



8 November 2018

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Originally sent by email to:
Clay.Preshaw@planning.nsw.gov.au

Attention Elle Donnelley

Dear Clay,

Re: Tritton Mine – DA 41/98 Modification 6 – Response to EPA Comments

Thank you for providing the comments prepared by the Environmental Protection Authority (EPA) following review of the Environmental Assessment for Modification 6 of Development Application (DA) 41/98 for the Tritton Mine (the Mine). I note that the comments from the Division of Resources and Geoscience and the Resources Regulator do not require a response and you have advised that Bogan Shire Council does not intend to provide comments. We look forward to receiving the feedback from the NSW Dam Safety Committee when it is available.

The following presents a response to the EPA comments and has been presented under section headings consistent with the comments provided. Additional figures and attachments are also provided. On the whole, Tritton Resources Pty Ltd (the Applicant) remains confident that the proposed modifications would be undertaken in a safe and environmentally responsible manner, provide an overall benefit by improving the efficiency and enhancing resource recovery for underground mining operations at the Applicant's Murrawombie Mine and would permit a beneficial use and long term storage option for the tailings material generated at the Tritton Mine.

Air Quality

Clarification of the monthly data for the deposition of dust for the 2014-2017 period outlined in Table 12

The data presented in the Environmental Assessment are correct noting that the data in the most recent AEMR incorrectly repeated the data from the previous year.

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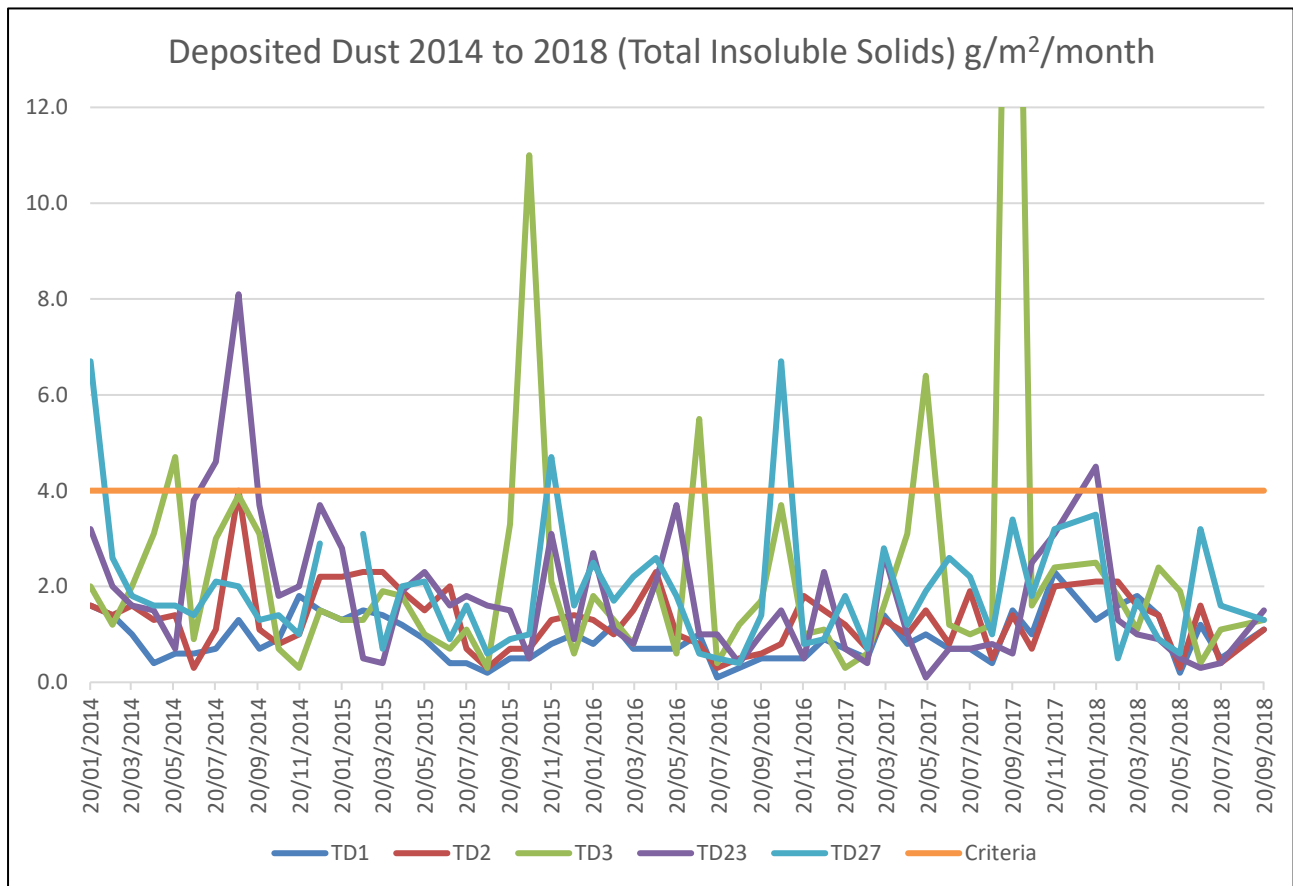
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The relevant criteria for deposited dust is the annual average (12 months) of the monthly data specified in g/m²/month. Therefore, the data presented in the Environmental Assessment is entirely suitable for consideration of existing compliance. Regardless, **Table 1** presents the data collected for monitoring locations at boundary locations for the Tritton Mine. These locations are the most appropriate for consideration as they provide an indication of deposited dust levels leaving the site. A chart of the data is also provided and demonstrates the low number of monthly exceedances of the 12-month average criteria, especially at monitoring locations TD1 and TD2 that are to the north of the Tailings Storage Facility (TSF).

Table 1
Updated Deposited Dust Monitoring 2014 – 2018

Date	Monitoring Location					Date	Monitoring Location				
	TD1	TD2	TD3	TD23	TD27		TD1	TD2	TD3	TD23	TD27
20/01/2014	1.6	1.6	2.0	3.2	6.7	20/05/2016	0.7	1.0	0.6	3.7	1.8
21/02/2014	1.4	1.4	1.2	2.0	2.6	22/06/2016	1.0	0.8	5.5	1.0	0.6
21/03/2014	1.0	1.6	2.0	1.6	1.8	18/07/2016	0.1	0.3	0.4	1.0	0.5
22/04/2014	0.4	1.3	3.1	1.5	1.6	19/08/2016	0.3	0.5	1.2	0.4	0.4
23/05/2014	0.6	1.4	4.7	0.7	1.6	20/09/2016	0.5	0.6	1.7	1.0	1.4
19/06/2014	0.6	0.3	0.9	3.8	1.4	19/10/2016	0.5	0.8	3.7	1.5	6.7
21/07/2014	0.7	1.1	3.0	4.6	2.1	21/11/2016	0.5	1.8	1.0	0.5	0.8
23/08/2014	1.3	4.0	3.9	8.1	2.0	20/12/2016	0.9	1.5	1.1	2.3	0.9
22/09/2014	0.7	1.1	3.1	3.7	1.3	20/01/2017	0.7	1.2	0.3	0.7	1.8
20/10/2014	0.9	0.8	0.7	1.8	1.4	21/02/2017	0.5	0.7	0.6	0.4	0.7
19/11/2014	1.8	1.0	0.3	2.0	1.0	17/03/2017	1.4	1.3	1.6	2.7	2.8
19/12/2014	1.5	2.2	1.5	3.7	2.9	20/04/2017	0.8	1.0	3.1	1.0	1.2
20/01/2015	1.3	2.2	1.3	2.8	NR	17/05/2017	1.0	1.5	6.4	0.1	1.9
20/02/2015	1.5	2.3	1.3	0.5	3.1	20/06/2017	0.7	0.8	1.2	0.7	2.6
20/03/2015	1.4	2.3	1.9	0.4	0.7	20/07/2017	0.7	1.9	1.0	0.7	2.2
17/04/2015	1.2	1.9	1.8	1.9	2.0	21/08/2017	0.4	0.5	1.2	0.8	1.0
20/05/2015	0.9	1.5	1.0	2.3	2.1	20/09/2017	1.5	1.4	24.8	0.6	3.4
26/06/2015	0.4	2.0	0.7	1.6	0.9	18/10/2017	1.0	0.7	1.6	2.5	1.8
20/07/2015	0.4	0.7	1.1	1.8	1.6	20/11/2017	2.3	2.0	2.4	3.1	3.2
19/08/2015	0.2	0.3	0.3	1.6	0.6	19/01/2018	1.3	2.1	2.5	4.5	3.5
21/09/2015	0.5	0.7	3.3	1.5	0.9	20/02/2018	1.6	2.1	1.8	1.3	0.5
19/10/2015	0.5	0.7	11.0	0.5	1.0	20/03/2018	1.8	1.6	1.1	1.0	1.7
20/11/2015	0.8	1.3	2.1	3.1	4.7	20/04/2018	1.4	1.4	2.4	0.9	0.9
23/12/2015	1.0	1.4	0.6	0.9	1.6	21/05/2018	0.2	0.3	1.9	0.5	0.6
20/01/2016	0.8	1.3	1.8	2.7	2.5	20/06/2018	1.2	1.6	0.4	0.3	3.2
19/02/2016	1.2	1.0	1.3	1.1	1.7	19/07/2018	0.5	0.4	1.1	0.4	1.6
18/03/2016	0.7	1.5	0.8	0.8	2.2	20/09/2018	1.1	1.1	1.3	1.5	1.3
20/04/2016	0.7	2.3	2.1	2.1	2.6						
Average All Records							0.9	1.3	2.4	1.8	1.9
Exceedance Number (>4.0 g/m ² /month)							0	0	5	3	3
Standard Deviation							0.47	0.69	3.56	1.45	1.32



The Applicant also records dust levels within the Mine Site and at locations in the local environment for reference. **Figure 1** presents the locations of these dust gauges at the Mine Site.

The additional data does not change the conclusion of the Environmental Assessment that existing dust levels at the Mine Site in the vicinity of the TSF are relatively low.

Justification of the adequacy of the proposed dust monitoring system to adequately assess dust impacts of the proposal and to allow for real management of dust. For example, consideration should be given to whether dust gauges to the east of the TSF are required as identified in Figure in the EA and the installation of HVAS or TEOMs

Given the low levels of deposited dust recorded in the vicinity of the TSF and the proposed management measures to limit dust lift-off under the proposed modification, it has been concluded that dust generated under the proposed modification would be likely to remain generally consistent with existing dust levels and within approved criteria levels. Unlike soil or waste rock stockpiles, the tailings material would have a relatively high moisture content. This inherently limits dust generation. In addition, specific mitigation measures to reduce dust generation include the following.

- Visually inspecting the excavation area of the TSF on a weekly basis to ensure that no visible dust is emitted from the area.
- Application of water from a water cart to the excavation area, TSF embankment, access ramp, haul route, and drying stockpiles during dry and/or windy conditions to suppress dust lift-off.

- Constructing the drying stockpiles to have slopes of no more than 1:3 (V:H), in order to improve stability and dust generation.
- Limiting operations where practicable during periods of high winds.
- Ensuring that the exhausts of construction, loading and hauling equipment would be diverted away from the ground surface so as not to generate dust.
- Ensuring that all trucks transporting dried tailings material from the Mine Site have their loads covered prior to exiting the stockpile area.
- Immediately cease any operations that are resulting in visible dust emissions beyond the TSF boundary.
- Respond promptly to any air quality-related complaints, including modifying on-site operations in the event that dust emissions from those operations are not acceptable.

The Applicant notes the EPA concerns about dust generated by vehicles activity in the vicinity of the TSF. However, it should be noted that vehicles would not be travelling backwards and forwards over the TSF and extraction would only occur in campaigns, not continuously.

Figure 1 presents the existing and proposed locations for dust gauges at the Mine Site. In order to demonstrate that the predictions relating to dust generation are sound, the Applicant has again considered annual wind conditions recorded at the Nyngan Airport AWS (Bureau of Meteorology Station ID 51039) with annual wind roses in the morning (9am) and afternoon (3pm) presented in **Figure 2**. The annual wind data indicate wind from variable directions throughout the year with winds more consistently from the south. There are two existing dust gauges to the north of the TSF (to record deposited dust dispersed by the prevailing winds) and several gauges to the west in the vicinity of mining operational areas. It is proposed that two additional dust gauges be installed to the south and to the east of the TSF in the vicinity of the access ramps and stockpiling area. The results of monthly deposited dust monitoring would be presented in annual reporting. The additional dust gauges would be installed prior to the commencement of tailings excavation activities.

The use of continuous particulate matter monitoring is considered unwarranted due to the limited dust generation in the past and the proximity to residences (the closest is approximately 4.5km from operational areas).

Definitions of high winds or windy conditions which will be used to warrant limiting operations or using a water cart including the development of a Trigger Action Response Plan (TARP) for the proposal

Management responses to windy conditions are considered a reactive management measure with visual observations of conditions triggering the use of the water cart or altering operations to reduce dust generation. Situations that may prompt this response include the following.

- Visual observation of dust lift-off from the waste rock emplacement or other stockpiles prompting the use of water spraying via the water cart.
- Visual observation of dust-lift off from the waste rock emplacement or other stockpiles prompting the relocation or amendment of operations at elevated locations (that is, on the waste rock emplacement) or stockpiling or handling of materials.

- On occasion, meteorological predictions may include wind levels, advising of adverse conditions. These conditions would be considered in operational planning and operations amended to suit conditions, where relevant.

It should be noted that these conditions are experienced very infrequently, and potential impacts are considered to be negligible. Therefore, formally specifying conditions under which reactive management would be required is considered unnecessary.

Clarification regarding the shaping and dimensions of stockpiles and how this will minimise wind erosion

As described in Section 4.3.5 of the Environmental Assessment, drying stockpiles would have slopes of no more than 1:3 (V:H), in order to improve stability and therefore limit the potential of slumping and dust generation.

Commitment to the installation of a meteorological station at the premises should one not be already installed

Approval for the Mine was granted in 1999 and since that time there has been no need for meteorological monitoring at the Mine Site or at any of the Tritton operations in the area. Reliance has been placed on locally available data recorded by the Bureau of Meteorology. Data references in the Environmental Assessment was sourced from the following locations.

- Nyngan Airport Automated Weather Station (Station Number 51039), located approximately 49km southeast of the Mine Site (temperature, humidity and wind).
- Girilambone (Wongala) Station (Station Number 151158), located approximately 16km to the northeast of the Mine Site (rainfall).

A dedicated meteorological station is considered unnecessary at the Mine Site given the proximity and reliability of nearby data sources.

Water

Drawings of surface water structures in relation to the TSF

Attachment 1 is the Erosion and Sediment Control Plan for the Tritton Mine that includes the locations of surface water management areas and structures in the vicinity of the TSF. Notwithstanding the presence of these structures, it is considered unlikely that additional storage would be required for the excavation of tailings as the excavated cells would drain to the decant trench within the TSF.

Clarification of the distance from the TSF embankment wall to excavation area contained in Table 9

Technical advice from CMW Geosciences (Appendix 1 of the EA) proposes the following offset from the embankment wall to maintain stability.

- 35m offset from the Stage 5 embankment wall.
- 26m offset from the Stage 6 embankment wall.
- 20m offset from the Stage 7 embankment wall.

It should be noted that the extraction cell locations presented in the Environmental Assessment are indicative only and are presented to demonstrate the offset from the embankment. Extraction cell locations would be selected and developed based on:

- stability of the surface;
- proximity to the drying stockpiles; and
- ramp access and the quantity of tailings required for any campaign.

The conclusion of the risk assessment (Table 9 of the EA) remains appropriate noting that the consequences of embankment failure are being treated as severe by the Applicant but the likelihood of this occurring is considered very rare based on the proposed operational procedures, proposed offset of excavation activities from the embankment, design of the embankment and commitment to limit access to these areas.

Clarification and justification of truck access points from the TSF embankment onto TSF surface to access the stockpile area and excavation areas and their potential impacts and proposed mitigation measures

The location for temporary stockpiling of the tailings material has been refined following the request from the EPA and the location of access and stockpiling areas is presented in **Figure 3**. The Applicant proposes two access points for access on to and off the TSF. Access would be one way (on and off the TSF) to reduce potential impacts to the TSF surface. Indicative cell locations are also presented in **Figure 3**, as material closest to the stockpiling area would be given priority to reduce handling requirements and potential dust generation.

The concerns of the EPA regarding TSF stability are noted. CMW Geosciences have been commissioned by the Applicant to prepare the structural design of the Stage 6 and Stage 7 development of the TSF (that is, the next two lifts of the embankment). These designs were considered in planning the operational guidelines for tailings extraction (Appendix 1 of the EA) that took into account the need for vehicles to access the facility and assumed a worst case phreatic surface, with a pond near the perimeter embankment (which is not likely to be the case). CMW Geosciences also considered the *New South Wales Dams Safety Committee (DSC), June 2012, DSC3F Guide, 'Tailings Dams'* in planning operational guidelines. CMW Geosciences have noted that with the inclusion of proposed excavation activities the proposed design and operation of the TSF remains unchanged.

It should also be noted that access to the TSF would not be continual as extraction would be campaign based.

On this basis, the Applicant is confident that potential stability issues would be effectively managed.

Waste (Tailings)

Tonnage of tailings material currently being generated per year at the Tritton Copper Mine

Tailings generation from the Tritton Mine was 1.4Mt in the 12 months to June 2018 and 1.3Mt in the 12 months to June 2017.

Tonnage of tailings material to be excavated and exported per year from the tailings storage facility

It is estimated that annual production of paste fill material would be 175 000m³ with approximately 265 000t of tailings material received from the Tritton Mine for use in the paste fill plant at the Murrawombie Mine each year.

Justification of the calculation of the tonnage of tailings material per year to be excavated

Based on the progress of operations at the Murrawombie Mine, it has been estimated that approximately 175 000m³ of paste fill material would be required each year. The calculation of excavated tailings is based on the existing operation of the paste fill plant at the Tritton Mine that uses a similar process to that which would be used at the Murrawombie Mine. It has been assumed that paste fill has a density of 2t/m³ and contains between 70% to 75% solids by mass. Therefore, converting the necessary fill material volume to tonnages and applying a solids content of 75% gives a solids (i.e. tailings) tonnage estimate of 262,500t that was rounded to 265,000t for the EA.

Composition of the existing tailings material to be excavated

Mineralogical analysis of two representative bulk samples of the Tritton tailings were undertaken in November 2009 and September 2010 at the time that the paste fill plant was constructed at the Tritton Mine. A summary of results of these analyses is presented in **Table 2**. The major minerals within the tailings are pyrite, chlorite and quartz.

Table 2
Tritton TSF Tailings Composition

Mineral Name	Formulas	Abundance (%wt)	
		Bulk sample 1	Bulk sample 2
Pyrite	FeS ₂	41	31
Chlorite, ferroan	(Mg,Fe) ₅ (Si,Al) ₄ O ₁₀ (OH) ₈	25	18
Quartz	Si O ₂	22	40
Illite	(K,H ₃ O)(Al,Mg,Fe) ₂ (Si,Al) ₄ O ₁₀ [(OH) ₂ (H ₂ O)]	10	-
Muscovite	KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂ (Na,CA)(Si,Al) ₄ O ₈	-	7
Plagioclase Feldspar		-	4

The sampling identified that the composition of the tailings material varied slightly dependant on the source of ore material. However, the variation is not significant and would not limit use of the material for paste fill.

Area to be utilised as drying stockpile area as well as further details on the dimensions of the tailings being stockpiled

The area intended for stockpiling tailings is presented in **Figure 3**. This is an area with a naturally elevated floor level. It would consist of a pad created through emplacement of waste rock material that would separate the areas from any contact with tailings slurry. Tailings stockpiles would be designed to have slopes of no greater than 1:3 (V:H).

Conclusion

I trust that the above satisfies the additional information requests of the EPA with regards the Modification 6 proposal and tailings excavation operations. The Applicant is confident that potential risks to the TSF embankment and the potential for dust generation would be suitably managed under the proposal.

It should be noted that the above information does not change the conclusions of the EA which related principally to the benefits of the proposed tailings excavation activities through beneficial use and long term storage of tailings material generated through processing operations at the Tritton Mine and the benefits to the efficiency and resource recovery at the Murrawombie Mine.

Should you have any additional queries on the above, please don't hesitate to contact myself or Dean Woods.

Yours sincerely



Nick Warren
Senior Environmental Consultant

Encls: Tritton Mine – Erosion and Sediment Control Plan (RWC, 2015)

Copy: Tritton Resources Pty Ltd



