



31 January 2023

Francis Kuranchie
Environmental Superintendent
Millennium Mine
M Mining Pty Ltd

Re: Environmental Authority Table C2 and Table C7 Amendment

Dear Mr Kuranchie,

M Mining Pty Ltd (M Mining) are in the process of amending the contaminant release limits for turbidity and suspended solids (SS; in '*Table C2: Mine affected water release limits*') in the Millennium Mine (MM) environmental authority (EA) EPML00819213. Currently, the contaminant release limits for turbidity and SS within Table C2 are listed as '*TBA*' (i.e. 'to be advised'). The footnote below Table C2 within the EA states that M Mining must amend the contaminant release limits for these two quality characteristics prior to 7 December 2022.

Consequently, M Mining requested the assistance of C&R Consulting Pty Ltd (C&R) in determining appropriate, site-specific water quality objectives (WQOs) for turbidity and SS, based on a provided background dataset, to ensure the protection of downstream environmental values. The receiving environments of MM are stated within the EA as New Chum Creek, West Creek and North Creek – as well as any connected waterways within 10 km downstream of the release points. Therefore, the receiving environments also include the Isaac River.

Environmental values of the receiving environment

Draft environmental values have been developed under the framework of the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (EPP Water and Wetland Biodiversity) for the Fitzroy Basin (Department of Science, Information Technology and Innovation [DSITI], 2017¹). DSITI (2017) separates the Isaac River sub-basin into several smaller environmental value zones, with Millennium associated with the *Isaac northern tributaries* and the *Isaac and lower Connors River main channel* zones. These two environmental value zones have the same allocated environmental values, which include:

- Aquatic ecosystems;
- Irrigation;
- Farm supply;
- Stock water;
- Human consumer;

¹ DSITI (2017). *Draft environmental values and water quality guidelines: Fitzroy Basin fresh, estuarine and marine waters, including Keppel Bay*. Newham, M., Moss, A., Moulton, D., Honchin, C., Thames, D., Shrestha, K., Elledge, A. Department of Science, Information Technology and Innovation, Queensland Government.



- Primary recreation;
- Secondary recreation;
- Visual recreation;
- Drinking water;
- Industrial use; and
- Cultural and spiritual values.

Based on these environmental values, the EPP Water and Wetland Biodiversity outlines the level of protection (or management intent) required to maintain these values (DSITI, 2017).

The EPP Water and Wetland Biodiversity outlines the management framework applicable to different aquatic ecosystems. The framework provides threshold levels of change that are acceptable for each aquatic ecosystem condition and involves maintaining the waters in good condition and seeking to sustainably manage water quality in modified waters (DSITI, 2017).

DSITI (2017) characterises the management intent for most of the Isaac/Connors River sub-basin (including the MM mining leases and receiving environment) as moderately disturbed. For moderately disturbed systems (*waters in which the biological integrity of the water is adversely affected by human activity to a relatively small but measurable degree*; EPP Water and Wetland Biodiversity), the intent is to achieve specified WQOs and – where appropriate WQOs do not exist – develop site-specific WQOs (DSITI, 2017).

Proposed site-specific WQOs for turbidity and SS

In a letter dated 13 November 2022 (C&R, 2022²), C&R provided M Mining an assessment of background water quality from New Chum Creek and the Isaac River against the data requirements for deriving site-specific WQOs in accordance with the *Queensland water quality guidelines* (DEHP, 2009³), ANZECC and ARMCANZ (2000⁴) and DES (2021⁵). The letter proposed contaminant release limits for turbidity and SS based on the 80th percentiles of the pooled background data (combined data from New Chum Creek and the Isaac River) to be submitted to the Department of Environment and Science (the Department), although the validity of background data from New Chum Creek was questioned. The site-specific derived WQOs for turbidity and SS were 2,160 NTU and 1,404 mg/L, respectively. Because these values were far greater than those provided within Table C7 of the EA for the receiving environment, C&R further recommended that Table C7 also adopt 2,160 NTU and 1,404 mg/L for turbidity and SS, respectively.

Following submission of the supporting information (including the C&R letter) to the Department (for the proposed EA amendment application), the Department provided feedback on the proposed contaminant release limits / WQOs, within an email dated 20 January 2023 from Team Leader Kathryn Eller. The email stated that the Department was able to review additional data (not available to C&R) collected from New Chum Creek by neighbouring mines (Poitrel Mine and Red Mountain Mine) that further reinforced C&R's initial findings about the questionable validity of M Mining's New Chum Creek

² C&R (2022). Letter: *Turbidity and TSS Release Limits*, Version 2. 13 November 2022.

³ DEHP (2009). *Queensland water quality guidelines*, Version 3. Department of Environment and Heritage Protection, Queensland. ISBN 978-0-9806986-0-2, pp. 184..

⁴ ANZECC and ARMCANZ (2000). *Australian and New Zealand guidelines for fresh and marine water quality*. National Water Quality Management Strategy. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

⁵ DES (2021). *Using monitoring data to assess groundwater quality and potential environmental impacts. Version 2*. Department of Environment and Science (DES), Queensland Government, Brisbane, pp. 60.

background dataset. Therefore, the Department suggested that the site-specific WQOs determined by C&R were unsuitable.

Instead, the Department proposed release limits for Table C2 (Table 1) and receiving environment trigger levels for Table C7 (Table 2) based on turbidity limits already imposed within EAs of neighbouring mines – and the SS values then determined via a correlation equation using the background dataset for New Chum Creek. C&R have various concerns with this approach / the Department's derived values, including:

- Unlike the site-specific WQOs developed by C&R, the proposed criteria are not derived using best-practice guidelines such as ANZECC and ARMCANZ (2000) or DEHP (2009⁶), nor have more rigorous statistical analysis – such as those recommended in DES (2021) – been applied.
- The proposed turbidity WQOs – that the SS WQOs are based on – are arbitrary values that are not based on site-specific data.
- The Department determined the SS WQOs based on a correlation factor with turbidity that was derived using a background dataset for New Chum Creek that the Department stated was inappropriate for developing site-specific WQOs from. It is unclear how this dataset can be relied on for a correlation value if its validity has already been questioned.
- The correlation figure provided by the Department showing the line-of-best-fit and the associated equation does not provide the corresponding R-value and p-value for the line to allow C&R to determine the effectiveness of the equation for the proposed use. From reviewing the figure, the correlation appears to be poor at higher levels of both SS and turbidity. This is not unexpected because additional factors can influence turbidity that do not affect SS and vice-versa, and this is generally accentuated at higher values.
- It is noted that the Poitrel Mine EA has adopted the arbitrary 500 NTU turbidity limit for releases and 750 NTU for receiving environment contaminant trigger level. However, no SS values have been imposed on Poitrel Mine at this stage, with the EA simply stating that site-specific SS WQOs must be developed when sufficient suitable data are available. This may also be an approach for MM.

Table 1: The Department's proposed release limits for EA Table C2.

EA Table C2 – Mine-affected water release limits	
Total suspended solids (mg/L)	265
Turbidity (NTU)	500

Table 2: The Department's proposed amendments to EA table C7.

EA Table C7 – Receiving water contaminant trigger levels	
Total suspended solids (mg/L)	400
Turbidity (NTU)	750

⁶ DEHP (2009). *Queensland water quality guidelines, Version 3*. Department of Environment and Heritage Protection, Queensland. ISBN 978-0-9806986-0-2, pp. 184.

Recipient: M Mining Pty Ltd
Subject: Environmental Authority amendment
Date: 31 January 2023



Impact to environmental values

Environmental values and water quality guidelines for the Fitzroy Basin are presented in DSITI (2017). The water quality guidelines are intended to protect the aquatic ecosystem environmental value for the respective sub-basin and are derived from both state and national guidelines, as well as site-specific data. A review of available guidelines for all other identified environmental values (where guidelines/objectives have been developed) found the objectives for aquatic ecosystems are the most stringent and are therefore suitable for protecting all other environmental values.

DSITI (2017) provides water quality guidelines for suspended solids (380 mg/L) and turbidity (590 NTU) – for event flows in the Upper Isaac River sub-basin – that are derived from the 80th percentile of data from the Isaac River gauging station at Deverill (downstream monitoring point MP7 in the MM EA). These guideline values are higher than the release limits proposed by the Department (Table 1). If MM undertake releases of mine affected water during event flows in the Isaac River, releases from the mine that adhere to the Department's proposed criteria (i.e. turbidity < 500 NTU and suspended solids < 265 mg/L) will not impact the downstream environmental values of the receiving environment of the Isaac River. This outcome is further reinforced by the background data for the Isaac River that C&R reviewed in the November 2022 letter to M Mining that calculated 50th percentiles for turbidity (933 NTU) and SS (601 mg/L) above the proposed guideline values, suggesting that the levels within the upstream receiving environment are generally above the proposed release limits and therefore any releases in accordance with the limits will not adversely influence the levels of these quality characteristics within the receiving environment.

Recommendations for Millennium

Despite concerns over the derivation methods of the release limits proposed by the Department, water quality data from stored waters at MM suggests that the proposed release limits are easily achievable to facilitate controlled releases of mine-affected water. Furthermore, the conservative nature of the proposed release limits ensures that any releases would not cause impacts to the downstream environmental values. Therefore, C&R recommend that MM accept the release limits proposed by the Department in Table 1.

With respect to the receiving water contaminant trigger levels proposed by the Department (Table 2), water quality collected from background sites on New Chum Creek and the Isaac River (C&R, 2022²) suggest that the turbidity and SS levels within the receiving environments are regularly recorded above this proposed objectives regardless of releases from MM, suggesting false-positive non-compliances are likely. However, a mechanism is built into the EA to address this potential issue (Condition C5), by comparing downstream results with the background levels during the same flow event. Therefore, C&R recommend that Millennium also accept the receiving water contaminant trigger levels proposed by the Department in (Table 2), with the provision that the receiving water contaminant trigger levels be reviewed once sufficient, appropriate, site-specific data are available.

Regards,

A handwritten signature in black ink, appearing to read 'Matt Knott', written over a light blue horizontal line.

Matt Knott
Senior Scientist / Manager
C&R Consulting Pty Ltd