active water management.

97. Therefore, irrigation is not critical in achieving the ultimate objectives of the mine closure plan, but may cause additional delays or costs to the operation.

Eden James Paul Sinclair
25 February 2022

Appendix 1

Revised TARPS

BATHURST RESOURCES LIMITED

Version 4

Key:

Amendments to the TARPs circulated as part of BCL's 20 December 2021 post conferencing memorandum are shown in red underline and ~~strike~~ through text.

Amendments to the TARPs circulated as part of BCL's 25 February 2022 reply evidence are shown in green underline and ~~strike~~ through text.

1.0 AMD Management TARPs: Active Closure Phase

The Active Closure Phase is primarily determined to ensure management of TSS is adequate with pumps remaining until closure criteria for vegetative cover and erosion management are met. Section 3 of Appendix 4 of the MCMP describes the Active Closure Phase.

During the active closure phase the following activities are occurring. Monitoring will be undertaken as described in Table 1.

1.1 North ELF: CC24 – Bush Gully Stream

As per Section 3.2 of Appendix 4 of the MCMP, at the end of the operational phase, the North ELF will be effectively complete with vegetative cover at desired levels. Any areas of concentrated flows will be lined. The North ELF Pond 2 decant system will be removed and water will flow unrestricted into the tributary of Bush Gully stream at CC20 via a constructed spillway.

During the Active Closure Phase the following activities will be undertaken:

1. Performance monitoring at CC20 will continue to understand water quality trends for the North ELF seepage where it is mixed with surface flow prior to discharge to Bush Gully Stream.

2. Compliance monitoring at CC24 in Bush Gully Stream.
3. A TARP is available in the Environmental Management Plan (BRL, 2016), one option being the installation of a mussel shell bioreactor.
4. The TARPs for this mine domain are not discussed, however, they are provided as Appendix A for ease of reference.

1.2 N02 Pit Pond: CC02_tele – Tara Catchment

During the Active Closure Phase the following activities will be undertaken:

1. Ongoing performance monitoring of the N02 Pit Pond for water quality and quantity.
2. Management of water quality in N02 Pit Pond will be undertaken in the same manner as currently being conducted during the active operational phase. This will include:
    a. N02 pond kept at a low height to provide surge capacity and to ensure adequate sediment settling (TSS treatment) until vegetative cover establishes reducing long term sediment loss.
    b. N02 pit water will be discharged to CC02_tele via pump (or pumped into lined drain to spill via tara pond) when water quality is in compliance with discharge consent conditions.
    c. If water quality is not compliant then adaptive management options need to be implemented (e.g., pH correction for acidity).
    d. Pumps automatically activated by float switches/remote start when water levels reach float switch levels.
    e. Tara Pond kept low via pumps (back to N02 Pit Pond).
3. Compliance monitoring will continue at CC02_tele
4. N02 Pit Pond water level will gradually be increased towards the end of the active treatment phase once there is confidence in the water quality, particularly TSS, of the N02 Pit Pond drainage runoff. It is anticipated this will occur in 6 – 12 months (as per Figure 7 of the MCMP).
5. With confidence in water quality trends (TSS and chemistry), pumps can be removed in a staged manner, likely in the following order
    a. Oyster Pump;
    b. Tara Pond pumps; and

c. N02 Pit Ponds.

6. At the end of the performance monitoring period (~2024) data will be available to demonstrate whether the water quality remains stable and whether N02 Pit Pond water will be of adequate quality to be used to dilute MSR effluent water post closure.
7. There remains uncertainty with this mine domain (Tara drainage including N02 Pit Pond drainage) in regards to water quality and quantity. Unlike the North ELF where water quality is observed, the water quality and quantity for the N02 Pit Pond is predicted. To manage this uncertainty, TARPs for this mine domain are available as shown below.

1.3 Tara Mussel Shell Reactor: CC02_tele – Tara Catchment

During the ~~Active~~Operational ~~Operational~~ ~~Closure~~ Phase the following activities will be undertaken:

1. Tara mussel shell reactor (MSR) will be constructed.
2. CC02 underdrain flows tapped into with the ability to direct flows either to the Tara Pond or to the Tara MSR.
3. Tara MSR commissioning period (expected to be 4 - 12 weeks) to be used to demonstrate that it will treat Zn, Fe, and acidity, with minor removal of Mn as expected.
4. During the commissioning period effluent from the Tara MSR will be pumped back to the Tara Pond, and subsequently the N02 Pit Pond. The commissioning period will ensure any first flush related loads (such as B, N) are returned to the N02 Pit Pond for dilution, and ensure functionality of the MSR meets requirements prior to discharge post commissioning. Dissolved oxygen (DO) will also be monitored during the commissioning phase.

During the Active Closure Phase the following activities will be undertaken:

1. Following the commissioning period Tara MSR effluent is diluted with potable water (modelled to be 0.11 L/s or 6.6 L/min) to ensure compliance with ~~boron~~ contaminant limits, particularly boron.

2. Boron will not be treated by the Tara MSR and dilution from the potable water supply (Malvern Hills RWS) will be required until N02 Pit Pond water is of sufficient quality post closure to provide dilution flows (or other management options used).
3. Performance monitoring will be undertaken of MSR influent and effluent water quality
4. Dissolved oxygen will be measured after dilution with a target oxygen saturation of 50%.
5. During the active closure phase, data will be available to demonstrate whether the water quality remains suitable and also the ability to transition to dilution from the N02 Pit Pond, when this is suitable.

1.4 Active Closure Phase Monitoring

Table 1 Matrix of monitoring – Active Closure Phase

Active Closure Phase monitoring matrix				
Site	**Designation**	**type**	**frequency**	**Parameters**
CC02_tele	Compliance	Continuous	15 mins	pH, Turbidity
CC02_tele**	Compliance	discrete	monthly	pH, Turbidity, Fe, Al, Zn, B, Mn, Ni
CC24	Compliance	Continuous	15 mins	~~EC,~~ pH, Turbidity
CC24_turb	Compliance	Continuous	15 mins	Turbidity
CC24	Compliance	discrete	monthly	~~EC,~~ pH, Turbidity, Fe, Al, Zn, B, Mn, Ni
CC02_tele**	Performance, Hardness	discrete	monthly	EC, SO4, Mg, Ca, DO, TSS
CC02_tele**	Performance	discrete	Annual	PAHs, As, Cd, Cr, Cu, Pb, Hg
CC02_tele**	Performance	Continuous	15 mins	EC, WL, temp
CC24	Performance	Continuous	15 mins	EC
CC24	Performance, Hardness	discrete	monthly	EC, TSS, SO4, Mg, Ca
CC02_TSMS (Tara spillway mixing structure)**	Performance/Compliance	discrete	monthly*	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca, DO, Total Fe, Total Al, Total Mn, DOC, temp
CC02_TSMS (Tara spillway mixing structure)**	Performance	discrete	Annual	PAHs, As, Cd, Cr, Cu, Pb, Hg
CC20	Performance	Continuous	15 mins	WL/Flow
CC20	Performance	discrete	monthly	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca
CC20	Performance/Compliance	discrete	Annual	PAHs, As, Cd, Cr, Cu, Pb, Hg
CC03	Receiving environment	Continuous	15 mins	WL/Flow, EC, pH note: data suitably smoothed to remove noise
CC03	Receiving environment	discrete	monthly	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca
CC09	Receiving environment	discrete	monthly	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca
CC12	Receiving environment/ Trend	discrete	monthly	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca
N02 Pit Pond	Performance	Continuous	15 mins	WL, EC, pH note: data suitably smoothed to remove noise
N02 Pit Pond	Performance	discrete	monthly*	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca, DO ~~COD, BOD, Acidity to pH 8.3~~
Tara Pond	Performance	Continuous	15 mins	WL/Flow note: data suitably smoothed to remove noise
Tara Pond	Performance	discrete	monthly	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca
MSR	Performance	Continuous	15 mins	WL note: data suitably smoothed to remove noise
MSR influent (CC02)	Performance	discrete	monthly	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca (& Flow)
MSR effluent	Performance	discrete	monthly*	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca (& Flow)
Dilution water (potable water)	Performance	discrete	monthly	Flow

*Frequency modified by TARPs.
Metal concentrations are dissolved unless specified.
**CC02_tele used for discrete compliance during times of pumped discharge or when Tara Pond is overflowing via the spillway. At other times the compliance point for discrete sampling shall be the bottom of the Tara spillway mixing structure (CC02_TSMS). continuous monitoring remains at CC02_tele

1.5 AMD Management TARPs: Tara Catchment Water Management

	Canterbury Coal Trigger Action Response Plan (TARPs) *Active Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**Red - Level 4**
N02 Pit Pond Acidity NOTES 1. Manual pH measurements of the pond water near the dewatering pumps – In the Active Closure Phase the N02 Pit Pond will not be discharging (pumped discharge only). 2. pH < 6.0 is not considered non-compliance against resource consent conditions as this will simply be a trigger to consider dosing of the N02 Pit Pond before pumps are utilised to discharge N02 Pit Pond water to the tara catchment via CC02_tele.				
Trigger	pH > 6.5	pH 6.0 - 6.5	pH <= 6.0	pH <= 6.0 (3 consecutive weekly samples)
Action / Response	• If pH >= 9.0 reduce alkaline dosing rates, investigate	• Investigate causal factors. For instance, is the low pH due to AMD or is the low pH due to	• Increase frequency of water sampling to weekly until 3 consecutive samples below Orange TARP trigger level.	• Install active NaOH dosing system into N02 Pit Pond inflow with real-time pH and/or flow rate inputs.

	Canterbury Coal Trigger Action Response Plan (TARPs) *Active Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**Red - Level 4**
	cause to prevent recurrence. • Otherwise, No action required	heavy rainfall, which can also lower pH. • Map N02 Pit Pond drainage for any point sources of surface flows with elevated acidity (pH meter mapping). • Install passive treatment for high-risk point sources where practicable. • Increase frequency of lime dosing to increase N02 Pit Pond pH to > 6.5~~.~~ and <9.0	• Investigate site below N02 Pit Pond spillway for a MSR to enable passive treatment of decanting flows from N02 Pit Pond Post Closure. • AND undertake Yellow actions.	• AND undertake Orange actions [NOTE: This means that NaOH dosing is required in addition to lime dosing – likely to be very rare, or lime dosing efficiencies are low (review lime dosing process)]

N02 Pit Pond Boron Concentration

NOTES:

1. Manual monthly N02 Pit Pond surface water samples for Boron.
2. Elevated boron concentrations are not considered non-compliance against resource consent conditions as this will simply be a trigger to consider management options for the N02 Pit Pond before pumps are utilised to discharge N02 Pit Pond water to the Tara catchment.

	Canterbury Coal Trigger Action Response Plan (TARPs) *Active Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**Red - Level 4**
	3. It is proposed that EC may be a suitable indicator of boron concentrations. This will require data and a reliable relationship, which needs to be developed over the active closure phase. Collect data and develop relationships. 4. EC and stage height (N02 Pit Pond) will be used to determine a relationship between fluctuations in the N02 Pit Pond water level and rainfall. These data will also be used to validate and update the water flow model to understand risks for the site at closure. 5. A boron options assessment will be undertaken to consider opportunities to treat / manage boron during the Active Closure Phase considering results obtained from initial water quality performance monitoring once actual water quality data is available from the N02 Pit Pond as it fills and if the water is elevated in boron. This will involve a desktop review and preliminary laboratory trials. Due to the nature of the Active Closure Phase it is difficult to define a trigger for the options assessment, however elevated boron levels in N02 Pit Pond or increasing trends once the Pond is above the decant level (>75% full) it would likely trigger the options assessment.			
Trigger	Boron < 1.25 mg/L	Boron 1.25 - 1.5 mg/L	Boron > 1.5 mg/L [OR EC equivalence and trending upwards over previous week – subject to NOTE#3]	Boron > 1.5 mg/L (3 consecutive samples)
Action / Response	• No action required	• Raise high level float switch in N02 Pit Pond (This will enable an increase in water volume	• Immediately lift pump floats or turn off pumps to reduce risk of	• Implement results/actions of any investigations undertaken prior to discharge.

	Canterbury Coal Trigger Action Response Plan (TARPs) *Active Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**Red - Level 4**
		leading to dilution prior to discharge due to additional surface water flows from the catchment).	discharge of waters having elevated boron. • Increase water sampling frequency to weekly until boron concentrations decrease to < 1.5 mg/L • AND undertake Yellow actions	• AND undertake Orange actions as necessary
N02 Pit Pond Zinc Concentration NOTES 1. Manual monthly N02 Pit Pond samples for Zinc. 2. Elevated zinc concentrations are not considered non-compliance against resource consent conditions as this will simply be a trigger to consider management options for the N02 Pit Pond before pumps are utilised to discharge N02 Pit Pond water to the Tara catchment.				
Trigger	Zinc < 7080% of ~~ANZECC~~ANZG 95% TV (Hardness Modified)	Zinc between ~~ANZECC~~ANZG 7080% -9095% TV (Hardness Modified)	Zinc > ~~ANZECC~~ANZG 9095% TV (Hardness Modified)	Zinc > ~~ANZECC~~ANZG 9095% TV (Hardness Modified) (3 consecutive samples)

	Canterbury Coal Trigger Action Response Plan (TARPs) *Active Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**Red - Level 4**
Action / Response	• No action required	• Increase frequency of lime dosing to increase N02 Pit Pond pH to achieve Zn compliance • Raise high level float switch in N02 Pit Pond (This will enable an increase in water volume leading to dilution prior to discharge due to additional surface water flows from the catchment).	• Increase frequency of water sampling to weekly until 3 consecutive samples below Orange TARP trigger level. • Investigate site for passive MSR to enable passive treatment of future decanting flows from N02 Pit Pond Post Closure. • AND undertake Yellow actions	• Install active NaOH dosing system into N02 Pit Pond inflow with live pH and/or flow rate inputs. • AND undertake Orange actions [NOTE: This means that NaOH dosing is required in addition to lime dosing – likely to be very rare, or limes dosing efficiencies are low (review lime dosing process)]
MSR Effluent / Clean Water Mixing Zone Water Quality NOTES: 1. Manual monthly samples at MSR / Tara spillway mixing point of discharge.				

	Canterbury Coal Trigger Action Response Plan (TARPs) *Active Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**Red - Level 4**
	2. During the Active Closure Phase, water quality from the N02 Pit Pond will be managed by the N02 Pit Pond TARPs. Water in the Tara Pond will not discharge directly and will be pumped back to the N02 Pit Pond until the Tara pond catchment meets criteria for vegetative cover and drain linings. Once closure criteria are met, the water from the Tara Pond can be allowed to spill into the MSR/clean-water mixing zone. **3.** CC02_tele will continue to be monitored as per proposed consent conditions [3] ~~while a piped discharge continues to be operated immediately above it~~.			
Trigger	Boron, manganese, nickel, zinc, iron are all within 70~~75~~% of CRC170541 limits	Either boron, or manganese, or nickel, or zinc, iron are between 70~~75~~% - 90% of CRC170541 limits	Either boron, or manganese, or nickel, or zinc, iron are >90% of CRC170541 limits	Either boron, or manganese, or nickel, or zinc, iron are >90% of CRC170541 limits (3 consecutive weekly samples)
Action / Response	No action required	• Investigate Tara MSR to ensure effective operation (such as flow rates, depth of freeboard, sludge depth, potential leakages, etc). • Increase flow rate of clean potable water at mixing zone to	• Increase frequency of water sampling to weekly until 3 consecutive samples below Orange TARP trigger level. • Investigate Tara MSR to ensure effective operation.	• undertake Orange actions • Reduce CC02 flow through the MSR by opening the CC02 to Tara Pond valve and pumping underdrain water to N02 Pond for mixing.

Canterbury Coal Trigger Action Response Plan (TARPs) *Active Closure Phase - Tara Water Management*			
GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**Red - Level 4**
	ensure concentrations in combined flows are below CRC170541 trigger levels. • Ensure adequate mixing is occurring at sample point.	• Increase flow rate of clean potable water at mixing zone to the maximum available in potable water supply. • Request increased potable water supply from SDC/landowner • Investigate (monitor) the Tara Pond to check water quality is suitable for discharge as further dilutant. • Investigate removing Tara Pump and allowing Tara Pond to spill (if water quality suitable).	• Consider and install other passive treatment systems for Mn, Zn, Ni. after first reducing flow through the MSR.

2.0 AMD Management TARPs: Post Closure Phase

The Post Closure Phase begins once all water treatment system pumps are removed from the site and all other ~~limits/~~criteria are met to allow continuous free flowing surface flows through the discharge locations. Ecan will be notified of this change from Active to Post closure phase.

In the post closure phase the North ELF ponds continue~~s~~ to discharge to Bush Gully Stream with decant removed and a permanent spillway constructed; the Tara MSR treats CC02 Underdrain waters ; and the N02 Pit Pond is intended to provide diluting flow for the MSR boron load if resulting water quality follows modelling.

Performance monitoring of the system will be undertaken and used for these AMD management TARPs. It is expected that monthly performance monitoring will be required at least until 2024 (~12 months post closure) or until the water system is stable and performs to expectations under all anticipated conditions where performance monitoring requirement can be expected to reduce. Monitoring will be undertaken as described in Table 2

Some TARPS may require additional studies / investigations and these will be addressed where necessary to identify options that can be implemented in a suitable timeframe.

2.1 North ELF: CC24 – Bush Gully Stream

Performance monitoring should be undertaken and used for adaptive management. Monitoring should show

1. That water quality trends are stable and below resource consent compliance limits at CC24; and
2. That water quality trends are stable at CC20, and acidity loads are below TARP thresholds.

2.2 N02 Pit Pond: CC02_tele – Tara Catchment

Prior to the post closure phase the following activities are proposed.

Performance monitoring must be used to:

1. Confirm that vegetative cover meets closure criteria.
2. Confirm concentrated flow path linings and infrastructure including N02 decant discharge pipe are designed and constructed to meet closure criteria.
3. Confirm that water quality trends are stable and suitable such that resource consent compliance limits at the ~~MSR/dilution~~ compliance point ~~CC02_tele~~ can be achieved.
4. Confirm that N02 Pit Pond water quantities and qualities are suitable to provide sufficient diluting flows for the Tara MSR.
5. Confirm that the decant from the N02 Pit Pond is working, is variable and is robust, being suitable to provide long term diluting flows. This ~~should also~~ includes:
    a. An assessment that the N02 Pit Pond decant rate can provide required dilutent flows in all anticipated climate cycles based on previous xx years.~~is sustainable in the long term (i.e., over dryer seasonal cycles).~~
    b. An assessment that the N02 Pit Pond Live Storage can provide required dilutent flows in all anticipated climate cycles based on previous xx years. ~~is sustainable in the long term (i.e., over dryer seasonal cycles).~~
    c. These assessments will be based on empirical data and water balance modelling, and validated using historic rainfall data.
6. If N02 Pit Pond water quality or water quantity is not ~~yet~~ sufficient to provide long term diluting flows for the Tara MSR then the potable water dilution flow used during the active closure phase must be retained for MSR effluent dilution until N02 Pit Pond can be used. If the N02 Pit Pond water quality is of sufficient quality to meet consent conditions, then the N02 Pit Pond can be set up to flow continuously to the discharge point via the overflow.
~~7. Develop low rainfall trigger values to identify when decant flow may stop and implement automatic text alert system. This could be linked to mean annual low flow conditions in the Selwyn River. The water level in the N02 Pit Pond will be continuously monitored with text/email alerts set for low levels.~~
8. Determine any additional performance monitoring requirements (if any) for the N02 Pit Pond where uncertainty exists in either flow rates or water quality. Where telemetered sondes are required for performance monitoring – confirm that relationships to contaminants of concern are provide a reliable relationship.~~appropriate~~.

9. Update and agree changes to TARPs as necessary, based on new information. Merge any changes into the Mine Closure Management Plan, or consent conditions.

2.3 Tara Mussel Shell Reactor: ~~CC02_tele –~~ Tara Catchment

Prior to the post closure phase the following activities are proposed.

Performance monitoring must be used to:

1. Confirm ~~that~~ reliable water quality trends ~~are stable~~ and that the MSR is operating to design expectations.
2. Confirm that water quantities and qualities can be reliably diluted by flows from the N02 Pit Pond.
3. Confirm all infrastructure is working ~~as expected~~ reliably as proposed.
4. Determine any additional performance monitoring requirements (if any) for the Tara MSR where reasonable uncertainty exists in either flow rates or water quality. Where telemetered sondes are required for long term performance monitoring – confirm that relationships ~~to~~ between contaminants of concern are ~~appropriate~~ reliable.
5. Update TARPs as necessary, based on new information. Merge any changes into the Mine Closure Management Plan, or consent conditions.
6. If N02 Pit Pond water quality or water quantity is not ~~yet~~ sufficient to provide long term diluting flows for the Tara MSR then the potable water dilution flow used during the active closure phase must be retained for MSR effluent dilution until N02 Pit Pond can be used. If the N02 Pit Pond water quality is of sufficient quality to meet consent conditions, then the N02 Pit Pond can be set up to flow continuously to the discharge point via the overflow.

2.4 Post Closure Monitoring

Table 2 Matrix of Monitoring – Post Closure Phase

Post Closure Phase monitoring matrix				
Site	**Designation**	**Type**	**Frequency**	**Parameters**
CC02_TSMS (Tara spillway mixing structure)	Compliance	Continuous	15 mins	~~EC,~~ pH
CC02_TSMS (Tara spillway mixing structure)	Compliance	discrete	monthly**	~~EC,~~ pH, Fe, Al, Zn, B, Mn, Ni~~, SO4, Mg, Ca, DO~~
CC24	Compliance	Continuous	15 mins	~~EC,~~ pH
CC24	Compliance	discrete	monthly	~~EC,~~ pH, Fe, Al, Zn, B, Mn, Ni
CC02_TSMS (Tara spillway mixing structure)	Performance	Continuous	15 mins	EC, temp
CC02_TSMS (Tara spillway mixing structure)	Performance, Hardness	discrete	monthly	EC, SO4, Mg, Ca, DO, Total Fe, Total Al, Total Mn, DOC, temp
CC02_TSMS (Tara spillway mixing structure)	Performance	discrete	Annual	PAHs, As, Cd, Cr, Cu, Pb, Hg
CC24	Performance	Continuous	15 mins	EC
CC24	Performance, Hardness	discrete	monthly	EC, SO4, Mg, Ca
CC20	Performance	Continuous	15 mins	WL/Flow
CC20	Performance	discrete	performance monitoring*	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca
CC20	Performance	discrete	Annual	PAHs, As, Cd, Cr, Cu, Pb, Hg
CC03	Receiving environment	Continuous	15 mins	WL/Flow, EC, pH note: data suitably smoothed to remove noise
CC03	Receiving environment	discrete	performance monitoring*	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca
CC09	Receiving environment	discrete	performance monitoring*	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca
CC12	Performance	discrete	performance monitoring*	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca
N02 Pit Pond	Performance	Continuous	15 mins	WL, EC, pH note: data suitably smoothed to remove noise
N02 Pit Pond	Performance	discrete	monthly**	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca, ~~DO, Acidity to pH 8.3~~
N02 Pit Pond - surface and basal water	Performance	discrete	monthly**	EC, pH, DO, Temp
Tara Pond	Performance	Continuous	15 mins	WL/Flow note: data suitably smoothed to remove noise
Tara Pond	Performance	discrete	performance monitoring*	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca
MSR	Performance	Continuous	15 mins	WL note: data suitably smoothed to remove noise
MSR influent (CC02)	Performance	discrete	performance monitoring*	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca (& Flow)
MSR effluent	Performance	discrete	monthly**	EC, pH, Fe, Al, Zn, B, Mn, Ni, SO4, Mg, Ca (& Flow)
Dilution water (potable water, or N02 decant)	Performance	discrete	monthly**	Flow

*Frequency set by performance monitoring. Initially this will be monthly.
**Modified by TARPs
Metal concentrations are dissolved unless specified.

2.5 Post Closure Tara Water management TARPS

	Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
N02 Pit Pond Acidity NOTES 1. Manual pH measurements of the pond water near the decant discharge combined with telemetered EC and pH measured during performance monitoring or as required by each TARP trigger level. 2. Collect data and develop relationships. Periodically review performance monitoring frequency.				
Trigger	pH > 7.0	pH 6.0 – 7.0	pH < 6.0	pH < 6.0 (3 consecutive weekly samples)
Action / Response	• If pH >= 9.0 reduce alkaline dosing rates, investigate cause to prevent recurrence.	Map N02 Pit Pond drainage for any point sources of surface/groundwater flows with	• Report as per RC 170541 if pH at ~~CC02_tele~~ the	• Report as per RC 170541 if pH at ~~CC02_tele~~ the

Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
• • Otherwise, No action required	elevated acidity. Install passive treatment for any high-risk point sources found.	compliance point also below pH 6. • Increase frequency of manual water sampling to weekly until 3 consecutive samples below Orange TARP trigger level. • Investigate causal factors and remedy/mitigate where practicable. For instance, is the low pH due to AMD or is the low pH due to	compliance point also below pH 6. • Install active NaOH dosing system into N02 Pit Pond inflow with live pH and/or flow rate inputs. • AND undertake Orange actions

	Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
			heavy rainfall, which can also lower pH. • Install a MSR to enable passive treatment of decanting flows from N02 Pit Pond if causal factor is not temporary/one off. • Ensure combined discharge quality pH is adequate at ~~CC02_tele~~ the compliance point. • AND undertake Yellow actions.	

	Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**

N02 Pit Pond Boron Concentrations

NOTES:

1. EC may be suitable for monitoring contaminant trends and concentrations in the N02 Pit Pond. An EC/boron relationship will be developed from performance monitoring data. If EC does not have a reliable relationship with boron, then manual sampling during performance monitoring sampling will be required or as required by each TARP trigger level. Continuous EC data triggers must account for short term variability in measured EC and relationship to contaminants. An adequate sample size will be required to determine these relationships.
2. Analogue models using CC20 water quality data (North ELF seepage and surface runoff) were used to determine a threshold value of 0.60 mg/L for the dilution model. Likewise, CC02 Underdrain boron concentrations of 3.65 mg/L were used in modelling. These data need to be reviewed once performance monitoring data are available during the active closure phase for the N02 Pit Pond.
3. Management options for boron may be assessed as conceptual studies during the active closure phase.
4. During the Post Closure Phase the N02 Pit Pond water quality must be suitably low ~~to enable~~ prior to using it for dilution of the MSR effluent after treatment of the CC02 underdrain.
5. Collect data and develop relationships. Periodically review performance monitoring frequency.

	Canterbury Coal Trigger Action Response Plan ***Post Closure Phase - Tara Water Management***			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
Trigger	Boron concentration < 0.60 mg/L (*or < 80% of maximum tolerated for suitable dilution* ~~or maximum tolerated for suitable dilution~~) [OR EC equivalence – subject to NOTE #1]	Boron concentration 80% -< 90% of maximum tolerated in diluting flows. [OR EC equivalence – subject to NOTE #1]	Boron concentration 90% - <100% of maximum tolerated in diluting flows. [OR EC equivalence – subject to NOTE #1]	Boron concentration >= 100% of maximum tolerated in diluting flows (for 3 consecutive weekly samples).
Action / Response	• No action required,	• Increase N02 Pit Pond decant flow rate. • Increase live storage of N02 Pit Pond by installing syphon or other method. • Review Boron Options Assessment and commence field trials of appropriate viable technology and/or processes. [This assumes the technology can be installed in the timeframe available by higher decant flow rates].	• Increase frequency of water sampling to weekly until 3 consecutive samples below Orange TARP trigger level. • Implement viable management options available from the Boron Options	• Report as per CRC170541 if exceedance has occurred at ~~CC02_tele~~ the compliance point. • Turn on clean water dilution at required flow • Implement viable options available from the Boron Options

	Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
			Assessment and undertake performance monitoring • AND undertake Yellow actions as necessary.	Assessment and undertake performance monitoring. • AND undertake Orange actions as necessary

N02 Pit Pond Decant Flow Rates

1. Manual flow measurements of the decant discharge, combined with continuous flow measurements (inline flow meter) ~~and Tara Pond Discharge combined with continuous measurements (water level sonde).~~ Manual measurements to be taken during performance monitoring sampling.
2. The decant flow rates proposed are based on the analogue model using CC20 water quality data (North ELF seepage and surface runoff), i.e., boron concentrations of 0.60 mg/L. Likewise, CC02 Underdrain boron concentrations of 3.65 mg/L were used in modelling. These data need to be confirmed once performance monitoring data are available during the active closure phase for the N02 Pit Pond.
3. Develop low rainfall trigger values for site to identify when decant ~~decantrequired~~ flow may stop and implement automatic text/email alert system.
4. Have sonde telemetry data available with text/email alerts established for N02 Pit Pond water level~~, and Tara spillway flow rate~~ trigger levels.

	Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
	5. If the N02 Pit Pond drops to 25% of live storage capacity then the decant rate will be adjusted down to be 125% of the flow required for dilution 6. If the N02 Pit Pond drops below the decant level, the ~~clean water~~ dilution system will be switched over to the MHRWS system.turned on~~If Tara Pond discharge rate is < 95% of the N02 Pit Pond decant rate (due to evaporation or other loses),~~ A~~a~~ pipe ~~should~~ will be installed and used to convey decant dilutent water between the N02 Pit Pond and the Tara Spillway mixing basin ~~Tara Pond~~ to convey the decanting flows. 7. Collect data and develop relationships.			
Trigger	Decant Flow ~~sustainable~~ at > 0.48 L/s (OR >= 150% of that required to dilute boron concentration ~~load~~ in Tara MSR Effluent)	Decant flow < 150% & >110% of that required to dilute boron concentration ~~load~~ in Tara MSR Effluent	Decant Flow sustained for 1 week (sonde gauge) < 150% & > 110% of that required to dilute boron concentration ~~load~~ in Tara MSR Effluent)	Decant Flow sustained for 1 week < 110% of that required to dilute boron concentration ~~load~~ in Tara MSR Effluent)
Action / Response	• If decant flow > 200% of that required to dilute Tara MSR Effluent, reduce decant flow	• Investigate improvements to decant system to prevent unplanned reduction in flow rates	• Increase frequency of manual flow measurements to	• Report as per CRC170541 if low flow has caused non-compliance in regards to

Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
rate to 200% to prolong life of live storage • Otherwise, no action required	• Confirm continuous flow measurements for decant flows are accurate. • Review and assess water levels and rainfall records.	weekly until 3 consecutive samples above TARP flow rate. • Implement improvements to Increase N02 Pit Pond decant flow rate to ensure flows do not drop below minimum threshold. • Increase N02 Pit Pond Live Storage through modifications to existing infrastructure.	water quality at ~~CC02_tele~~ the compliance point. • Implement viable options available from the Boron Options Assessment and undertake performance monitoring. This may include the supply of additional water from off site. • AND undertake Orange actions as necessary.

	Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
			• Investigate alternative dilution sources. • Manually measure decant rate at Tara Pond overflow to evaluate pressure sonde flow accuracy. • AND undertake Yellow actions as necessary.	

N02 Pit Pond Stratification

1. Manual measurements of the N02 Pit Pond water quality (EC, pH, DO, Temp) measured within 0.5m of the surface and at a depth of 2.5m at the deepest point of the pond.

	Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
	2. Note, discrete sampling of the surface water is also undertaken during performance monitoring for laboratory analysis 3. It is noted that stratification within N02 Pit Pond is a risk to discharge water quality if the contaminant load within the water layers would not meet the levels required to meet dilution requirements at the MSR effluent point, or if a mixing event led to displacement and discharge of the stored water causing a exceedance of compliance limits at the discharge point. 4. Trigger differentials are measured as the difference between paired samples of bottom water vs surface water 5. If N02 Pit Pond is not being used for dilution at the MSR effluent, there is no requirement to proceed to orange or red levels. 6. Collect data and develop predictive relationships with potential climatic, seasonal, and other potential limnological drivers or other inputs.			
Trigger	Differentials all within following: pH +/- 1.0 EC +/- 20% DO +/- 20% Temp +/- 1°	Differentials above Green Level, but all within the following: pH +/- 2.0 EC + 40% DO - 40% Temp +/- 3°	Differentials above Yellow Level	Differentials above Yellow Level & contaminant concentrations of bottom waters > compliance limits

	Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
Action / Response	• No action required~~v~~	• ~~Review and assess water levels and rainfall records.~~Scope and engineer Aeration and/or mixing device suitable for the site and pond size. • investigate temporary mixing method such as motor boat.	• Undertake lab sample for compliance contaminant suite. • Increase frequency of manual measurements to weekly until 3 consecutive samples under yellow TARP levels • Undertake temporary mixing method determined in yellow level investigation if practicable.	• revert to clean water supply for dilution until tarp level trigger reduces to yellow. • Install Aeration device into N02 Pit Pond • revert to clean water supply for dilution until tarp level trigger reduces to yellow. • AND undertake Orange actions as necessary.

	Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
			• Quantify the risk of the stratified waters 'flipping' • AND undertake Yellow actions as necessary.	

TARA MSR Effluent Contaminant Loads

NOTES

1. Manual flow measurements (bucket & stop watch) of the MSR influent and effluent discharge rates to be taken during performance monitoring sampling. It is not expected for flow rates to varying greatly once all site earthworks are completed ~~and flows stabilised.~~
2. Contaminant loads (based on sampled concentration and measured flow rates) have been used to account for potentially variable flow and quality. Boron contaminant loads have been derived from Model 7 where MSR design flow rate is 0.2 L/s and 3.65 mg/L = 0.73 mg/s. It is assumed that other contaminant loads are also stable.

	Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
	3. The contaminant loads proposed for boron are based on the analogue model using CC20 water quality data (North ELF seepage and surface runoff), i.e., boron concentrations of 0.60 mg/L. Likewise, CC02 Underdrain boron concentrations of 3.65 mg/L were used in modelling. These data need to be confirmed once performance monitoring data are available during the active closure phase for the N02 Pit Pond. 4. Data should be used to update management requirements for the MSR including sludge accumulation rates and desludging requirements. 5. Collect data and develop relationships.			
Trigger	Boron contaminant load < 0.35 mg/s stable [NOTE: equivalent to 0.1 L/s at 3.65 mg/L].	Boron contaminant load between 0.35 – 0.7 mg/s	Boron contaminant load > 0.7 mg/s	Boron contaminant load > 0.7 mg/s (for 3 consecutive weeks).
Action / Response	• Continue to monitor concentrations, flow rates, and loads to derive estimate of contaminant decay rates and expectations of passive treatment duration.	• Ensure N02 Pit Pond decant flow rates are adequate to dilute Tara MSR effluent flows • Compare CC02 water quality vs modelled concentrations and loads for Tara MSR treatment capability	• Increase frequency of flow and water quality measurements to weekly until 3 consecutive samples above TARP.	• Report as per RC170541 if high loads have caused non-compliance in regards to water quality at the compliance point~~CC02_tele~~.

Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
		• Increase N02 Pit Pond decant flow rate to meet dilution requirements. • Increase N02 Pit Pond live storage. • Investigate alternative options for Tara MSR effluent dilution • Increase Tara MSR freeboard. • AND undertake Yellow actions as necessary.	• Implement alternative sources for dilution • Implement as required other viable options available from the Boron Options Assessment and undertake performance monitoring. • AND undertake Orange actions as necessary.

BATHURST RESOURCES LIMITED

	Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
Tara MSR Water level NOTES: **1.** Manual measurements of the MSR pond freeboard are required combined with continuous stage height (Sonde). Manual measurements to be taken during performance monitoring sampling. **2.** Data should be used to update management requirements for the MSR including sludge accumulation rates and desludging requirements. **3.** Collect data and develop relationships.				
Trigger	Water level > 200 mm below maximum freeboard level	Water level 100 mm – 200 mm below maximum freeboard level	Water level 50 mm - 100 mm below maximum freeboard level.	Water level < 50 mm below maximum freeboard level
Action / Response	• No action required.	• Investigate Tara MSR performance to date. • Update expectations for sludge removal frequency • Manually Perforate sludge layer at top of mussel shell bed	• Assess Tara MSR for any modifications required to improve operability.	• Undertake sludge removal process (See sludge removal SOP) • AND undertake Orange actions as necessary.

	Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
			• AND undertake Yellow actions as necessary	
MSR Effluent / Tara Pond outflow Mixing Zone Water Quality (Boron / Manganese) NOTES: 1. Manual samples taken during performance monitoring at MSR/Tara spillway point of discharge 2. EC may be suitable for monitoring contaminant trends and concentrations at ~~CC02_tele~~ the compliance point instead of manual sampling. This will require data and a reliable relationship, which will be developed through performance monitoring. ~~3. CC02_tele will continue to be monitored as per consent conditions.~~ 4. Collect data and develop relationships.				
Trigger	Boron, manganese, ~~nickel, zinc~~ are all within 70~~80~~% of consent~~CRC170541~~ limits	Either boron, or manganese, or nickel, or zinc are between 70~~8~~~~0~~% - 90% of consent~~CRC170541~~ limits	Either boron, or manganese, or nickel, or zinc are >90% of consent~~CRC170541~~ limits	Either boron, or manganese, or nickel, or zinc are >90% of consent~~CRC170541~~ limits (3 consecutive weekly samples)

	Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
	GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
Action / Response	• No action required	• Investigate Tara MSR to ensure effective operation. • Increase clean water / N02 Pit Pond decant rate to ensure contaminant concentrations in combined flows are below trigger levels.	• Increase frequency of water quality measurements to weekly until 3 consecutive samples below Orange trigger level~~above TARP.~~ • ~~Investigate Tara MSR to ensure effective operation.~~ • ~~Increase N02 Pit Pond decant rate to ensure concentrations in combined flows are below trigger levels~~	• Implement results/actions of any investigations undertaken. • AND undertake Orange actions as necessary.

Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
		• Undertake a study on specific effects on receiving environment (Tara Wetland) • Quantify acceptable maximum tolerable concentration of contaminant of concern for short term exposures. • ~~Investigate~~ Implement viable options available from the Boron Options Assessment.	

Canterbury Coal Trigger Action Response Plan *Post Closure Phase - Tara Water Management*			
GREEN – Level 1	**Yellow – Level 2**	**Orange – Level 3**	**RED – Level 4**
		• ~~Install active NaOH dosing system into N02 Pit Pond inflow with real-time pH and/or flow rate inputs~~ • ~~Install N02 MSR to enable passive treatment of decanting flows from N02 Pond~~ • AND undertake Yellow actions as necessary.	

Appendix A – North ELF TARP as per CRC173823

AMD risk class	Acid Load	Description	Operational	Closure
Very low	Negligible	No treatment – discharge within compliance	Discharge at North ELF discharge point within compliance at CC24	Discharge at North ELF discharge point within compliance at CC24
Very low but with metals compliance risks	Negligible	Controlled discharge	Discharge at North ELF discharge point within compliance at CC24 **OR** pump mussel shell reactor effluent back to North ELF or Main Mine Site for dust suppression	Discharge at North ELF discharge point within compliance at CC24 **OR** lov maintenance solar pump mussel shell reactor effluent irrigate pasture/forestry
Low	< 1 t $CaCO_3$/yr	Passive treatment 1 – Small scale containerised passive treatment	Construct small scale (containerised) passive treatment system between Pond 1 and Pond 2. Discharge via Pond 2 within compliance at CC24 **OR** pump mussel shell reactor effluent back to North ELF or Main Mine Site for dust suppression	Convert Pond 1 and/or Pon to a passive treatment syste Discharge via Pond 2 within compliance at CC24 **OR** lov maintenance solar pump mussel shell reactor effluent irrigate pasture/forestry
Moderate	< 15 t $CaCO_3$/yr	Passive treatment 2 – Large scale passive treatment	Construct large scale (pond) passive treatment system between Pond 1 and Pond 2. Discharge via Pond 2 within compliance at CC24 **OR** pump mussel shell reactor effluent back to North ELF or Main Mine Site for dust suppression.	Convert Pond 1 and/or Pon to a passive treatment syste Discharge via Pond 2 within compliance at CC24 **OR** lov maintenance solar pump mussel shell reactor effluent irrigate pasture/forestry
OR				
Moderate	< 15 t $CaCO_3$/yr	Active treatment 1 – Small scale active treatment (direct caustic dosing, lime irrigator, *etc.*)	Construct small scale active treatment system dosing chemical to Pond 1 and/or Pond 2. Discharge via Pond 2 within compliance at CC24 **OR** pump treated underdrain effluent back to North ELF or Main Mine Site for dust suppression.	Operate small scale active treatment system dosing chemical to Pond 1 and/or Pond 2. Discharge via Pond 2 within compliance at CC24 **OR** lov maintenance solar pump treated underdrain effluent irrigate pasture/forestry